West Virginia Mathematics Program Improvement Review

Bear County Middle School

BEAR County Schools

111 ANIMAL WAY
WILDERNESS, WV 22222

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Program Reviewers
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WHAT DO WE EXPECT TO FIND?

- Materials readily accessible
- Evidence of mathematics activity in the classroom and/or in displays
- A defined curriculum, aligned to state and local objectives
- A variety of documentation of student progress and participation in mathematics
- Teachers familiar with and confident about their mathematics program
- Evidence of mathematics in long-range/unit/daily plans
- Positive attitudes from faculty, staff, parents, and students
- The principal focusing on effective instructional practices and supporting the teachers in the implementation of aligned curriculum lessons and activities.
- Parent/community involvement in mathematics activities
- A system of accountability/alignment of teaching to program standards
- Mathematics targeted in the School Improvement Plan and the plan is reviewed/ monitored for progress regularly
- Evidence of the use of instructional technology to enhance data collection, interpretation, and communication
- Equity within the mathematics program, i.e., all students have equal access to high quality instruction as evidenced by high achievement regardless of gender, race, socioeconomic status, learning style or multiple intelligence, and ability

STANDARDS FOR A QUALITY MATHEMATICS PROGRAM

Bear County Middle School

Consistency Rating Summary

Where the Teachers Are
5=completely consistent with best practices in mathematics
3=moderately consistent with best practices in mathematics
1=inconsistent with best practices in mathematics
N.O. = not observed or not enough evidence
N.A. = not applicable

[redacted] Math Standard 1-Curriculum: Uses problem-centered content that develops students' conceptual understanding of mathematics, ability to apply mathematics, ability to communicate mathematically, and knowledge and skills in basic computation

4	1.1 The school has a written mathematics curriculum and it is used by the math teachers in planning the instructional program.
4	1.2 The mathematics curriculum is research-based, aligned to national and state standards and assessments, and redesigned periodically to respond to our changing society.
2	1.3 Problem solving is an integral part of all mathematical activity.
2+	1.4 Students understand that communicating mathematically requires a variety of processes-- observing, representing, discussing, analyzing, thinking creatively, sharing thinking, asking questions, justifying, reading, writing, listening.
4	1.5 Students understand that mathematical ideas are connected and that all of mathematics is an integrated whole.
	1.6 The curriculum develops students'
3+	a. number and operation sense, and computational skills (including real numbers for high school)
3+	b. estimation and mental computation skills
3	c. understanding of patterns, sequences, and series
2	d. knowledge of measurement and geometry (including indirect measurement)
2	e. spatial sense and reasoning (including algebraic and geometric transformations in high school).
2+	f. ability to collect, organize, represent, and interpret and work with data and statistics (including 2-variable data in high school).
2+	g. facility exploring chance and probability models
3	h. facility using algebraic skills and concepts, (including matrices, graphing equations and inequalities, line of best fit, characteristics of the graph of a function, and linear/quadratic/ exponential/ functions in high school).
3	1.7 Appropriate and relevant instructional materials/textbooks are used to reinforce the objectives of the mathematics curriculum. Materials avoid bias and stereotyping, and encourage cultural and gender appreciation.

Findings:

The [redacted] and the 2006 Program of Studies documents constitute the mathematics curriculum maps of [redacted] County Middle School. These documents are aligned with national and state standards and are coordinated and sequential for grades 6 through 8. The lesson plans include the [redacted] and the 2006 Program of Studies as well as outcomes, resources, vocabulary, and activities. The faculty is in the process of revising the curriculum maps in order to align them with the new textbook, Connected Mathematics 2 (CMP2).

During the interviews, the teachers defined problem solving as engaging students in real-life applications and problems that require the use of different strategies. In fact, the teachers were quick to point out that one strength of the CMP2 textbooks is problem solving where it is introduced with a technique called "launch, explore, summarize." Upon examination of the lesson plans submitted, this technique is being followed. Sample [redacted] practice tests and one teacher-made test were submitted to the site reviewers, but based on the teachers' definition above, problem solving is not evident in these samples. The teachers stated that they engage students in problem solving by putting problems on the Smart Board and allowing students to work in groups. According to the Teacher Self-Perception Questionnaire (TSPQ), eight (8) of the 10 teachers have had two (2) or less professional development sessions on developing lessons with a problem-solving focus in the last 3 years. Only three (3) teachers indicated that they feel somewhat prepared or not at all prepared to teach problem solving in mathematics. ***All 10 teachers*** *responding on the TSPQ* ***indicated*** *that using* ***problem solving****, both as a goal of instruction and as a means of investigating important math concepts, is* ***very important****. It is interesting to note that when asked during the interviews what is most important to teach in math, no teacher mentioned problem solving.*

It was clear from the observations that the primary instructional emphasis is on developing content knowledge/basic skills rather than higher-order thinking skills. In five (5) of six (6) classroom observations, review of concepts or procedures was the major focus of the lesson.[1] *For example, in one classroom, the first 30 minutes was devoted to Flashbacks and Math Minutes. In another situation, the students spent 45 minutes on Flashback exercises. Accelerated Math was a major component of all lessons as well. The data compiled from the TSPQ indicate that of the 10 teachers responding* ***eight (8)*** *concentrate* ***a lot*** *on learning mathematics facts/concepts and* ***nine (9)*** *concentrate* ***a lot*** *on skills/procedures to solve routine problems; however****, eight*** *(8) out* ***of 10*** *teachers indicated that they spend* ***a lot*** *of time developing reasoning and analytical ability to solve unique problems. In* ***only two*** *(2) of the six (6) classroom observations were* ***higher-level skills*** *being introduced or developed. These two (2) involved interpreting/analyzing data, evaluating logical consistency, interpretative discussion, and determining problem-solving strategies.*

In their interviews, the teachers commented that students communicate mathematically through verbal responses, written work, manipulatives, products, discussions, group work, demonstrations, and body language. According to the TSPQ, nine ***(9) out of 10*** *teachers reported that students* ***discuss*** *mathematics ideas* ***almost daily****. The majority of students*[2] *interviewed indicated that they* ***often*** *discuss different ways to solve mathematics problems. This is fairly consistent with the spring 2007 [redacted] Mathematics Student Questionnaire in which* ***66% of the eighth graders*** *and* ***73% of both the 6th and 7th graders*** *indicated they* ***discussed*** *different ways to solve problems* ***at least once a week.*** *Eight (8) of the 13 students interviewed commented that it is important to communicate mathematically by listening to how other students solve problems.*

Six (6) of the 13 students interviewed stated that they use writing to describe answers to problems, and only four (4) feel it is important to describe answers so that teachers understand student thinking. According to the TSPQ, ***six (6) out of 10*** *teachers reported that students use* ***writing*** *to communicate mathematics* ***almost daily.*** *From the classroom observations, the use of writing in mathematics was limited to drill sheets and textbook assignments; however, upon examination of submitted student tests previously mentioned, the students have some opportunities to express their understanding of mathematics in writing. Examples include "Explain your reasoning." "Explain why the data has no*

[1] Of the 6 observations, one teacher was observed twice. There was a 7th observation started but was interrupted and not completed.

