

# **Mathematics Program Evaluation Report K-5**

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### **Program Scope and Highlights**

A Mathematics K-5 program evaluation took place in July of 2016 as well as July of 2017. The previous review of the mathematics curriculum occurred in 2008. During the current program evaluation, teachers represented all elementary grade levels, instructional support, and the gifted and talented program. These evaluators also represented all four district elementary schools. The focus of this review was to examine the successes and weaknesses of the current curriculum and develop related goals for future progress.

Other New Jersey districts were surveyed throughout 2016 and 2017 to learn about current curricular programs, enrichment options, utilization of instructional coaches, implementation of mathematics workshop, and availability of technology. In 2017, parents and teachers in the Bernards Township School District completed their own respective surveys. The parent survey focused on parent attitudes toward the mathematics program while the teacher survey centered around their ability to effectively deliver the curriculum in place. The committee utilized these results to guide goal setting for the future of our mathematics program.

The committee researched current best practices in education by examining online resources that supplement the current Go Math! curriculum. Representatives from Waggle and Study Island presented their programs and evaluators also explored the TenMarks online resource. It was determined that utilizing TenMarks and other online resources would help support and enrich the current Go Math! curriculum. It was decided that the Go Math! curriculum continues to best meet the needs of Bernards Township School District students. The committee will investigate an updated version of the program in the coming years.

The committee used the information gathered throughout the evaluation process to set five major goals. Our research and future goals include: the implementation of math workshop; selecting a technology resource to increase computational fluency and enrich the current curriculum; incorporating relevant math experiences for students; providing professional development and collaboration opportunities for teachers; and increasing parent awareness and confidence in supporting their children as lifelong mathematical learners.

## **Program Mission Statement and Vision**

### **Mission –**

Bernards Township elementary mathematics teachers will prepare lifelong learners in a dynamic environment utilizing small group instruction, integration of technology, and the application of critical thinking and real-world problem solving strategies.

### **Vision –**

In order to achieve this mission:

- Teachers and students are enthused about mathematics and encouraged to demonstrate mathematical reasoning and risk-taking through real world problem solving.
- Teachers are facilitators of appropriately challenging inquiry-based learning that utilizes thoughtfully integrated technology, resources, and hands on activities.
- Teachers utilize a variety of assessments to guide instructional practices and provide timely feedback to the students.
- Teachers are highly trained and confident in current best instructional practices through collaboration, ongoing professional development, and vertical articulation.
- Students participate in small group instruction within a workshop model, while engaging in mathematical discussions that support and extend the learning of all mathematical thinkers.
- Students confidently use a variety of strategies to approach problem solving and make interdisciplinary connections that extend beyond the classroom.
- Students demonstrate computational and procedural fluency.

## **Analysis of Current Program**

The mathematics program for Grades K-5 is part of the comprehensive, elementary school curriculum provided to students in the Bernards Township School District. The mathematics curriculum, includes the written program, textbooks, and materials, as well as the classroom instruction and the teachers' preparation of the curriculum. Student assessment is via materials provided by the textbook publishers, teacher and district created tests and assessments, standardized tests, and teacher observations. The mathematics program provides students in kindergarten through grade 5 with the tools necessary to become mathematically literate thinkers and creative problem solvers. The mathematics curriculum integrates applicable mathematical content at each grade level with problem solving, communication, reasoning, and technology. The curriculum is based on the the May 2016 New Jersey Student Learning Standards. Bernards Township teachers are encouraged to utilize the Mathematical Practices.

The classroom teachers for kindergarten through grade 5 implement the mathematics curriculum. Students in kindergarten should receive 40 minutes of mathematics instruction each day, while students in grade 1 through grade 5 should receive 60 minutes of mathematics instruction each day from the classroom teacher. This can differ depending on individual building and classroom needs and restrictions. The cluster grouping model is utilized in grades 3-5, research has shown this model to be beneficial for students of all levels. The cluster grouping model groups students with similar math abilities in the same general education classroom. A telescoped gifted and talented program was started in grade 3 in 2015 and will eventually encompass grades three through five by 2018. The gifted and talented teachers will teach the telescoped mathematics curriculum to all identified math students and also support the learning of non identified students in the classes they work.

Many individuals provide support for the mathematics program within each classroom. The elementary grade level teachers, special education teachers, mathematics instructional support teachers, and gifted and talented teachers provide instruction in mathematics to the students in kindergarten through grade 5. The four elementary school principals allocate funds for the program and make decisions about class scheduling. The elementary principals and assistant principals supervise instruction in each building. The grade level leaders in each building are responsible for the ordering of texts, supplies, and materials associated with the mathematics program and also at times help to support grade level planning. The district's mathematics supervisor provides support for the teachers via staff in-service. The superintendent and board of education provide financial support that enables both the students and the teachers in the program to have adequate textbooks, supplies, and materials.

