A REVIEW OF THE K-12 MATHEMATICS PROGRAM FOR BRIGHTON CENTRAL SCHOOL DISTRICT

2013-2014

Abstract

The purpose of this program evaluation was to determine the degree to which Brighton students are developing mathematical literacy. In addition to acquiring the concepts and skills of mathematics, mathematical literacy was also defined by the students' abilities to problem solve, reason and communicate using appropriate tools and strategies. Overall, one can conclude, based on both the quantitative and qualitative data studied, that most of the students of Brighton Central School District are acquiring the desired mathematical behaviors at a rate comparable to or exceeding other students from around New York State and the nation. That does not mean however that there were no areas for improvement. In this evaluation, areas of need were identified for both the overall K-12 program as well as the instruction for specific subgroups of students.

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History of the Mathematics Program for Brighton Central School: 1996-Present

Brighton Central School District has a long history of excellence in mathematics education. Students have typically been very successful in mathematics and many go on to pursue fields in mathematics, engineering and medicine. In order to establish a context for the current BCSD mathematics program, a brief history of the development of the mathematics program and its relationship to the larger context of mathematics education reform is essential.

The current national mathematics education reform movement began in the mid-1980s "in response to the documented failure of traditional methods of teaching mathematics, to the curriculum changes necessitated by the widespread availability of computing devices, and to a major paradigm shift in the scientific study of mathematics learning" (Battista, 1999). Beginning in 1964 with the First International Mathematics Study, US students have consistently performed poorly in comparison to their counterparts in other areas of the world. This performance has been repeatedly documented in multiple subsequent international studies over the past 50 years. In 1983 the National Commission on Excellence in Education cited "poor performance on tests administered by the NAEP, declining SAT scores, and an increase in remedial courses by colleges, businesses, and the military as evidence of a 'rising tide of mediocrity' in schools in the United States" (Senk and Thompson, 2003). In addition, results of research in cognitive science have provided educators with better understandings of "how students learn". The National Research Council (1989), for example, stated that "Research in learning shows that students actually construct their own understanding based on new experiences that enlarge intellectual frameworks in which ideas can be created. Much of the failure in school mathematics is due to a tradition of teaching that is inappropriate to the way most students learn." These results conclude that people learn better from active engagement and social interaction (see also, for example, NRC 1999, 2000). The National Council of Teachers of Mathematics (NCTM) reacted to this growing body of evidence that mathematics education in the US needed significant attention and adjustment with the publication of their first set of mathematics standards, the *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989).

The goal behind the original NCTM *Standards* document was to create a new vision of what mathematics were/is important to learn and what mathematics instruction should look like in a K-12 environment. Shortly after the release of this work, the field realized that there were not materials available for districts, schools and teachers to actually enact the true vision of these *Standards*. In the early 1990's the National Science Foundation (NSF) offered grant opportunities for writing curricula that would "put into practice" the recommendations of NCTM's *Standards*. Ultimately, 13 NSF-funded programs were developed: 3 at the elementary level, 5 at the middle level and 5 at the high school level. Each of these programs was developed by a team of mathematicians, higher education and K-12 mathematics educators, and researchers. Each of these programs spent at least four years in development which included piloting, revisions, field testing, more revisions and final publication, all of which took place with actual students in actual classrooms with real teachers providing feedback. Pre-publication versions of the materials became available in the mid-90's.

Brighton educators, due to their involvement in projects at the Warner Graduate School of Education at the University of Rochester, became aware of these programs and the research supporting them in 1997. Through a piloting process, middle school math teachers tried out some of the units from one of these NSF-funded programs, *Connected Mathematics* (Lappan, et al, 1996) and began to see their students engage in mathematical thinking and problem solving in ways that they had not seen before. The district supported developing leaders in this curricular change. Middle school teachers attended conferences, worked with teachers in other districts as well as with the authors of the program. During this time, results of the NYS Math 8 Assessment scores (the only NYS middle school math assessment given at that time) continued to climb and Brighton students outperformed other area districts as teachers became more knowledgeable about the program and instructional implications.