[2] Five 6th graders, four 7th graders, four 8th graders were interviewed.

*mode." "Explain how to find the mean." "Explain how to find the median." "Describe the overall pattern of change you see in the graph and table." From the textbook, Investigation 4, grade level 6, was submitted for review. In this particular lesson, the following questions are posed for students to express their understanding of mathematics: "How can you tell when the least common multiple will be the product of the two (or more) numbers given, and when the least common multiple will be less than the product of the two or more numbers given?" "What do you need to find to answer questions like the Ferris wheel and the cicada problems?" "Could it be 8? 12? Why?" It is not known if students write their responses to questions like these posed in the textbook, if they answer the questions orally, or even if the questions are asked at all. On the **2006** [redacted] Mathematics Student Questionnaire, **52% of the eighth graders** indicated that they **write about mathematics** at least once a week. The new **2007** [redacted] Student Questionnaire does not ask the students how often they write about mathematics. However, the students were asked how often they draw pictures, charts or graphs to help explain their thinking. Fifty-seven percent (**57%**) of the **6th graders** indicated they do this at least once or twice a week. For the **7th grade**, it is **67%** and for the **8th grade**, **57%**. On the 2006 [redacted] **58%-63% of the eighth graders scored "0" or "1"** on Open-Response questions overall across the four mathematics sub-domains of Number/Computation, Geometry/Measurement, Probability/Statistics, and Algebraic Ideas. On the most current report, the 2007 [redacted] **29%-48% of the eighth graders scored "0" or "1"** on the Open Response questions overall across the five mathematics sub-domains of Number Properties/Operations, Measurement, Geometry, Data Analysis/Probability, and Algebraic Thinking. In the **seventh grade**, **23%-78%** of the students scored either a "0" or "1" on the Open Response questions, and for the **sixth grade**, **35%-87%.***

The teachers show students that mathematics ideas are connected by showing the relationship between multiples and LCM; factors and GCF; word problems and equations; and graphs/tables and patterns and then patterns to equations. In addition, one teacher mentioned building on prior knowledge. The teachers stated that the CMP2 textbooks are strong in connecting the mathematical ideas. Eight (8) of the 10 respondents on the TSPQ have had at least some professional development in the last 3 years on making connections between/among mathematical ideas. As for the students, they understand that mathematical ideas are connected, citing as examples relationships among fractions/decimals/percents and how multiplication is related to division.

The students interviewed stated that they have had a variety of experiences in mathematical concepts and processes. These included such items as creating models/designs, collecting data through a survey, conducting probability experiments, and creating patterns or sequences. The parents interviewed believe that the students get varied experiences over the years and not just the same thing each year. Parents also said their children have made models or designs and/or have measured shapes and objects. The varied experiences were supported by teachers' responses on the TSPQ in which nearly all teachers spend at least some time in all areas of mathematics. According to the TSPQ, the majority of teachers feel prepared or very well prepared to teach the mathematics areas.

*According to the spring **2006** [redacted] the eighth grade was below the state in three mathematical areas tested – Number/Computation, Geometry/Measurement, and Probability/Statistics. The Algebraic Ideas sub-domain was below the state mean, but considering the standard error of measurement, the eighth grade was within range of the state score. The academic index for the eighth grade was 59 out of 140 (state index was 69). According to the spring **2007** [redacted] on the multiple-choice section of the mathematics subtest, the eighth grade was below the state in only one area – data analysis and probability. The seventh grade fell below the state in four areas – number properties/operations, measurement, data analysis and probability, and algebraic thinking. The sixth grade fell below the state in only one area – measurement. The academic index for the eighth grade was 75 (state index 77); for the seventh grade, 74 (state index 81); for the sixth grade, 90 (state index 84). **Overall**, according to the 2007 [redacted] **40% of the sixth graders** were **below proficient** in mathematics; **57% of the seventh graders**; **54% of the eighth graders**.*

The adopted textbook is Connected Mathematics (CMP2) *published in 2006. Other materials, software, and programs used by the teachers include [redacted] Coach, United Streaming, Brain Pop, The Futures Channel, Accelerated Math, PLATO, Dale Seymour publications, etc.*

Recommendations

- **Continue working on revising the curriculum maps to correlate with the new textbook. Add to the maps a section entitled "Process Standards." These include Problem Solving, Communication, Reasoning and Proof, Connections, and Representation. For more information on these, refer to the National Council of Teachers of Mathematics (NCTM) *Principles and Standards for School Mathematics*, NCTM, 2000, www.nctm.org. Include in this section a couple of rich, collaborative tasks that require students to reason through and solve a problem, communicate through various methods, make connections with other math ideas or the real world, and display the math using various representations. Additionally, add to your maps the Technology Standards from the Combined Curriculum Document 2006 that pertain to mathematics. Be sure you are preparing your students for the 21st Century. See the next to last recommendation under Standard 2.**

- **Research as a faculty what "problem solving" means and develop units around that concept and/or be intentional in implementing the units in the CMP2 so that there is consistency among the grade levels. Refer to the National Council of Teachers of Mathematics (NCTM) *Principles and Standards for School Mathematics*, NCTM, 2000, pages 52-55, or go online at www.nctm.org.**

- **Be attentive to those teachers less experienced or struggling with the mathematics content; mentor them. Encourage them to take courses, workshops, or any professional development sessions that will improve their confidence and preparedness in understanding certain mathematics topics such as Algebra, Geometry, Measurement, Data Analysis, and Probability and Statistics.**

  --Engage in free courses from Annenberg/CPB Channel through digital satellite feed or streamed online via broadband. All of the NCTM Content Standards are offered. See www.learner.org for more information.
  --Engage in courses offered through www.pbs.org/teacherline. These courses have a cost.
  --Go to a Marilyn Burns 30-hour institute (see www.mathsolutions.com) on content, instructional strategies, and problem solving (see possible locations in [redacted] or [redacted]).
  --Attend an NCTM weeklong academy or e-workshop (see www.nctm.org).
  --Attend an academy or workshop, e.g., from a university, [redacted], or other educational organization.
  --Purchase for your own personal enhancement Improving Instruction in Rational Numbers and Proportionality, Improving Instruction in Algebra, and Improving Instruction in Geometry and Measurement by Margaret Schwan Smith and et. al. These books are for middle school teachers.