Textbooks and materials are integral to any instructional program. For the mathematics program the textbook, is the backbone of the program. The program is published by Houghton Mifflin

Harcourt. This research based program utilizes five major research strands including writing to learn, vocabulary, scaffolding, metacognition and graphic organizers (HMHCO 2010). One positive to the Go Math! program is the online resources which include practice tests and Soar to Success activities all which can be accessed at home. The district also purchased the Exemplars library which provides multi-leveled and real-world problem solving opportunities for all students.

Additional supplemental materials include but are not limited to: Khan Academy, Kahoot, TenMarks and SumDog. Teachers also use materials found in reliable publications such as Scholastic. Games and hands-on activities are used during the workshop model. Some teachers continue to use popular games or activities from the previous math program, Everyday Math. Teachers are also using new resources and activities introduced by the math supervisor.

### **K-5 Mathematics Evaluation Teacher Survey Results**

In 2017, a survey gave 96 teachers across the Bernards Township School District the opportunity to share their opinion of the strengths and weaknesses of the Go Math! program. The questions they responded to covered curriculum, instruction, assessments, and materials. Teachers shared their successes with the math workshop model as well as some of the new games and activities that have been introduced as a supplement to the Go Math! program. Teachers also shared they are comfortable with the content of the Go Math! program and feel secure teaching the material to all students. The results are listed in Appendix A.

To summarize, there were five main conclusions that were drawn from the results:

- MAP results are not being utilized to their fullest benefit by teachers to inform mathematics instruction. Based on the survey, 76.9% of the teachers who responded said they disagreed or strongly disagreed with the statement, “I often utilize MAP assessment results to inform my mathematics instructional practices.”
- Teachers need support in creating additional formative and summative assessments to guide their instruction. Based on the survey, 58.3% of teachers reported that they needed to create supplemental problems.
- The majority of teachers are strictly following the provided program; not allowing for flexibility in the sequencing of lessons and concepts. While 91.6% of teachers agreed with curriculum being grade-level appropriate, it was found that all teachers who responded either agreed or strongly agreed that they follow the curriculum. While following the program is beneficial, allowing for teacher choice in the creation of a sequencing of lessons to meet their students’ needs is necessary when using a math workshop model. When asked if they combined lessons into one period, 86.5% of teachers said they rarely did this. When asked if they eliminate lessons, 95.5% of teachers said this wasn’t a common practice.

- Teachers shared that the amount of time being allowed to communicate regarding the mathematics program across district is lacking. 89.6% of teachers say they agreed with the idea that they share across grade level within their building. On the other hand, 74.8% disagreed or strongly disagreed with the statement that they share across grade levels across the entire district.
- Teachers find inconsistencies in how developmentally appropriate word problems are and how much the problems are tied in with reading comprehension.

### **K-5 Mathematics Evaluation Parent Survey Results**

A 2017 parent survey gave parents the opportunity to share their opinion of the strengths and weaknesses of the Go Math! program. Parents were asked to complete one response per child, and there were a total of four hundred forty responses. Only part of the survey dealt specifically with mathematics. Most parents believe in the effectiveness and overall quality of the mathematics curriculum. Parents celebrated the time spent on number identification and number sense as well as the clear and logical progression of the units. Parents shared their concerns about the lack of real-life problem solving skills, shortage of spiral review, assessment questions being worded at a higher comprehension level, lack of challenging math activities and confusing homework. They also stated their need to understand the teaching methods used with their children.

A closer look at the data follows:

- 88% of parent respondents were aware of what their child was learning in mathematics.
- 85% of parent respondents felt that their child had made adequate progress in mathematics.
- 83% of parent respondents felt that their child enjoyed their mathematics learning experiences.
- 77% of parent respondents discuss mathematics with their children multiple times a week.
- 77% of parents respondents felt that the elementary math curriculum helped their child develop appropriate problem solving skills in mathematics.
- 71% of parent respondents felt that the mathematics program provided an appropriate amount of challenge for their child.
  - 23% of parent respondents felt that there was not enough challenge for their child in this math program.
- 73% of parent respondents felt that the program helped their child develop a strong conceptual understanding of mathematics.
- 63% of parent respondents felt that the program provides an adequate amount of support to assist their child at home.
  - 22% of parent respondents felt that there were not enough resources to provide their child with adequate support at home.