These results, coupled with observational data, provided the district with evidence that these programs could be effective not only in improving students' mathematical knowledge and reasoning skills but also on their performance on high stakes exams. As a result, the district began to explore opportunities for similar changes at the K-5 and 9-12 levels. Collaborations with the Warner School and other districts continued. Ultimately, this continued work led to the adoption of *Investigations in Number, Data, and Space* (Mokros & Russell, 1995), the *Connected Math Project* (CMP) (Lappan, et al, 1996) and *Core-Plus Mathematics* (Coxford, et al, 2003).

In 2001, departments were charged with creating a philosophy statement that would guide the implementation of the BCSD mathematics curriculum map. As a result of this work, the following belief statements were written:

- Mathematics can and must be learned by <u>all</u> students. Mathematics education requires high expectations and strong support for all students to be successful and meet their full potential.
- A mathematics curriculum should be coherent and well-articulated across the grades. The curriculum should guide students to increasing levels of sophistication and depth of knowledge.
- A mathematics curriculum should support development of thinking and reasoning skills while focused on important mathematical ideas.
- The mathematics curriculum should support the communication of ideas through reading, writing, and discussion.
- Students must learn mathematics with conceptual understanding to enable them to solve the new kinds of problems the rapidly changing world presents.
- Assessment should be an ongoing classroom activity that supports the learning of mathematics and informs instruction.
- Effective teaching requires that the teacher knows and understands mathematics, knows and understands the developmental stages of learners, and knows and employs a variety of instructional strategies.
- Technology should be used in mathematics education as a teaching tool to enhance student learning, but not as a replacement for basic understanding and computational fluency.

In addition, specific goals were developed to identify measurable outcomes for the students in the district.

1. Students will meet and exceed New York State Standards in mathematics understanding.
2. Students will be enrolled in a math course every year through graduation.
3. All students will be successful on the Math A* Regents exam.
4. All students will be successful on the Math B* Regents exam.
5. Increase participation in college math study.

*2014-2015 – Currently defined as Common Core Integrated Algebra, Common Core Geometry, and Algebra II/Trigonometry.

The Role of Common Core in the Program Evaluation

Of note, in 2011, New York State, along with forty-four other states adopted the Common Core Learning Standards (CCLS) for mathematics and English/language arts. Since that time, the district has been working to align these new expectations to curriculum and instructional practices. At the time of this evaluation (2013-2014), these new standards had been in place in the 3-8 classrooms for two years. Although historical data were used during this program evaluation, only one of those data sets (2012-2013) reflected student performance on assessments which were aligned to the Common Core. In addition, only data for students in grades 3-8 were aligned to the Common Core given that the first high school level assessment (Algebra 1), was administered in June of 2014, after the program evaluation was complete. Because of this, it was difficult for the committee to draw any firm conclusions on the current body of resources (i.e. Investigations, Connected Math and/or Core Plus) and their congruency with the expectations inherent in the new standards. Since the evaluation, additional data have been made available for student performance in the 2013-2014 school year and analysis of those data will take place in the fall of 2014 in order to determine the efficacy of current curriculum, including resources, and instructional practices that enable Brighton's students to meet the new standards.

Evaluation Design

The evaluation design was created with two objectives:

1. To evaluate the extent to which the students are achieving the expectations for their learning in K-12 mathematics
2. To evaluate the extent to which the instructional practices and organizational structures of the district support student achievement.

Design for Evaluating Student Achievement

The committee focused on three essential dimensions of student achievement in mathematics studies: student acquisition and use of mathematical concepts, students' ability to communicate and reason mathematically, and problem solving abilities. While similar to the dimensions evaluated in the original program evaluation, updates were made based on the expectations outlined in the new common core standards. Once defined, each dimension was delineated by specific indicators and data sets. The following table summarizes the entire design for the dimensions reflecting student achievement.