- **Talk to students about the importance of writing in mathematics to express their understanding of mathematics, explaining to them that communicating mathematics by writing lets you understand what they are trying to do—they need to value writing as a tool and as a window to their thinking about math. Every other day or so, instead of asking students to respond verbally to a question (e.g., strategies they tried or conjectures they made to solve a problem), ask them to write the response, possibly as an exit slip or for homework. Take the time periodically to discuss these responses so that students see the value of expressing information precisely and succinctly. Refer to the NCTM website (www.nctm.org) and find *Illuminations* lessons that include writing. There are also some ideas for writing in mathematics in the 2000 *Standards* documents. Do not skip the sections of your books that require students to write about mathematics. Have students write conclusions related to data, predictions about patterns or graphed data, and their own related problems and open-response questions. Share your effective writing ideas when you meet as a staff or grade-level team. The more students "practice" how to think and communicate in writing through the years, the more comfortable they will be to "enter" mathematics open-response questions on [redacted] and the better they will perform overall.**

- **Compare the amount of time spent daily on flashbacks and Accelerated Math problems to the amount of time actually spent on teaching the mathematics content. If more than seven (7) minutes daily is spent in this kind of review, there is not enough time left to teach the mathematics content effectively with students demonstrating understanding, mastery, and ability to use it to solve problems.**

[redacted] Math Standard 2-Instruction: Engages students in a variety of learning experiences designed to develop mathematical discovery and reasoning.

2 +	2.1 Instructional strategies reflect a constructivist orientation, including student exploration, development of concepts from direct experience, and questioning to elicit higher-order thinking.
2+	2.2a Instructional strategies include using multiple problem-solving strategies, applying them in routine and non-routine problems, and providing opportunities for students to pose their own problems, to reflect on their work through writing, discussing, and analyzing their own mistakes and to discover new solutions.
3	2.2b Instructional strategies include a variety of instructional grouping patterns appropriate for different tasks and diverse learning styles.
3	2.2c Instructional strategies include use of manipulatives to introduce concepts, practice skills, provide for problem solving, and verify mathematical reasoning.
3	2.2d Instructional strategies include monitoring student performance, giving immediate response, and adjusting instruction accordingly.
2	2.3a Students use computers and other technological tools in math lessons to develop and extend their mathematical understanding.
3	2.3b Students use calculators and related equipment in math lessons to develop and extend their mathematical understanding.
2	2.4 Instruction balances preteach/teach/reteach, review, supervised classwork, and independent homework.
1+	2.5 Field trips, speakers, and other supplementary programs extend instruction beyond the classroom into the school and the community.

Findings:

From the data collected, it appears that teachers at [redacted] County Middle School are aware of the significance of asking questions to elicit higher-order thinking which requires students to analyze, predict, interpret, explain, classify, infer, formulate, decide, etc. All of the teachers indicated on the TSPQ that it is very important to use questioning techniques that promote student interaction and discussion. In the interviews, they mentioned such questions as "How does this apply?" "Why?" "What does this coordinate pair have to do with this equation?" "How did you go about solving the problem?" As noted in Standard 1 above, the CMP2 textbook is grounded in higher-order, divergent questions for teacher use to engage students in developing their mathematical thinking. Higher-order questions were also heard in the classroom during the observations. Some of those questions were "Why don't we ever try to find GCM?" "Why is it important to check to be sure you have listed all the numbers?" "What would the graph have looked like if the rides had traveled at this average speed all day?" "Can someone explain to me what she said?" However, the norm was mostly narrow or convergent questions focusing on factual recall or one-word responses.

The principal indicated on her questionnaire that the mathematics program encourages students to explore, discover, and find answers for themselves. All the teachers feel it is very important to involve students in constructing and applying mathematical ideas; however, according to the TSPQ, half of the teachers have had no professional development in the last 3 years on developing lessons for students to actively construct their own mathematical knowledge. As already noted in Standard 1, the students participate in a lot of practice and review for the [redacted] This was corroborated when the students reported engaging daily in Flashbacks, Math Minutes, and Accelerated Math worksheets, all activities which are for practice and drill in building basic skills than developing, exploring, and discovering mathematics ideas. According to the TSPQ, six (6) of the teachers reported that class review of skills and procedures is a daily activity. This was affirmed in the classroom observations. Refer to Standard 1 for additional findings about the amount of time spent in these activities.

*According to the TSPQ, the technique most frequently used to communicate mathematics in the classroom is the teacher **demonstrating/modeling** how to work an exercise or solve a problem (**10 of 10 almost daily**). Verbal communication by the teacher in the form of demonstrating/modeling/guiding practice and the students responding to*

questions was supported by 100% of the classroom observations where teacher-led instruction as a method of instruction was used. Along with modeling how to solve problems, the interviews indicate that the teachers model/instruct problem-solving strategies for their students in those "teachable moments" when the occasion arises. However, the teachers also have the students decide which method or strategy to use when solving problems, which substantiates the student comments about discussing different ways to solve problems. Only two (2) students interviewed indicated that they have the opportunity to make up their own problems and solve them. ***Four*** *(4) of the 10 teachers reported on the TSPQ that they have had* ***no*** *professional development in the last 3 years on how to model multiple problem-solving strategies and* ***four*** *(4) have also had* ***no*** *professional development on how to facilitate students' applying of problem-solving strategies. It is important to note again that 11 of 12 teachers submitting a TSPQ believe that using problem solving both as a goal of instruction and as a means of investigating important mathematics concepts is very important.*

From the TSPQ it appears that other instructional approaches used at least once or twice a week include students leading discussions, students using manipulatives, students working together in groups, and lecture. ***Small group work*** *or pairs of students working together was observed in two (2) of the 6 classes. According to the TSPQ, six (6) out of 10 teachers reported using groups or teams in their classes almost daily, which is consistent with the teacher interviews. One teacher specifically mentioned using Collaborating On-Task Thinking. The students confirmed in their interview that they work in groups investigating, discussing, and working problems. All of them said that group work helps them. All but two (2) teachers have had some professional development on using cooperative groups as an instructional approach as reported on the TSPQ.*

To help improve student academic performance, the 2006-2007 [redacted] *states that students in* ***all*** *math classes are to* ***use manipulatives 50%*** *of the instructional time. The interviews and TSPQ indicate that manipulatives are being used. Nine (9) of 10 teachers have students using manipulatives to practice skills or learn concepts at least once or twice a week , according to the TSPQ, and eight (8) of the 10 teachers have students using manipulatives to solve problems or verify reasoning at least once or twice a week. In their interview, the teachers indicated that they use manipulatives to introduce concepts and for discovery, and the students have access to manipulatives any time. The special needs teachers reported using manipulatives with everything. The site reviewers saw no manipulatives being used on the day of the visit. There was one missed opportunity to use manipulatives to engage actively students in discovering a concept during one classroom observation. All but one (1) teacher have had some professional development in the last 3 years on providing opportunities for students to use manipulatives to verify mathematical reasoning, and nine (9) of the teachers reported on the TSPQ that they feel prepared or very prepared to teach students' use of manipulatives. Nine (9) of the 13 students interviewed stated they rarely use manipulatives; the other four (4) said they use manipulatives once a week, mentioning such manipulatives as centimeter cubes and geoboards. On the* [redacted] *Student Questionnaire for the spring of 2007,* ***36% of the eighth graders, 48% of the seventh graders,*** *and* ***42% of the sixth graders*** *reported using hands-on materials* ***once a week or more****. Math manipulatives/tools were evident in some of the classrooms; however, one teacher has a storage room where manipulatives are kept for teacher use. The teachers indicated no lack of manipulatives.*