## **Prior Goals and Progress**

**Goal # 1:** Purchase and implement the updated editions (2008) of the Everyday Mathematics (EM) program. After reviewing the updated materials, the teaching staff and the members of the committee have determined that the updated editions will enhance the mathematics program. Based on data analysis of standardized test data, our students currently exceed proficiencies in relation to schools within the same District Factor Group (DFG) as Bernards Township. Research also supports a potentially positive effect on scores compared to programs using a traditional textbook. The committee made the recommendation early in the process that a traditional textbook would not align with the district's philosophy of student learning at the elementary grades. Teachers feel materials in the EM Program overall are well organized, easily retrievable, and accessible. Students feel confident with mathematics and have a positive attitude towards learning new concepts. The members of the Mathematics Evaluation Committee have decided it is more cost effective to adopt the 2008 EM edition rather than to implement an entirely new program, based on materials and staff development. The members agree that a more seamless implementation will result from adopting the updated version of EM due to the fact that now more than 50% of students nationwide use EM materials, making it more likely than ever that new hires will be familiar with the materials.

**Progress:** The district did not adopt the 2008 Everyday Mathematics program due to the implementation of the Common Core State Standards. Everyday Mathematics did not have their program fully aligned to the amended standards in time for the implementation due to their need to field test new materials before releasing them. Instead the district purchased and implemented Go Math! as the elementary mathematics program in 2011-2012 for grades K-2, and 2012-2013 for grades 3-5.

**Goal # 2:** Develop materials that will provide for increased computational fluency. Because the Everyday Mathematics program is a curriculum project, the members of the evaluation committee recommend that summer curriculum writing focus on developing materials to provide for more practice to improve fluency with respect to basic computational skills. The members of the evaluation committee suggest considering the following when choosing a program to address computational fluency: learning objectives, student proficiency levels, state standards, and the National Council of Teachers of Mathematics (NCTM) Focal Points. It is suggested that the members of the summer curriculum writing project research and develop/adopt leveled materials to align to the curriculum and outline a standardized implementation of the materials.

**Progress:** At the time, A Framework for Computational Fluency was developed for each grade level. These frameworks included games, worksheets, and teaching strategies to supplement the curriculum. They were mainly used with our struggling learners with inconsistent use and results. In more recent years, classroom teachers have been using a variety of Internet based resources including but not limited to XtraMath, SumDog, and TenMarks. Teachers also have their students use websites with varied math games and administer "fact quizzes" at times throughout the school year. Teachers seem to enjoy using the Internet programs mentioned and have seen a high level of student engagement but

the overall benefit to student achievement is still to be determined. Sumdog, while very engaging, has been seen to be not always grade level appropriate. XtraMath, looks to have more educational value, but student engagement was lower.

**Goal # 3:** Develop pacing and sequencing guidelines. The Everyday Math materials do provide a scope and sequence that will be included in the district curriculum guides. The members of the evaluation committee recommend that summer curriculum writing focus on developing suggested pacing guidelines for including additional materials for computational fluency. Also, the summer curriculum writing committee members should consider redesigning EM sequencing guidelines to adequately prepare students for standardized testing.

**Progress:** Following the adoption of Go Math!, pacing and sequencing guides were created and shared with all staff. These have generally remained in place for grades K-2. For the 2014-2015 school year, PARCC was established and the teaching staff had to adjust rapidly and throughout the school year. As information was released by the state, the district examined the information and edited the scope and sequence accordingly. Currently there is no formal scope and sequence for grades 3-5, although suggestions from the mathematics supervisor have been provided as information from the state is released.

**Goal # 4:** Expand staff development. This recommendation is the responsibility of the district mathematics supervisor as well as the building administrators. To address this recommendation, the members of the committee believe that the mathematics supervisor should develop a comprehensive staff development plan that will differentiate to meet the needs of the teachers, revise the new teacher in-service to better address the needs of new staff, and create an in-service program for administrators.

**Progress:** Progress with staff development has been minimal. There have been fewer and fewer opportunities to have pull-out trainings without sacrificing classroom instruction. Due to changes at the state level, trainings have been focused on PARCC readiness and a deeper understanding of the New Jersey Student Learning Standards. Trainings have focused primarily on assessments and creating tools for teachers to understand their students' level of understanding. The mathematics supervisor presented information to administrators as to what they should look for during evaluations. A comprehensive plan was not established and the needs of the staff are still varied.

### Program Comparisons and Best Practices

The chart below is a comparison of elementary school programs from similar New Jersey school districts who were willing to complete a survey. The schools that received the survey were chosen based on geographic proximity and the quality of their mathematics instruction.