Guiding Question: How do we define mathematical literacy?	**What are the essential skills and knowledge students are expected to achieve across the curriculum?**	**Data Sets Used to Measure Each Dimension**
Dimension 1: Students understand the concepts of and become proficient with mathematical skills and	**Students:** a. demonstrate computational and procedural fluency b. recognize patterns from real-world, geometric, graphical and numeric situations as recurring functional relationships. They express relationships verbally, symbolically,	1. MAP – Avg RIT scores and percentile by grade, by cohort, over time, individual strand info (by subgroup) 2. mClass (CRPS) 3. NYS tests (3-8 and Regents) a. Whole group b. Sub group(s)

<u>practices</u> as identified by Common Core Learning Standards content and Mathematical Standards for Practice # 4, 7 & 8	graphically, or as tables of values. They use representations to solve problems, make predictions, and draw conclusions. c. have an understanding of geometric objects and relationships and can make and use measurements in a variety of settings. d. use statistical methods to describe, analyze, evaluate and make decisions. This involves, but is not limited to: proportional reasoning, numbers and operations, algebraic thinking and reasoning, and geometric thinking.	4. Historical item analysis. Only go back to last cut point for 3-8 5. SAT/ACT 6. Longitudinal look at student in math – how does he/she do? Random sample of students at different levels 7. Percentage of students enrolled in accelerated math over time 8. Percentage of students qualifying for gr 3-5 math league
<u>Dimension 2:</u> Students communicate and reason mathematically. Directly related to Common Core Learning Standards content and Mathematical Standards for Practice # 3 & 6.	**Students:** a. express & share mathematical thinking in writing using representations, pictures, numbers, AND words with peers, groups, teachers, others b. use clear, precise communication c. make and investigate conjectures and support with evidence/proof d. analyze and evaluate the mathematical thinking and strategies of others	1. Analysis of common assessments (MS/HS) looking for types of questions being asked (Std area, A-MM-T) 2. Analysis of writing in math 3. K-2 End of unit questions requiring student writing 4. 3-5 End of unit assessments 5. 6-8 End of investigation reflection (in journals) 6. HS Collection of math tool kits **Student Focus groups – Questions:** 1. What does it mean to communicate? How do you communicate in math? 2. If your teacher gave you this problem….how would you approach it? **Teacher Survey**: **Questions:** 1. What do you do to promote communication in your math class?
<u>Dimension 3:</u> Students are <u>problem solvers</u> by using appropriate tools and strategies. Directly related to Common Core Learning Standards content and Mathematical Standards for	**The ability to solve problems using critical thinking and creativity is demonstrated when students:** a. solve complex/unrehearsed problems and apply problem solving skills in novel situations. b. have access to multiple strategies and use them efficiently to produce accurate work. c. exhibit flexibility with tools/technology – choosing the most <u>appropriate</u> and effective tool for the task	1. Analysis of common assessments (MS/HS) looking for types of questions being asked (Std area, A-MM-T) 2. Analysis of math journals **Student Focus groups** (see questions for Dimension 2)

Practice # 1, 2 and 5.	d. connect mathematics to the context of the problem situation and to other mathematical ideas e. monitor and evaluate their progress and reflect on their results	

Design for Evaluating the Work of the Organization

The second construct for this evaluation focused on instructional practices and organizational supports. The purpose of this data collection was to determine the extent to which organizational conditions align to validated principles and indicators of high performing systems. For this construct, four specific areas were identified as being integral to the teaching and learning of math; intervention practices, use of time, use of technology and assessment. In addition, the role of the parent was included as another indicator of organizational support. Once defined, indicators of each area were defined along with potential data sets.