Teachers interviewed stated that continuous assessment of student work most commonly results in adjusting lessons and addressing misconceptions. Formative assessment of student performance is conducted everyday through observations and the administration and checking of flashbacks. On the 2007 [redacted] *Mathematics Student Questionnaire, an average of sixty-six percent (66%) of all students indicated that they receive helpful comments at least once a week from the teachers on assignments in their classes, not limited to just mathematics. It is unclear how often adjustments are made in the instructional process due to student performance, what kind of adjustments are made, what type of assessment for learning feedback the students receive, or how effective the feedback is.*

Student use of computers is not mentioned in any of the lesson plans submitted nor were they observed being used as a tool to learn mathematics in any of the six (6) classroom observations. It was obvious from the teacher interviews that computers are rarely used by the students in the classroom to develop and extend their mathematical understanding. On the other hand, six (6) of the 10 teachers reported that students practice skills in math using computers at least once

[3] Further citations from the [redacted] refer to this particular document.

a week and four (4) of the 10 teachers responding on the TSPQ indicated that students use computers to solve problems at least once a week. Both teachers and students reported using computers for Accelerated Math, STAR test, MAP test, PLATO, and Excel The teachers stated that the students go to the computer lab about once a week; however, access for math instruction is limited many times due to online testing. As reported on the TSPQ, ***three*** *(3) out of 10 teachers have had* ***no*** *professional development over the last 3 years in teaching students to use computers as a tool to learn. Six (6) of the 10 teachers indicated on the TSPQ that they feel prepared or very well prepared to teach students' use of computers in mathematics. Every classroom had three (3) or four (4) computers.*

Teachers, students, and parents interviewed reported using calculators almost every day. According to the 2007 [redacted] *Student Questionnaire,* ***85% of the eighth graders*** *and* ***83% of both the seventh and sixth graders*** *reported using* ***calculators at least once a week****. The students have access to TI-34II, TI-30, TI-73, and some TI-83 calculators. Although all but one (1) of the 10 teachers responding on the TSPQ indicated that they feel prepared or very well prepared to teach students' use of calculators in mathematics, five (5) have had no professional development in the last 3 years on teaching students to use calculators as a tool to learn mathematics. Calculators were being used in two (2) of the six (6) classroom observations. The principal stated that there is a goal to use graphing calculators; teachers mentioned needing training on the use of graphing calculators. The* [redacted] *states that teachers will refine and continue to use calculators, among other technology, to increase student achievement, but the plan does not specify how often this is to take place or to what degree.*

Extending mathematics instruction beyond the classroom in the form of a field trip or inviting a guest speaker to talk about how math is used in the real world is almost non-existent. One field trip to [redacted] *Kingdom by the eighth grade was mentioned. All math activities related to this trip were done prior to the trip.*

Recommendations

- **Develop a plan to use more open-ended and divergent questions and develop quality-questioning skills. If you find it easy to ask higher-level questions in your classroom, help your colleagues develop these skills. Observe each other in classrooms, or ask the administrators to observe, taking note of all questions asked and then look at the kind of questions being asked. Engage in discussion on how to change some of the convergent (lower-level) questions into divergent (higher-level) questions. Keep a list of questions to use. For example, instead of "When you flip a coin what are the possibilities you can have?" ask, "How did you reach that conclusion?" Instead of telling the students answers to questions, prompt them with such questions as "What do you need to find out?" "What information do you have?" "What strategies are you going to use?" etc. Download from www.pbs.org/teacherline a list of questions to use to develop mathematical thinking, also enclosed in the resource packet accompanying this report. Practice on one or two questions at a time until you have them embedded in your instruction. Quality questions are not just asked; they have to be designed and teachers have a responsibility to pose questions that elicit higher-order thinking. Other teacher examples of questions that move students to construct their own mathematical thinking:**

  --How did you group these triangles?
  --What's distinctive about that one?
  --Why are there more spaces in between these numbers?
  --How are these numbers not the same?
  --What different ways can we write ratios?
  --How can we figure out whether this number is divisible by 6?
  --If it doesn't work, why do you think it might not?
  --Why is that not a good way to record my pattern?
  --What's the difference between a square and a box?
  --How did your prediction compare to the actual?
  --What do you notice about those two lines?
  --Is it possible to have more than one mode? Why or why not?
  --Why do we need to add and subtract fractions?
  --How will different spinners affect the outcome of a game?
  --How can your knowledge of probability help you make a prediction?

--How can you decide how many zeros to use?
--How can we figure out whether this game is fair or unfair?
--Why does this formula work?
--Can anyone show what she did in her head then?
--What kind of pattern do you see?
--Would 12 trials be enough for experimental probability? Why or why not?
--How are positive and negative numbers used in everyday life?
--If 2 shapes have the same area, does that mean they have the same perimeter?
--How are geometric transformations used in the real world?
--What are the ways that a player can win?
--How can you prove that?
--What other ways could we use to solve the problem?
--What is different about this question from the last?
--Why is it important to know how data was obtained?
--Would you rather have the mean, median, or mode of your test grades for your 9-weeks grade?
--What can you conclude from the results of the survey?
--What does a negative temperature feel like?
--What other things rotate?
--What other statements could I come up with about my table?

These questions elicit different types of thinking than recall or solving by an algorithm; they move the students to the correct response and constructing their own mathematics thinking.

- **Incorporate in your instruction higher-level instructional feedback to enhance student learning. This is more than the motivational responses observed by the reviewers such as "Good job," or "Very good." Higher-level instructional feedback is feedback offered relative to progress in learning; it provides students the opportunity to extend their learning beyond the specific response/question being addressed. An example observed in a classroom observation was "How would wind affect the speed the riders could travel?" This moved the students beyond the lesson at hand.**

- **Purchase recommended resources for book studies or for your professional development library about quality questioning and higher-level feedback: Improving Classroom Questions by Kenneth R. Chuska and Quality Questioning by Jackie A. Walsh and Beth D. Sattes.**

- **Be sure there is fidelity to implementing the lessons in the *Connected Math series.* If needed in order to improve student proficiency, design more lessons to be student-centered, problem-based, and real-world related making certain to include higher-level skills such as collecting/recording data, interpreting/analyzing data, investigating through hands-on or technology, applying theorems/principles, evaluating relevancy of data, determining problem-solving strategies, creating/formulating patterns and equations, evaluating logical consistency, justifying/verifying solutions, and interpretive discussion. Encourage brainstorming. Use suggestions and classroom activities in NCTM publications (www.nctm.org) for creating more student-centered, problem-based activities. Check out www.e-missions.net for simulated, problem-based, learning adventures, right in the classroom. All middle school students need to be rigorously prepared for high school mathematics and the world in which they will live. Refer to the recommendation in Standard 1 about problem solving.**

- **Continue in sustained, ongoing professional development provided by representatives from the *Connected Math series* or by a master teacher who has been using the series effectively. This should be mandatory. It is important that all teachers teaching math understand and are comfortable with the methodologies presented in the students' textbooks and the teachers' editions. If possible have the "expert" come into your classrooms and actually model the program.**

- **Engage in a study of the book Implementing Standards-Based Mathematics Instruction by Mary Kay Stein, et. al. to learn more about the levels of cognitive demand. There are lower-level demands, such as**

memorization tasks and procedures without connections tasks, and higher-level demands, such as procedures with connections tasks and doing mathematics tasks.