<b>District</b>	<b>Program</b>	<b>Other Resources</b>	<b>Time Allotted</b>	<b>Enrichment/G&amp;T</b>	<b>Math Coaches</b>	<b>Math Workshop</b>	<b>Technology</b>
<b>Bernards Township</b>	Go Math! (2012)	Exemplars	60 minutes	Telescoped Math Grades 3-5	No	Beginning	Chromebook arts available on sign out basis in grades 3-5
<b>Cranford</b>	enVision Mathematics 2.0	enVision online resources	60 minutes	Grades 3-5: Pathways to Excellence	1 Math Coach K-5 (certified math K-8)	No	Not 1:1; iPad and laptop carts accessible
<b>Flemington-Raritan</b>	Math Expressions (K-2); enVision Math 2.0 (3-5)	Front Row Math (grade 2); Pearson Realize (3-5)	Not Reported	Grades 1&2-pullout groups for identified students; Grades 3+: pullout G&T math for identified students	G&T Math Teachers	Guided Math Groups	1:1 with Chromebooks Grades 3-8
<b>Glen Rock</b>	Everyday Mathematics	ConnectED	60 minutes	ISTEEM	No	No	Shared laptops; desktops; interwrite boards
<b>Hopewell Valley</b>	Go Math!	Everyday Math Resources; IXL; Study Island, Tenmarks	60 minutes	Advance Level Math; Replacement Instruction Grades 3-5	No	Beginning workshop model	1:1 iPads in K-2; 1:1 Chromebooks in 3-5
<b>Livingston</b>	My Math (2-5); Growing with Math	IXL Math; Measuring Up Live/My Quest	60 minutes	Within Classroom	No	No	Chromebooks & iPads in K-5

	(K-1)						
<b>Montville</b>	enVision Mathematics 2.0	iReady	60 minutes	None	No	Teacher Choice; not mandated	Mostly Chromebooks, but some other devices (e.g. iPads) available
<b>Princeton</b>	Everyday Mathematics	Everyday Math Online	Not Reported	Focus Period	No	No	Document cameras, LCD projectors, iPads
<b>Ridgewood</b>	enVision Mathematics 2.0	MathXL	60 minutes	MathXL	No	Math Workshop (District Push)	1:1 Chromebooks in 3-5; Chromebooks carts in K-2
<b>Somerset Hills</b>	Math in Focus	ThinkCentral Exemplars	Not Reported	Within Classroom; CML; Before & After School Clubs	No	No	Grades 3&4-1:1 with Chromebooks; Grade 2: Chromebooks to share; Grades 1-2: iPads to share
<b>Warren Township</b>	Go Math! 2015	ThinkCentral	50-60 minutes	Curriculum Compacting	Instructional Coaches (1 for every 2 buildings)	Beginning workshop and guided groups	1:2 with iPads in grades K-2; 1:1 with Chromebooks in grades 3-5
<b>West Windsor-Plainsboro</b>	enVision Mathematics 2011	Exemplars, Howard County Maryland's Math sites, Inside Mathematics	60 minutes	Within Classroom	Teacher Resource Specialist for Math (upper elementary); 1 Teacher Resource Specialist for all Curriculum (each elementary school)	Math Workshop expected K-5	Grade 5: 1:1 with Chromebooks; Grade 4: Chrombeook carts; Grades K-3: SMART Boards and iPads

**Summary:** In the elementary schools that were analyzed, there were a variety of different programs. It was noted that not one particular program stood alone as the majority of districts supplement their curriculum with various online resources. There was no consistency in reports regarding the effectiveness of the online resources they shared. Bernards Township appears to be one of the first districts implementing math workshop as a best practice for mathematics instruction. Flemington-Raritan, Warren Township, Cranford, and West Windsor-Plainsboro have instructional coaches available for mathematics. Enrichment, in these districts, is provided through either a gifted and talented program or within the general education classroom. Out of the 11 districts surveyed, 6 of them have at least one grade level that has a one-to-one technology to student ratio. The districts with higher student-to-technology ratios reported using more online resources than the schools that do not have 1-to-1 student-to-technology ratios.

### **Testing Data**

The Bernards Township School District currently uses two forms of standardized assessments for students in grades 3-5. PARCC is administered in the spring each year. In 2014-2015 PARCC was broken into 2 testing sessions - Performance Based Assessment and End of Year Assessment. For the 2015-2016 school year, PARCC was consolidated into one testing session. The MAP assessment is used as a local assessment to look at student growth and student needs. In 2014-2015 and 2015-2016 the MAP assessment was administered in the fall and spring. In 2016-2017 the MAP assessment was administered in the fall, winter, and spring. Moving forward, the MAP assessment will be administered in the winter and spring.