Area/Definition	In each of the areas, what supports would inform student achievement? What questions would you like answered?	Data Sets Used to Measure Each Dimension
Dimension 4: Organizational Supports- The degree to which the organization is structured to increase student achievement. Including: 1. Intervention & Student Support 2. Meeting needs of all learners (differentiation) 3. Assessment and use of data 4. Parent involvement, knowledge and understanding	1. What structures are in place for supporting students in math at each building and is there a vertical alignment between buildings? 2. What data are available and how is it being used to support instruction? 3. How are academic support groups scheduled? 4. What are the tools and criteria for identifying, monitoring progress, and exiting students? 5. What is our parents' understanding of the foundations and philosophical underpinnings of our K-12 math program?	1. Descriptions of AIS in each building including: a. Student identification processes b. Type/length of service. c. Delivery of service d. Curriculum/instructional practices used 2. Longitudinal look at student in math – how does he/she do? Random sample of students at different levels **Teacher survey: Questions regarding:** a. Assessment and data use b. Ability to differentiate c. Identification and delivery of AIS d. Resources (availability and use) **Parent survey: Questions regarding:** a. Knowledge of goals of K-12 math program b. Perception of child's ability/dispositions in math c. Comfort level in assisting child in math

5. Instructional Technology	1. How is technology being used by teachers to improve student learning? 2. How is technology being used by students to improve student learning?	**Teacher survey**
6. Instructional Time	1. How is time being used to provide instruction and remediation in each of the buildings?	**Teacher Survey:**

Results

Results for Dimension 1:

<u>Dimension 1:</u> Students understand the concepts of and become proficient with mathematical skills and practices as identified by Common Core Learning Standards content and Mathematical Standards for Practice # 4, 7 & 8

In order to determine whether or not students were developing numerical competency at a developmentally appropriate rate, numerous data sets were reviewed. When available, data were reviewed across time, across comparative groups, and between subgroups. Of note however, especially for the analysis of high school level data is the fact that curriculum expectations are changing, starting w/2013-2014 school year, and HS courses are being aligned to Common Core standards. Because of this, no conclusions can be made regarding student ability/achievement on new standards at the high school level using historical data. It is also difficult to draw conclusions on a single year's worth of data at the 3-8 level. Analysis of past performance can however inform current/future needs. It is recognized that the results of standardized testing are one important consideration in evaluating the efficacy of a particular program as well as other indicators of success within that program. In Brighton, the goal of the K-12 mathematics program is to prepare mathematical thinkers.

This analysis was done in an attempt to obtain a comprehensive look at student performance and achievement using multiple measures. A review of the data sets for Dimension 1 revealed the following observations:

From 9-12 Regents analysis:

- For the last five years, over 90% of students scored at mastery/proficient on the New York State Alg. 1 and Geometry tests.
- For the last three years, over 70% of students scored at mastery/proficient on the New York State Alg. 2/Trigonometry test.
- Low income students and students with disabilities perform in general about 10%-20% lower on all Regents exams in math with the most marked discrepancy occurring in Algebra 2/Trig.

From HS SAT & AP analysis:

- SAT performance – Although there were no significant fluctuations in student performance on the SAT across the years for Brighton students, of note was the 2014 recognition by *Business First* that

Brighton High School posted the highest SAT scores for math of all of the high schools in the 48 counties of upstate New York for the 2012 administration period.

- The number of students taking AP Calculus has decreased over the last five years, but increased in 2013-2014. Possible explanation: We offer more math courses now than we did five years ago. Students have multiple paths through math for the four years. There is an increase in rigor in Calc AB.

From 3-8 New York State Testing Program (NYSTP) analysis:

- For the last three years, the percentage of proficient students remained relatively consistent for Brighton across most grades. Seventh grade showed an increase in percent of proficient students from 2011-2012. Note, assessments were from both the 2005 math standards and common core in 2012-2013.
- When compared to West Irondequoit, Honeoye Falls-Lima, Penfield & Pittsford, from 2011-2013, 3rd and 4th grades consistently rank in the top 3, 5th-8th grades rank in the bottom 3 with 6th grade ranking last every year
- The gap between the special populations (i.e. students with disabilities, low income, and African American & Hispanic students) as compared to the general education population on the 2012-2013 test was larger than in any other year. In general, the gap increases from FRES to TCMS.