- **Use Accelerated Math sparingly in a purposeful targeted way for students who need help on particular topics or to provide opportunity for excellent students to challenge them with the "extended response" items that are more like [redacted] open-response questions. Accelerated Math is designed to be a method of periodically assessing individual students on mathematics skills for the purpose of intervening or assisting each one after determining his/her misconceptions. By its nature, the questions generally reflect lower-order remembering and understanding (Bloom's Revised Taxonomy) levels or they are mathematical exercises without context. Most of the questions are not [redacted] like. In addition, while students are being assessed on the Accelerated Math skills, they are losing time that they could be doing hands-on investigations, learning new grade-level math content and skills, and applying them in real-world situations or using them in solving non-routine problems. Use Accelerated Math for the use it was intended. See also the last recommendation in Standard 1.**

- **Review what cooperative learning groups are designed to be and then review your use of such groups to be sure you are providing differentiated opportunities for students with varied learning styles and multiple intelligences, linear and creative thinkers, hands-on and abstract learners, leaders, organizers, recorders, etc. Helping each other with homework or checking each others work occasionally can be beneficial to students; however, working in cooperative learning groups gives students the opportunity to deepen their understanding of difficult mathematical concepts by conducting brainstorming sessions, explaining their understanding and misunderstandings, and communicating about their problem-solving strategies.**

- **Inventory your math manipulatives and tools, if needed. Make sure they are easily accessible. Teachable moments can be missed when manipulatives and tools are not on hand. Share in your component meetings or grade-level meetings how to use manipulatives effectively to facilitate problem solving and verifying solutions and reasoning. Seek additional professional development as needed. Students need to use manipulatives to enhance their understanding of concepts and to solve problems. During your team meetings, you might want to take time together to Google Virtual Manipulatives for many sites, such as the National Library of Virtual Manipulatives, available for student use of manipulatives (good students' use of computers), to explore all the possibilities and then discuss how you could incorporate such sites in your lessons. The deeper students understand concepts, the easier it will be for them to transfer to the abstract representation, which is required for responding on the [redacted].**

- **Take inventory of calculators to determine if more calculators are needed and to upgrade some of the existing ones. Students need to be comfortable in knowing how and when to use calculators, when it would be more efficient NOT to use them, and to be competent in performing tasks with them. Calculators are essentially "hand-held computers" and students need to take advantage of their capability and complexity in problem solving, reasoning, and real-world application. Students can learn more mathematics using the appropriate calculator to make predictions, evaluate, think critically, and/or make decisions. They are not to be a "crutch" or just a tool to do computations. Use your TI-73 calculators to plot data, use geoboards, simplify (stacked) fractions, find areas of shapes, compare fractions and decimals on a number line, and explore probability at a much deeper level and in a much more motivating fashion than doing it by hand. For the 8th graders consider purchasing TI-84+Silver that has preloaded applications such as Cabri Jr. Geometry, probability simulations, science tools, and Algebra I topics, and is compatible with TI-SmartView emulator software (that you might purchase some day). You can also download other applications and classroom activities free from the TI website, www.education.ti.com. Be sure to purchase enough presentation tools such as TI-Presenters to meet the needs of all teachers. Consider purchasing the TI-Navigator and training teachers to use the system.**

- **Ensure the participation of math teachers and special education teachers in professional development on teaching mathematics using calculators. Contact [redacted] at [redacted] (trainer for Texas Instruments in [redacted] to see if she can help you find a trainer close to you.**
- **Attend professional development as soon as possible on the most effective use of computers, websites, higher-level problem-solving software, and other technology to enhance mathematical instruction. Continue the use of a computer and projection device and/or Smart Boards to teach lessons from the Internet and create interactive activities. Schedule times for the computer lab to be used for problem-based activities/lessons other than skills practice.**
- **Inform yourself about the new Technology Content Standards in the *2006* [redacted] on the [redacted] website. These are now required for all students and need included in curriculum maps. These standards require by state regulation that students apply technology across all curriculum areas and demonstrate competencies needed for high school graduation, which means that all students need to have access to computers and calculators for learning math.**
- **Take students on a field trip to the grocery store to study unit pricing and best buys, to a bank to see the use of percents, or to a local business, which periodically hires students, to explore time clocks and wages. Invite speakers in, e.g., a dentist to speak about uses of math and technology in designing braces or making other dental appliances, a local architect to show how math is used in designing structures, or a meteorologist to talk about the uses of math in weather reporting. Use of the website http://www.thefutureschannel.com to access virtual speakers and excellent lesson plans that relate mathematics to real life is strongly recommended.**

[redacted] Math Standard 3-Equity and Diversity: Provides learning environments that meet students' diverse learning needs.

4	3.1 Students of all ethnic groups, cultural groups, ability groups, economic levels, learning styles, multiple intelligences, and genders have equal access to information, assistance, classroom interaction, and technology. Classrooms invite participation by every student.
3	3.2 Teachers accommodate students' special needs, abilities, and disabilities.
2	3.3 Academic support activities for both struggling math learners (e.g., tutoring) and excelling math learners (e.g., math club, other enrichment) provide additional opportunities for student learning in mathematics.

Findings:

From the interviews, it appears that there are efforts being made at [redacted] County Middle School to meet the needs of all students. Factors effecting that environment include full inclusion of special needs students in regular mathematics classes, special needs teachers co-teaching in the inclusion classes, single-gender classes, student access to manipulatives and technological tools, the Power Period, tutoring, and time allotted for math instruction. All students are receiving mathematics instruction from a math teacher with assistance from a special needs teacher where there is inclusion, each providing one-on-one instruction as needed. Individual assistance was observed in three (3) of the six (6) observations. Sometimes students are pulled out of the regular class for more one-on-one instruction after the task analysis and based on scores. There is also an intern working with students. The top boys and girls at all three (3) grade levels are assigned to a single-gender class. This provides opportunities for those students who excel in math that otherwise might not happen. Regardless of the class placement, all students are receiving the same curriculum and the same core content. As already noted, all students have access to manipulatives and calculators, and there are computers available in the classrooms as well as in two computer labs for student use. The Power Period is used to accelerate students as opposed to remediating. For example, the eighth grade special needs students are taught an algebra unit during this time. Special needs students are also given opportunity to work on an assignment not completed in the regular class period. This period is used as well to practice on [redacted]-like items. It should be noted

that the Power Period is not just for mathematics. Some of the teachers stay after school to tutor and [redacted] services are provided during the school day using the [redacted] program in the computer lab. According to the master schedule, there is approximately one hour for math instruction daily. It was refreshing to hear all the students interviewed indicate that they feel comfortable participating in math class.