### **PARCC Testing Data**

<b>PARCC 2015 % Met or Exceeded Expectations</b>	<b>Grade 3</b>	<b>Grade 4</b>	<b>Grade 5</b>
STATE	45	41	41
DISTRICT	79	80	80
Cedar Hill	80	77	83
Liberty Corner	71	78	75
Mt. Prospect	88	86	90
Oak St.	77	79	72

- PARCC 2015, Grades 3,4,5:
  - Percentage of students who did not meet or partially met expectations was fairly consistent across grades 3, 4, and 5 (6%, 5%, 5%)
  - Percentage of students who met or exceeded expectations was fairly consistent across grades 3,4, and 5 ( 82%, 80%, 82%)
  - The percentage of students in our district that meet or exceeded expectations is at least 35% greater than the state percentage in each grade, 3-5.

<b>PARCC 2016 % Met or Exceeded Expectations</b>	<b>Grade 3</b>	<b>Grade 4</b>	<b>Grade 5</b>
STATE	51.7	46.6	47.2
DISTRICT	82	80.1	82
Cedar Hill	78	82	78
Liberty Corner	78	72	77
Mt. Prospect	92	84	97
Oak St.	79	81	71

- PARCC 2016 data, grades 3-5
  - Percentage of students who did not meet or partially met expectations was fairly consistent across grades 3, 4, and 5 (6%, 6%, 4%)
  - Percentage of students who met or exceeded expectations was fairly consistent across grades 3,4, and 5 ( 79%, 80%, 80%)
  - The percentage of students in our district that meet or exceeded expectations is at least 30% greater than the state percentage in each grade, 3-5.

**2016 Spring PARCC School & Grade-Level Outcomes in Mathematics  
(Peer Group Level Comparisons)**

	Grade 3 % >= Level 4	Grade 4 % >= Level 4	Grade 5 % >= Level 4
State	52	47	47
BTSD	82	80	82
Montgomery	80	75	78
Princeton	79	76	65
Chatham	87	79	74
Millburn	87	72	86
West Windsor	81	78	77
Westfield	80	78	75
Northern Highlands	77	83	86
Haddonfield	80	66	80
Averages	+1	+4	+4

- When comparing Grades 3-5 students' abilities to meet or exceed expectations on the 2016 Mathematics PARCC with state and peer school comparison grouping scores, Bernards Township fared very well. Peer schools are schools that have similar grade configurations and are educating (or held accountable for) students with similar demographic characteristics (NJDOE, 2015). In 2016, 82% of third graders, 80% of fourth graders, and 82% of fifth graders in Bernards Township met or exceeded expectations. We achieved a greater percentage of students in grades 3-5 meeting or exceeding expectations than the average of the peer schools.

**MAP Testing Data**

**MAP District Means vs. Normative Data**

Grade	Year	Fall Mean RIT	Fall 2015 National Mean RIT	Spring Mean RIT	Spring 2015 National Mean RIT
3	2014-2015	201.8	190.4	216.1	203.4
3	2015-2016	201.0		214.2	

3	2016-2017	200.8		214.0	
4	2014-2015	214.4	201.9	229.1	213.5
4	2015-2016	213.8		225.9	
4	2016-2017	213.6		225.9	
5	2015-2016	223.9	211.4	235.7	221.4
5	2016-2017	226.0		237.0	

\*Data from 2014-2015 Grade 5 is not available due to experimenting with a different version of the MAP Assessment

- The students of BTSD consistently outperform normative data.
- In grades 3 and 4, the BTSD students score roughly 10 points higher than the normative data
- By the time BTSD students reach 5th grade, they score roughly 15 points higher than the normative data
- In grades 3-4 there was a small decrease in mean scores from 2014-2015 to 2015-2016. It should be noted that the PARCC assessment started in 2014-2015 and the decrease could be attributed to test fatigue.