From 2-8 MAP analysis:

- Brighton norms on the MAP are routinely higher than national norms
- Gr 2-5 trends: Subscores for the areas of number sense and algebra were lower in 2013 than in previous years
- Subscores for the area of geometry in grades 4 & 5 was above average
- Overall there were few areas of concern but also few trends of relatively strong performance

From K-2 mClass analysis:

- There has been a general movement toward improvement in math as measured by mClass.
- There was a drop in performance between 1st and 2nd grade, but it was noted that the format of these two tests is extremely different and may have contributed to the discrepancy.

From 3-8 and 9-12 Item Analysis of New York State Assessments

- Calculation of "area" is consistently low among elementary students.
- Fractions are an area of need in grades 3-7. The emphasis on fractions has increased in the Common Core.
- Although curricular strengths for each grade were noted for all grades, there was no pattern of strength identified across grades.
- Largest areas of weakness were in areas not emphasized in Brighton's curriculum.
- There was a mixed performance when the indicator was assessed in extended response and multiple choice. BCSD students did better on extended response type questions.

From analysis of longitudinal student data:

- Percentage of students enrolled in accelerated courses has stayed the same (approx. 1/3 of Brighton students are in an accelerated math class). There is no difference in the number of girls vs boys enrolled in accelerated courses.
- It appears that students are properly placed. Many students who were placed in accelerated math classes tended to stay there (but not all). The number of sections of accelerated math increases between grades 3-5. There didn't seem to be a significant amount of movement, which might mean students are placed in the math class that is right for them.
- Students displayed consistent performance across assessment types indicating that our measures are congruent.

Conclusions for Dimension 1:

The previous observations led the committee to conclude the following about student development of mathematical proficiency:

1. The gap in achievement between members of certain subgroups (SpEd, AA, Hispanic, low SES) has grown in the last few years on the 3-8 NYS assessment. The gap is wider for students in the older grades. The new common core assessments had a greater impact on the students in these subgroups.
2. The overall decrease in performance may be due to the reading demands on the 3-8 test, not the mathematical expectations.
3. The following curricular areas were noted as areas of "need" during analysis of 3-8 assessments: area, fractions, solving multistep problems.
4. Because all Brighton students are expected to take Algebra 1, Geometry and Algebra 2/Trigonometry, achievement on Algebra 2/Trig may be misleading. It appears that our performance is lower when compared to other districts in the region. A portion of this disparity is due to the fact that Brighton has a higher proportion of students with disabilities challenging this exam.
5. Brighton students traditionally score well above national averages on other measures of student achievement (mClass, MAP, SAT).

At times, there is a disconnect between what is assessed on state assessments and what is valued in mathematics instruction for lifelong learning. This disconnect between curriculum and NYS assessments may lead to lower scores on state assessments. For example, Brighton curriculum and instruction emphasizes attainment of major concepts and skills whereas state assessments assess more discrete skills.

Results for Dimension 2:

<u>Dimension 2:</u> Students communicate and reason mathematically. This goal is directly related to Common Core Learning Standards content and Mathematical Standards for Practice # 3 & 6.

While it is important that students become mathematically proficient, of equal importance is the development of their abilities to reason mathematically and then communicate those findings. To assess this dimension, the committee examined data sets which included results of student focus groups, teacher surveys and analysis of common assessments. Analysis of the data resulted in the following observations:

From Focus Groups:

All students in grades 2-12 could describe how they used the following to communicate in math:

- Talking to partner/group
- Group work
- Sharing/showing thinking
- Students view partners and group interaction as helping them understand math
- Explaining answers step by step, sharing ideas
- Writing and solving equations

From Teacher Surveys:

<u>K-12 Results:</u>

- All teachers agree that the curriculum promotes mathematical discourse.
- Communication at all levels involves sharing strategies through small group work, class discussions, and journal writing. K-5 is supplementing for differentiation.
- All responses included sharing strategies and having discussions in whole class and partner groups, as well as in writing via journals.