Based on observations, examination of submitted lesson plans, and interviews, there are factors compromising equity and meeting the diversity of students' learning needs, those factors being questioning techniques and planning/implementing a variety of teaching strategies. Questions stimulating higher-level, divergent thinking were very limited as already detailed in Standard 2. Appropriate wait time, after asking questions and even after questions were answered, was almost non-existent. One teacher used some wait time and another teacher was close to using the 3-5 second wait time rule. Thirdly, the teachers did not typically use questioning strategies to ensure that <u>all</u> students have an opportunity to respond. Students were observed answering questions by calling out the answers, not allowing all students enough time to think about the question and/or the answer presented. Sometimes, only those students with hands raised were called upon. However, there were occasions observed in the classroom observations in which students were called upon randomly with one teacher in particular selecting cards on which student names were written. Although the use and availability of manipulatives and the use of collaborative groups can be means of differentiating instruction, only one teacher specifically referred to differentiating instruction in the lesson plans submitted. In particular, peer teaching and adjusting questions were mentioned. On a positive note, during the observations, one teacher in an inclusion class read the questions to the students prior to the flashback review and then read them again during the checking process.

*There is other evidence that indicates that the needs of all students are not being met. Test data, as reported on the 2007 [redacted] show that statistically there are significant differences in achievement between males and females in the 7th grade. Of the females, 52% achieved proficient or above whereas the males had 34% achieving proficient or above. All three (3) grade levels showed significant socioeconomic differences. Sixty-three percent (63%) of the total school population is classified as approved for free or reduced lunch. In the **6th grade**, **48%** of those approved for **free/reduced lunch** achieved **proficiency or above**; **7th grade – 36%; 8th grade – 34%**. The academic index for those 6th grade students approved for free/reduced lunch is 79, but those not approved is 109 on a scale of 0 to 140. For the 7th grade, it is 67 compared to 87 and for the 8th grade, it is 62 compared to 94.*

*The disability subpopulation is the only group that did not achieve Adequate Yearly Progress (AYP). In the **6th grade**, **8%** of those students identified with **learning disabilities** achieved **proficiency or above**; **7th grade – 0%; 8th grade – 8%**. On an academic index scale of 0 to 140, the 6th grade students identified with learning disabilities had a score of 37, but those without learning disabilities had 97. For the same group of students in the 7th grade, the comparison is 29 to 82 and for the 8th grade, 36 to 81.*

*It is especially interesting to note, in light of the fact that [redacted] County Middle School has single-gender classes based on top academic performance, that there is a **significant statistical difference** between those students identified as **gifted/talented** and those who are not. Using the [redacted] scale score data disaggregation, there is a 31-point gap between participating and non-participating students in the 6th grade. The 7th grade also had a 31-point gap and the 8th grade had a 27-point gap. It is not surprising that the students identified as gifted/talented scored very well on the [redacted]; however, only 16% of the total school population falls in this category. Ninety-seven percent (97%) of the 6th graders in this subpopulation achieved proficient or distinguished, 100% of the 7th graders, and 80% of the 8th graders.*

Race and ethnicity are not factors in considering equity and meeting student needs.

On a more positive note, the fall 2006 8th graders compared equally to the national norm group on the EXPLORE, although the females outscored the males. Achievement on this test has improved over the period 2004-2006.

According to the TSPQ, all but two (2) teachers have had some professional development over the last 3 years on using appropriate techniques for working with special needs students, and three (3) of 10 have had no professional development in the last 3 years on teaching classes containing students of heterogeneous abilities. Only one teacher has had no professional development in the last 3 years on addressing different learning styles. Almost all of the

teachers feel prepared or very well prepared in the use of learning styles and multiple intelligences theory in teaching mathematics.

Recommendations

- **Commend yourselves for the efforts you are making to meet the diversity of the various student subpopulations. It is commendable that you include special education students in regular math classes with collaborating teachers and that those teachers who are collaborating have common planning times. During this time, the math teachers can learn more about how to help special needs students in math and special needs teachers can learn more about mathematics content, if necessary. If (more) professional development is needed in how to teach in a collaborating classroom, you might want to contact a Special Education Cooperative in [redacted] (see the [redacted] Department of Education website-Special Education [redacted] or [redacted] and participate as a team of math and special needs teachers.**

- **Continue working on improving the performance of students, especially the socioeconomic, special needs, and gender subpopulations. Be sure that the special needs teachers have the materials/handbook that accompanies the *Connected Math series* for special needs students. When you have additional textbook implementation training, ask your trainer for suggestions on implementation with special needs students.**

- **As you plan daily to meet student needs and as you plan your next revision of the [redacted], be sure to include specific measurable goals, objectives, strategies that you are going to implement in order to increase student achievement where there are identified achievement gaps. There can only be success when there is a doable action plan. Just to acknowledge the gaps is not sufficient. The [redacted] does not specifically detail how it will meet the needs of any of the subpopulations identified with learning gaps. For example, to say that teachers will refine and continue to use calculators to increase student achievement is not measurable. This strategy does not identify how this action is to take place, what it will look like when implemented, how it is going to be measured. Many of the recommendations throughout this report will lead you in your planning. A good plan will have only 2 or 3 measurable goals with objectives that are clearly defined as to how they are to be implemented. Start with what you want learning to look like and work from there.**

- **The above recommendation is the same for the gifted/talented students. You have tracked some of your students into top learning groups as well as into some single-gender classes. Include in your daily planning and in the [redacted] how you are going to address these groupings. Identify specific learning outcomes for these students---what expectations you have. There is much research on single-gender classes and there are many opportunities for gifted/talented students as mentioned in the next recommendation. Google "single gender middle school classroom" for a start. Seek professional development in these areas as needed.**

- **To challenge and motivate students who excel and/or have an interest in mathematics, let them explore areas such as discrete math or number theory, which are outside the curriculum. This could be done during regular class time after these students have finished their work ahead of time. *All* students could benefit from this extra time, as it is available. Visit www.artofproblemsolving.com for problem-solving resources and information on how to trade ideas with other top math students. Consider forming a Math Club where all students have opportunity to participate in Problem-Based Learning (PBL), investigate Lego projects, robotics, etc. Participate in St. Jude Math-A-Thon and Math Counts.**

- **Intentionally allow wait time for students to respond to questions and for students to "digest" the answers given. When you ask general questions to the whole class, discourage students from calling out the answers; this does not give ALL students the time to think and be individually accountable for his/her learning. It signals to the less able or quieter students that they can stop thinking. This is also true for calling on only those students whose hands are raised. Practice wait time and explain to the**

students why you are doing it: ask a question, wait 3-5 seconds for students to think and formulate a response, then call on one at random and wait again 3-5 seconds after the response for the student to elaborate and/or for others to reflect on the answer. At first, it will be difficult to change your practice and will slow the teaching process, but it gets easier as you do it repeatedly and students know they are going to be held accountable. The two books on quality questioning recommended in Standard 2 will help with this.