**BTSD MAP Student Cohort Growth**

Spring 2014-2015 Mean RIT	Spring 2015-2016 Mean RIT	Spring 2016-2017 Mean RIT
200.5 (Grade 2)	214.2 (Grade 3)	225.9 (Grade 4)
216.1 (Grade 3)	225.9 (Grade 4)	237 (Grade 5)
229.1 (Grade 4)	235.7 (Grade 5)	-
-	201.5 (Grade 2)	214 (Grade 3)

<b>2015 MATHEMATICS Student Growth Norms</b>		
Grade	Mean	SD
3	13.0	6.47
4	11.6	6.41
5	9.9	6.80

Source: NWEA

- MAP Assessment data gives us the ability to track cohorts of students as they move through the grades. When looking at the mean scores of cohorts as they move through grades 3-5, all but one cohort showed a 10-15 point increase in RIT score as they progressed through elementary school. In grades 3-5 there was a smaller increase in mean scores from 2014-2015 to 2015-2016. It should be noted that the PARCC assessment started in 2014-2015 and the decrease could be attributed to test fatigue.
- When comparing the growth data of BTSD to the normative data, our numbers fall a little short of the normative data. But this is explained by NWEA when they write in their 2015 normative report, “The growth norm tables below show mean growth when the mean grade level status score is used as the starting score. In each case, the starting score is treated as a factor predicting growth. If a particular student’s starting score was below the grade level status mean, the growth mean is typically higher. Similarly, students with starting scores above the grade level mean would typically show less growth on average.” Since the scores of BTSD students are significantly higher than the normative scores, it is expected that our students may not hit the same levels of growth. But again it should be noted that even though our scores far exceed the scores of others, our growth scores fall just short of the normed data. This shows that our students growth is still more than the expected growth norms.

## **Goals/Recommendations**

**Goal #1:** Implement a math workshop model in grades K-5 to differentiate for the needs of each individual student.

**Problem Statement:** Currently, the majority of math instruction is delivered whole class, making it difficult to reach students at their varied levels.

**Supporting Data/ Research:** According to a teacher survey completed in the spring of 2017, many teachers responded that they are challenged with management and acquiring effective activities and materials to support a math workshop model.

The West Windsor-Plainsboro school district was recently surveyed and reported that a strength of their math workshop model was, “Teachers meeting the needs of students through using a Math Workshop Model. This model supports student choice, enrichment and creating positive math communities within the classroom.” Math workshops provide differentiated instruction. During math workshop, children work on targeted skills based on their readiness. Differentiated workstations benefit both the student and the teacher. Differentiated activities can provide a component to classroom management; this is because children are challenged appropriately for their level of understanding since they are assigned to tasks that are not beyond their abilities or bored by tasks that are too easy. Children that are working in what Vygotsky (1978) calls their “zone of proximal development” are more likely to stay on task, because they are interested and able to do the work at hand.

In math workshop small group instruction and targeted skill activities are provided. Math groups allow students the opportunity to talk with each other about math. They should be acting things out, using objects, using drawings, and using math vocabulary to explain their thinking. Using targeted activities, teachers are able to remediate, have students practice grade level skills and offer enrichment. According to Newton (2016), as a follow-up to math workshop, a share time is beneficial. This can target 3 areas including making “I can” statements for students to connect to targeted skills, an interactive journal where students can record the skills worked on in small groups, a focus question to represent student understanding or an exit ticket, and finally a discussion time for students to share with the class their experience and learning during the workshop. This can expand students ability to understand and explain their mathematical thinking.

A highly effective math workshop model requires teacher planning time, preparation, and quality materials. In order for a workshop model to be successful, multiple independent learning centers are utilized. Many of these are teacher created, however supplies to enrich these activities are extremely beneficial. Some manipulatives are supplied through the Go Math! program but many are not. Newton (2016) suggests that students need their own toolkits that encompass tools from prior grade levels such as counters, cubes, and number lines as well as tools to scaffold their current learning. Storage areas for these materials are also needed. Calendar math is also suggested as a primary grade resource. Materials needed to implement this include coins, counting jars, anchor charts, graphing tools, and journals. Another important resource for elementary teachers is rich classroom library of mathematics related picture books. These can used for introducing big ideas and new skills as well as reviewing previously learned material. It is imperative that teachers and students have ample storage for all of these tools.

Technology plays a key role in supplementing the mathematics curriculum. The National Council of Teachers of Mathematics (2015) suggests “by making use of electronic tools, students have a greater sense of ownership of the mathematics they are learning, since the applications promote a sense of shared enterprise in the learning of mathematics.” The use of technological tools within the math workshop model fosters independence and challenges students at their individual learning levels. Many online programs allow for spiral review and data storage from previous school years. This gives teachers a wealth of information about each student. Technology tools also provide parents and students with valuable feedback about their mathematics progress.

**Proposed Solutions:** Investigate developmentally-appropriate ways to increase K-5 student and teacher access to technology in order to allow students to increase computational fluency, practice skills, and promote engagement in the curriculum, as well as provide teachers with data to inform and drive instruction. Purchase additional resources, games and manipulatives for use during small group center activities. Provide in-service time for cross district discussions and time for peer observation.