From analysis of common assessments:

TCMS/BHS:

- Journal entries and assessments showed evidence of multiple representations and connections.
- Journal responses are more concrete/contextual in MS and becomes more abstract through 8-9th grade.
- All formats encourage "show or explain your reasoning".
- Kids often share ideas & journal entries with each other (anecdotal, no evidence).

CRPS/FRES:

- Students use a variety of strategies and representations

Conclusions for Dimension 2:

1. K-12, students communicate mathematically in a variety of ways, through partnerships and group work and by sharing and showing thinking in writing as well as speaking.
2. Teachers agree that the curriculum develops math understanding and skills and enables students to communicate that understanding.
3. Most, but not all, teachers K-12 agree that the curriculum builds a framework and allows students to make connections. Largest percentage of disagreement shared by teachers from CRPS and FRES.

Results for Dimension 3:

Dimension 3: Students are problem solvers by using appropriate tools and strategies. This goal is directly related to Common Core Learning Standards content and Mathematical Standards for Practice # 1, 2 and 5.

One of the primary goals of any mathematics program is that students develop the ability to apply the knowledge and skills that are being acquired to solve unrehearsed, authentic problems. The current instructional approach being used throughout the district fosters and reinforces these abilities by providing students with ongoing opportunities to engage in problem solving situations. This is further defined by a student's ability to exhibit flexibility with tools/technology, choosing the most appropriate and effective tool for the task.

In order to determine the extent to which students are developing these skills, the data sets used to evaluate Dimension 2 were also used to ascertain student problem solving abilities for Dimension 3. Analysis of the student work indicated the following performance patterns:

From Student Focus Groups:

K-12, students use multiple strategies in problem solving including:

- Underlining the question
- Highlighting the problem
- Underlining important info
- Drawing a picture
- Determining operation

Analysis of student responses indicated that students were more apt to share specific problem solving "strategies" rather than describe their "approach" to problem solving.

From 3-8 NYSTP analysis:

- One of the indicators used to determine problem solving ability was the percentage of students scoring at level 4 on the New York State assessment. The assumption was made that students who are proficient at problem solving would score at the upper level. Given that, it was noted that there has not been an increase of students scoring at this level when comparing results with the other districts across Monroe County, with the exception of grade 8. Grade 6, in fact, has the lowest percentage of students scoring at the upper level when comparing to neighboring districts.

From Teacher Surveys

- Overwhelmingly, teachers agreed that the curriculum fostered problem formulation, problem solving and mathematical reasoning.
- 6-12 teachers agree that the curriculum promotes building conceptual connections to real life applications.
- CRPS & FRES teachers were split in their beliefs that the curriculum allowed for transfer of knowledge and skills to authentic situations. This finding supports the evidence derived from the

analysis of the 3-8 assessments.

From analysis of common assessments:

- There were transfer type questions on all assessments for grades 6-12, fewer, if any on assessments for grades K-5.

Conclusions for Dimension 3:

Review of these results led the committee members to conclude the following about students' ability to solve problems using a variety of strategies:

1. K-12 students use a variety of strategies to solve problems, however, there has been a decrease in level 4 performance on the 3-8 NYS assessment for students in grades 3-7. Since there is an assumption that students scoring in the upper ranges on these assessments are better problem solvers, the evidence from this data set suggests that Brighton students are not increasing their ability to solve problems in unrehearsed situations.
2. K-12, teachers believe that the curriculum fosters problem solving and mathematical reasoning abilities although analysis of locally developed assessments K-12 revealed fewer opportunities to transfer understanding in assessments in grades K-5.
3. There is a consistent need to increase students' ability to solve multistep problems across grades 2-8.