- **Intentionally include time in math team meetings to discuss strategies being used to address those subpopulations where there are achievement gaps Discuss what is working, what is not working, and share what you have learned from research on best practices. Recommended resources are:**

    1. Literacy Strategies for Improving Mathematics Instruction by Joan M. Kenney
    2. Implementing Standards-Based Mathematics Instruction by Mary K. Stein, et al.
    3. Connecting Mathematical Ideas by Jo Boaler and Cathy Humphreys
    4. The Differentiated Classroom by Carol Ann Tomlinson
    5. Best Practice, 3rd edition, by Steven Zemelman, et al.
    6. Classroom Instruction that Works by Robert J. Marzano, et al.
    7. So Each May Learn: Integrating Learning Styles and Multiple Intelligences by Harvey F. Silver, et al.

[redacted] Math Standard 4-School Climate: Creates positive attitudes towards and about mathematics as well as encourages and recognizes students' accomplishments in mathematics.

4	4.1 Students, parents, and teachers believe all students are capable of achievement in mathematics.
3	4.2 Teachers exhibit high expectations for all students.
2	4.3 Students demonstrate high expectations and help develop standards for themselves and for others; they are rewarded for originality, personal initiative, creativity, risk-taking, and accuracy in their mathematics classwork, but feel free to make mistakes and learn from them.
2+	4.4 The school recognizes, rewards, and celebrates the mathematics achievements of all students, including girls, minority students, developing English speakers, and those with special education needs.
2	4.5 Support and administrative personnel (counselors, administrators, instructional assistants, media directors, etc.) actively discuss mathematics and promote the math program to students.

Findings:

The principal stated that students appear to like math and that both the teachers and students are positive when math is discussed with them. A positive attitude is reflected in the students' response on the 2007 Student Questionnaire. ***Seventy-five percent (75%)*** *of the* ***6th graders****,* ***83%*** *of the* ***7th graders****, and* ***79%*** *of the* ***8th graders*** *responded that they* ***tried harder*** *on the [redacted] test than they do on their regular schoolwork.*[4] *It has already been mentioned that the students feel comfortable participating in the math classes.*

According to the principal, to assure that there are high expectations for all students, instruction is curriculum-based and rigorous and the teachers have worked on assessments using the backward design. Teachers believe that all students can succeed, although they qualified that statement by saying "not at the same level." They think the special needs students are doing well; these students try and are interested. Parents believe there are high expectations for all learners in math, but would like the students to be pushed more. One parent mentioned that his/her daughter was bored and another parent said that his/her son was prepared when he entered high school. The lack of appropriate wait time, the preponderance of lower-level, convergent questions, the lack of higher-level, cognitive demand activities, and the methods of getting answers to questions, as stated in Standards 2 and 3, along with not enough textbooks so students can take one home, according to the parents, compromise high expectations for ***all*** *students. Four (4) of*

[4] This finding is applicable to the entire [redacted] test and not just the math subtest.

students interviewed wish that math were more difficult or more challenging. Although the CSIP does not specifically address the issue of high expectations, it is the belief of this site reviewer that the mission statement of [redacted] County Middle School has that intention. "[T]o prepare all students for further education…" requires high expectations.

The majority of students were orderly, causing no disruptions to the learning environment, as well as engaged and/or demonstrating interest in all lessons observed. The students interviewed stated that they learn strategies that help them, such as the use of pneumonics like PEMDAS and KHDC in the metric system and the use of calculators. Eight (8) students interviewed said that the teachers encourage them to develop their own ideas and it is okay if the ideas do not work. All the students stated that they have opportunities to figure out what they do wrong and correct mistakes. The teachers interviewed supported the student findings. The teachers stated that they allow their students to learn their own way, to use their own methods, and will even ask, "Can you show another way?"

Some teachers stated that when their students work in Collaborative On-Task Thinking groups, the students create their own goals and rubrics, setting standards for themselves. The students use rubrics when responding to the [redacted]' open-response questions.

Several methods of recognizing student accomplishments are incorporated into the school environment and classroom. Student work is sometimes displayed in the classroom according to the principal, although on the day of the site visit, student work was displayed in only one (1) classroom. The teachers use verbal recognition and praise; classroom rewards for reaching Accelerated Math goals, such as candy, toys, soda, pencils, and Pizza Hut coupons; a star with the students' name; certificates; [redacted] that students earn to buy items in the school store. In the classrooms, lists of students and teams were posted to show progress in the Accelerated Math competition. The teachers also recognize the top male and female students, the most improved male and female students, those students who reached proficient or distinguished on [redacted], and those with the top [redacted] scores. The students said they are rewarded with pizza parties and outside lunch passes. The academic success committee is talking about using newscast video once a week to recognize students in the school.

The students reported that their teachers and parents tell them how important the study of mathematics is to future grades or to a career. The teachers believe that math is not promoted by the administration, counselors, etc., except when it comes to the [redacted] The teachers went on to say excitement about math is not generated among the student body.

Recommendations

- **Be sure you are incorporating all strategies possible that exhibit high expectations for all students. Note in the findings above those factors that compromise high expectations. Work on improving those areas as recommended in Standards 2 and 3 Let the students know exactly what you expect and keep saying it until they believe it, then insist they give their best.**
- **Everyone --- regular and special education teachers, principal, counselor, parents --- must visibly promote mathematics to all students. As a school team, establish goals and plans of action for actively discussing and promoting math among the students. It is important that all adults show enthusiasm for the discipline and help the students understand the importance of learning math and its connection to the real world as they prepare their students to be lifelong learners in the 21st Century. Far too often teachers get "caught up" in teaching to the [redacted] (the unintended consequence of No Child Left Behind – NCLB), that they forget about discussing the relevance of learning math and about engaging students in meaningful mathematics. Although lower-level cognitive demand tasks (memorization tasks and procedures without connections tasks) are necessary at times, be sure to balance instruction with higher-level cognitive demand tasks (procedures with connections tasks and doing mathematics tasks) - source: Implementing Standards-Based Mathematics Instruction by Mary Kay Stein, et al., previously mentioned. As noted in Standard 7, there are efforts to talk to parents about the results of the [redacted]. Talk to the students also. Include the EXPLORE test results, [redacted] test and [redacted] test as well. Help students to take ownership of their own learning as well.**