**Goal #2:** Select a technology resource for mathematics which can allow students to increase computational fluency, practice skills, and promote engagement in the curriculum, as well as provide teachers with data to inform and drive instruction.

**Problem Statement:** Students are assessed in multiple formats but it is difficult to synthesize this data and use it effectively. Students require a high level of stimulation and interest to stay engaged in learning.

**Supporting Data/Research:**

The use of technology is an integral part of our everyday lives. When our students become adults, the careers they choose will most likely involve technology. For this reason, our mathematics classrooms should prepare them for this reality. The National Council of Teachers of Mathematics developed *Principles to Actions: Ensuring Mathematical Success for All* to guide mathematics education into the future. It addresses necessary elements of teaching and learning. They assert that the use of technology can be useful to help students work on solving challenging mathematical problems. Additionally, in 2015, NCTM states that, “students should have regular access to technologies that support mathematical sense making, reasoning, problem solving, and communication.”

Through teacher and administrative exploration with the Waggle, Study Island, TenMarks internet programs, it was concluded that TenMarks is the most effective for student learning. In addition, both paid and free subscriptions were explored, and TenMarks has components that are free. It would be worthwhile to explore a paid subscription. The program can be used in multiple ways. Teachers can use the program to introduce a new topic or lesson, review concepts before a test, or refresh knowledge learned in a previous grade. Teachers can use the program to provide an individualized curriculum for each student, which is based on specific needs. All content is aligned to the Common Core State Standards, and each assignment has video explanations and hints for students who need them.

During the 2010-2011 school year, the University of San Francisco’s School of Education conducted a study at Everest High School, a suburban charter school in Redwood City, CA, to evaluate TenMarks. The findings of the study indicated that students using TenMarks made significant improvement in their math skills over a six week period in comparison to students who did not use the program. TenMarks was found to be equally effective for girls and boys; for students receiving special education services through IEP and 504 plans; and for students of different ethnic backgrounds

**Proposed Solutions:** Evaluate, purchase and provide training for a technology resource that will purposely engage students and provide meaningful data integration for teachers.

**Goal #3:** Provide relevant and meaningful mathematics experiences for students.

**Problem Statement:** There is a need to expose students to relevant problem solving situations within the mathematics curriculum. The real-life examples are included in each lesson but are not always easily relatable or meaningful for elementary-aged students.

**Supporting Data:**

The National Council of Teachers of Mathematics (NCTM) has a curriculum guiding core principle that states, “An excellent mathematics program includes a curriculum that develops important mathematics along coherent learning progressions and develops connections among areas of mathematical study and between mathematics and the real world” (NCTM, 2015). The curriculum evaluators searched for best practices in incorporating more real world situations in the classroom. Findings suggest that in order to promote real world connections and increase confidence with math, students should see math tools around their classrooms. Teachers should have the resources to create whole-group meeting areas, workstations, word walls, anchor charts, manipulative toolkits, and math libraries within their classrooms (Newton, 2016). Being surrounded by these resources on a daily basis allows students to increase mathematical comfort and fluency. They also provide teachers with multiple ways to reinforce and review concepts.

Use of the Math Workshop model encourages students to work together as a team and provides the opportunities for problems solving. The incorporation of real world situations into math centers during the workshop model allows students to become comfortable with working on this subject matter independently. They are able to think critically and make real world and cross curricular connections. Research also suggests that mathematics problem solving be approached using a variety of methods within the workshop model to increase collaboration amongst students in small groups (Newton, 2016).

**Proposed Solutions:** Incorporate more inquiry based projects and STEM at all grade levels. Provide teachers with the resources necessary to create math rich environments with many opportunities for real world connections. Encourage teachers to invite community members into the classroom to share examples of the real world mathematics that they utilize.

**Goal #4:** Prepare teachers to implement and execute the best practices of math education through purposeful professional development and collaboration.

**Problem Statement:** Teachers are moving between grade levels, new teachers are being hired and best practices and curricular materials are constantly evolving, creating a need for professional development. Individual teachers and/or buildings and grade levels tend to be isolated and teacher created materials are not shared across the district.

**Supporting Data:**

One of the Bernards Township School District's recent goals was to work in Professional Learning Communities. As expressed in the teacher survey which was administered in the spring of 2017, a large population of teachers feel that materials and ideas are being shared sufficiently within their grade level in their building but the same cannot be said across district. Grade levels across the district feel isolated from each other; leaving potentially valuable resources unshared and unrecognized by other teachers. This also leaves students without the opportunity to access these materials.