Dimension 4: Organizational Supports

The last dimension, Dimension 4, attempts to quantify the degree to which the organization supports the work of the instructional program as well as the role the parents play in the overall mathematical literacy acquisition of the students. The process used to determine these relationships was based on an examination of instructional practices and organizational conditions within the buildings and a comparison of those findings to a set of validated principles and indicators of high performing systems. Areas of specific inquiry included implementation of academic intervention services (AIS), availability of resources to meet the needs of all learners, and parent involvement, knowledge and understanding.

Results for Dimension 4:

Data sets included teacher, student and parent surveys as well as analysis of student assessments. Analysis of the data revealed the following results:

Academic Intervention Services (AIS):

K-5:

- Many teachers see pullout/push as beneficial.
- More needy children need pull out to fill in gaps and work on basic foundational skills.
- There needs to be a strong line of communication between AIS and classroom teacher.
- More girls receive math AIS than boys.

6-12:

- Decrease in the number of students qualifying for AIS from 8th to 9th grades.
- Most TCMS teachers believe AIS should be given by the classroom teacher.
- Most BHS teachers believe the attached lab is most beneficial when taught by the classroom teacher.
- FLEX model at TCMS is well-liked as a way to reach kids for extra support.

Availability and use of resources to meet the needs of all learners:

K-5:

- There is a high need to supplement program, especially for the more advanced learners
- Some topics seem to be missing (time, $$).
- Extra practice is needed for struggling students.
- More rigor is needed to meet CCLS, including multistep and transfer type questions.
- In general teachers were split or disagreed that the current resources support differentiation. Teachers feel the need to supplement to differentiate for both high and low learners. There is not enough time to do investigation the way it is intended and include differentiation too and teachers feel that it is difficult to pace a lesson for multiple levels of learners.

6-12:

- Materials mostly meeting the needs of students and the curriculum supports differentiation.

From Teacher Surveys about Assessment Practices:

- K-5: Assessments need to match the prioritized standards. We need to streamline between instruction and indicators. There needs to be a direct match between mClass/MAP and Investigations. FRES teachers felt that assessments were not rigorous enough, lacked problem solving and transfer of skills.
- 6-12 – Availability of materials seemed to be adequate. There is a need to supplement for specific needs (AIS, test review.)

Results from Parent Surveys:

- The percentage of parents agreeing with the statement “My child has a positive attitude toward math” decreased when moving up through the grades.
- The percentage of parents indicating that they understand the goals of the math program decreased when moving up through the grades:
    - 64% CRPS
    - 58% FRES
    - 50% TCMS
    - 37% BHS
- Parents wish there was more communication about the overall K-12 math program.
- Parents expressed concerns about AIS and acceleration and students not meeting guidelines for either.
- Math concerns increased when moving from middle school to high school.

Conclusions for Dimension 4:

1. In grades 6-12, AIS is more beneficial when delivered by the classroom teacher.
2. In K-5, teachers feel the flexibility of push in/pull out groups is working, but acknowledge the need for ongoing communication between the AIS and classroom teacher.
3. Teachers feel that there is a need to supplement their resources to meet the needs of the highest and neediest learners, especially at the K-5 level.
4. On assessment: There is a difference between “disconnected” and unrehearsed. Teachers often feel the need to provide children with additional scaffolding rather than allowing them to “grapple” with the math.
5. Parents do not feel that they understand what the goals of the math program are and as such are not able to support the teachers and their child(rens) learning.
6. Professional development is needed to help teachers implement programs more uniformly.
7. There is a need to increase the use of formative assessment to guide teaching.
8. As we continue to explore the common core standards, we need to pay attention to understanding the individual standards and what math is contained in each. This along with a continued alignment to our materials will allow us to identify the gaps in our materials/resources and where we might need to supplement and differentiate.

Recommendations for each of the dimensions:

The purpose of this program evaluation was to determine the degree to which Brighton students are developing mathematical literacy. In addition to acquiring the concepts and skills of mathematics, mathematical literacy was also defined by the students’ abilities to problem solve, reason and communicate using appropriate tools and strategies. Overall, one can conclude, based on both the quantitative and qualitative data studied, that most of the students of Brighton Central School District are acquiring the desired mathematical behaviors at a rate comparable to or exceeding other students from around New York state and the nation. That does not mean however that there were no areas for improvement identified for both the overall K-12 program as well as the instruction for specific subgroups of students.

Recommendations in service to student achievement:

Recommendations for K-12:

1. Continue to explore the common core standards, with attention to understanding the individual standards and what math is contained in each. This along with a continued alignment to our materials will allow us to identify the gaps in our materials/resources and where we might need to supplement and differentiate.
2. Review curriculum to incorporate opportunities to transfer understanding to unrehearsed situations. Increase proportion of transfer questions in K- 5 assessments.
3. Continue to explore ways to meet the needs of math students who have had difficulty in their previous math classes.
4. Provide teachers with professional development on instructional best practice when considering issues of race and poverty and how to best support all learners.
5. Whenever possible, support a consistent math staff with strong backgrounds in mathematics.

6. Explore the vocabulary/reading demands of new assessments. Provide math teachers with professional development on close reading in math.
7. Develop a common understanding of what quality communication looks like in math.
8. Provide a better articulation of Brighton's philosophical underpinnings regarding mathematical understandings to parents and community members. These should include the belief that all students should take a math course every year they are in school.

Added Note: Because of the ongoing changes in mathematics standards defined by the common core and the associated changes in assessments, it is essential that the district conduct ongoing analysis of student results and not rely on a single year's data to make large scale changes in curriculum. In addition, it is important that these results be triangulated with other measures of student achievement (i.e. MAP assessments, locally developed common assessments) in order to better inform the resulting decisions. Since the time of this evaluation, results from the 2013-2014 NYS assessments have been made available. Analysis of these results will be compared to the results and recommendations made during this evaluation to ascertain continued relevancy.

Recommendations specific to K-8:

1. Review curriculum to identify prioritized concepts and skills with special attention to solving multistep problems and fractions.
2. Look at alignment between 5th to 6th grade math content and skill learning targets.

Recommendations in service to organizational supports:

1. Explore alternatives for AIS service delivery at K-8 which may include classroom teacher delivery options as well as increased opportunities for AIS provider and classroom teacher collaboration.
2. Review use of AIS providers for nonsupport functions (i.e. administering tests) in order to maximize time with students in K-5.
3. Explore possibilities of mirroring AIS model used in Algebra 1 for Geometry and Algebra 2/Trig..
4. Incorporate additional opportunities to solve unrehearsed problems in daily work and on assessments.
5. Provide professional development on use of data and understanding the purpose of assessments.
6. Explore ways in which we can involve parents and increase communication in an **ongoing** fashion, in order to increase their knowledge of the math program's philosophy, goals and practices.
7. Explore effective means to communicate (i.e. use of direct communication, web sites, social media, etc).

Limitations

Throughout the program evaluation process, several surveys were used to increase the evaluation teams' understanding about certain areas of the K-12 math program and the developing skills and understanding of the students. In most instances, standardized survey administration protocols were followed; all parties received surveys and procedures were put in place to maximize return of those instruments.   These standards were adhered to for the teacher survey which inquired about perceptions of curriculum development, instructional and assessment practices. For student focus groups, questions were standardized for developmental appropriateness and the same individual conducted all interviews, thus ensuring a consistency of data collection. Surveys administered to parents were made available online. Invitations were sent out via weekly eNews from each building as well as via Schooltool. Despite these frequent reminders, only 227 surveys were completed, making it difficult to generalize results across the entire district. In addition, survey instruments for the parent survey were developed in-house and had not been validated against any other populations.