The National Council of Teachers of Mathematics supports the idea of collaboration amongst teachers. In 2014, the NCTM stated, "Collaboration among teachers contributes to a career-long process for developing expertise and having a positive impact on teacher effectiveness." It is important to recognize the idea of developing expertise. With the changes that have been happening in recent years, teachers get new ideas and materials presented on a regular basis. "All mathematics teachers are collectively responsible for student learning, the improvement of the professional knowledge base, and everyone's effectiveness" (NCTM 2014, p. 102). Without collaboration, teachers could get lost in the changes that are being presented. By allowing for collaboration, the stress of finding resources can be alleviated through teamwork. "All mathematics teachers are collectively responsible for student learning, the improvement of the professional knowledge base, and everyone's effectiveness" (NCTM 2014, p. 102) Too often in education, teachers feel isolated and feeling they are the only ones who can help their students, but as the NCTM discusses, teachers must share the responsibility for the education of all students and the constant advancement of educational practices and resources. With this mindset, the feelings of stress can be eliminated and teacher effectiveness can improve; greatly impacting the education for the students.

In addition to cross district collaboration, teachers benefit from well planned and comprehensive professional development. The NCTM came up with four major areas where professional development should help mathematics teachers to develop. The four areas were to "build teachers' mathematical knowledge and their capacity to use it in practice, build teachers' capacity to notice, analyze, and respond to students' thinking, build teachers' productive habits of mind, and build collegial relationships and structures that support continued learning" (NCTM, 2010). With the move to the math workshop model, one of the most crucial areas is the ability to notice, analyze, and respond to student thinking. Teachers will be even better equipped to diagnose areas of struggles and strengths which would be conducive to guided math groups.

In the 2015 National Council of Teacher of Mathematics publication *Principles to Action: Ensuring Mathematical Success for All*, professional principles include: teachers continually grow in knowledge of mathematics for teaching, mathematical pedagogical knowledge, and knowledge of students as learners of mathematics. In addition teachers should have opportunities for professional

development and collaboration. This collaboration should include issues of access and equity, curriculum, instruction, tools and technology, assessment, and professional growth.

The implementation of cross district collaboration and additional professional development will benefit the teachers and students of the Bernards Township School District. Teaching mathematics requires specialized expertise and professional knowledge that includes not only knowing mathematics, but knowing it in ways that make it useful for the work of teaching (Ball and Forzani 2010; Ball, Thames, and Phelps 2008) and a clear view of how student learning develops and progresses across grades (Daro, Mosher, and Corcoran 2011). Cross town and vertical articulation are key. Not only will teachers be able to develop a more comprehensive list of resources, but they will also be able to be better suited to analyze and respond to student needs within the mathematics curriculum.

**Proposed Solutions:** Expand cross-district collaboration, training and resource sharing through teachers observing their peers during the school day, and utilizing a menu of lessons and related skills extension activities. Increasing awareness of the grade-level Google Shared drive and how to access it will help teachers efficiently utilize numerous math workshop resources. Professional development opportunities should be expanded to focus on concepts, using MAP results to inform mathematics instruction, and responses to student thinking while collaboration should be used to focus on sharing materials.

**Goal #5:** Offer parents of elementary students the opportunity to learn about current best practices in mathematics as well as the specific strategies being presented to their children in the classrooms.

**Problem Statement:** Parents have noticed that the math instruction and homework their child receives in Bernards Township looks very different from what they remember from when they were students. This creates a disconnect between how students are learning math at school and how they are practicing it at home.

**Supporting Data:** Research has shown that partnerships between schools, families and communities lead to improved student achievement and higher performance for schools. When schools and parents work together to create a positive learning environment, student performance increases. Innovative strategies should be utilized to effectively engage families in supporting improving skills for students (Henderson and Mapp, 2002).

The National Council of Teachers of Mathematics also recognizes the need for a strong home school connection. In 2013, NCTM President, Linda M. Gojak stated that, “Although parent involvement is an important part of any student’s academic experience, enlisting parent support in mathematics may present a greater challenge and a more conscientious effort on our part. Studies show that many parents are intimidated by coming into schools and meeting teachers—especially mathematics teachers.” In order to foster this connection, schools should create opportunities to help parents become more involved in their child’s mathematical education.

An overwhelming majority of parents who responded to our survey indicate that they feel that they are not adequately prepared to support their children with their math homework because they are unfamiliar with the strategies being taught in the classrooms. As teachers, we have noticed that parents tend to teach their children the methods they remember from school which are often not what we are teaching in the classroom. Many parents see the need to become more comfortable with their child’s mathematics education.

**Proposed Solutions:** Develop a parent education program within each elementary building to inform parents about the Go Math! program, the math workshop model, as well as specific strategies used in mathematics instruction.

## **Resources**

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