- **Be selective in using praise during questioning. Praise is good, but it can also stop the discussion or learning because the students think the correct answer has been given. Praise can be effective with individual students in such formats as feedback on a test, a written assignment, a project, or in conferences, unless these formats are being used as assessments for learning (formative assessment). Praise when given verbally should include concrete reasons. Refer to the two books mentioned in Standard 2 pertaining to quality questioning.**
- **Increase the use of rubrics beyond the [redacted] practice tests, if you have not already done so, and, if any teacher is not using them, ask for help from one who is. The use of rubrics allows students to set standards of achievement for themselves, assess their own work, and to determine how to make corrections; it also gives students a sense of confidence. Google "rubrics" for all kinds of sites to set up rubrics, such as http://www.rubistar4teachers.com . Rubrics are also good instruments to help teachers with assessment of student participation, group work, projects, etc.**
- **Intentionally establish ways to celebrate and honor students often for their work in mathematics in the school as well as in public. Honor a student or group during announcements, for example, once a week, much as schools do athletics. Show that math is just as important as athletics! Proceed with plans to use the newscast as a way of public announcements. Post excellence in math on the school website or teacher websites. Use the local newspaper to announce special recognitions in math. It is very evident that you recognize student accomplishments in [redacted] Math and the [redacted] but remember to also recognize students who stay on task, work well in cooperative groups, improve the most over so many tests, or who show the most consistent improvement over a period of time, to name a few. Email parents or send a postcard when a student does some exceptional task such as completing homework for a week.**

[redacted] Math Standard 5-Usefulness: Relates instruction and learning to students' interests, experiences, and future goals.

4	5.1 Teachers highlight applications of mathematics in the everyday life and culture of students and the community, relate mathematics to individual student interests, and stress the importance of math in students' future career choices and subsequent mathematical studies.
3	5.2 The school environment – within classrooms, in the halls, the media center, the cafeteria, and other public places - stimulates and demonstrates imaginative uses of mathematics.
2	5.3 Teachers integrate mathematics with other content areas when appropriate.

Findings:

The teachers highlighted that one of the key features of the CMP2 program is connecting math to the real world. Upon examination by this site reviewer of sample lessons submitted, the CMP2 series utilizes engaging interactive problems and motivating everyday situations. From the interviews, the students understand they are solving real-world problems; parents understand that their son or daughter is solving math problems related to everyday life citing conversions as an example. Seven (7) of the 13 students interviewed said that the teachers ask them what they are interested in and then find problems related to those interests. Lesson plans reveal that the students are receiving instruction from the CMP2 textbooks and, according to the TSPQ, nine (9) of the teachers indicated that they have students solve real-life problems at least once or twice a week with six (6) of the nine (9) doing so almost daily. ***Three*** *(3) teachers have had* ***no professional development*** *in the last 3 years on* ***connecting math to real-life*** *contexts and careers.*

All the classrooms had a variety of engaging visuals to stimulate student interest in mathematics. These included such topics as measurement, integer rules, formulas, types of graphs, triangles, angles, algebraic rules, and the calculator. In a hallway, there was a math showcase. The current topic was Factor Pairs. Teachers rotate responsibility for maintaining this bulletin board.

There is little evidence that the teachers connect math to other disciplines. During the teacher interviews, there was mention of math and science collaborating on a unit. The teacher questionnaire data indicate eight (8) teachers use interdisciplinary lessons, but the frequency varies from almost daily to rarely.

Recommendations

- **Be sure all teachers teach the Core Content and Program of Studies with a focus on real-world problems.**

  The need to understand and be able to use mathematics in everyday life and in the workplace has never been greater and will continue to increase. ---Principles and Standards for School Mathematics, NCTM, 2000, page 4.

  Students' perceptions about what is real-world mathematics may differ from what you intend or teach; however, if they think they are doing real-world math, they will be more interested and enthusiastic about learning it. If students are practicing skills only or learning concepts abstractly and not applying them in the real world or solving problems with them, they will not understand the relevance or depth, and will not be prepared to maximize the demonstration of their learning in later topics, on the [redacted] in high school courses, and in life. The students should think they are doing real-world math every day, rather than once or twice a week or less. If there is fidelity to the *Connected Math series*, you will provide sufficient exposure to real-world problems for your students. Additional suggestions for incorporating real-world problems into the math program would be to have students find patterns at home; take pictures of geometric shapes in the community; plan a budget with their allowance; use as many real-world objects and data as possible. Make Problems-of-the-Week with real-world scenarios and use students' names in them. Incorporate everything real you can think of into the lesson --- share with other teachers in team meetings, an ongoing professional development study group, or a summer institute/academy. Collect free things or have students explore the Internet or write to companies for brochures or data you can use. Put ideas in your curriculum maps. Some ideas from other teachers to make connections for students that could become projects, enrichment activities, or challenging situations, perhaps especially for the single-gender classes include:

  -- Geometry/Measurement: explore the relationship between circumference and diameter of circles related to bicycles or trees; build replicas of 3-D buildings and discuss how building influences a community (social studies); design, buy materials, and build a cost-efficient shed or storage building (to scale) – everyone build a shed for a different part of the country and discuss the "why" of the differences; fly a kite and talk about different angles the kite makes with the ground; investigate symmetry, congruency, and other attributes using bread, candy bars, crackers, pictures in magazines; use real schedules of a bus, train, or a subway to talk about time and elapsed time—bring in geography and transportation as you talk about it; make predictions about whether something will sink or float in water.

  --Probability/Data/Statistics: engage in a study of the moon in "Where is the Moon Tonight," (see May 2006 *Mathematics Teaching in the Middle School* journal from NCTM p. 467-475; create a game or a game board and rules for playing, points awarded, etc., then determine if it is fair; conduct and analyze data from a cookie survey/taste test; involve students in a simulated student election and collect, analyze and report data; examine questions for a survey to determine if they are biased or unbiased, such as "Do you think the school year should be shorter?" or "Do you think the cafeteria should serve ice cream?"; simulate the [redacted]; graph students' heights vs. arm spans and make a correlation.

  --Number/Algebra: Use arrays to figure out how many students are in the high school marching band; figure out how many people can ride a roller coaster or Ferris wheel at [redacted] Kingdom; read maps and find distances to places students want to go to practice adding whole numbers or to locate a place with an ordered pair on the letter/number grid; for fractions/decimals, talk about measurements by builders, doctor prescriptions, recipes; try algebra puzzles or algebraic reasoning on

http://www.mathplayground.com/; collect real world data (e.g., cost of the same items at different stores or number of times certain commercials are shown during the week) and determine if there are any patterns; connect coordinate grids and maps in geography.

--Varied: Use cartoons to spark problems or scenarios with several questions (see "Cartoon Corner" in November 2005 *Mathematics Teaching in the Middle School* (5-8) journal from NCTM, pages 182 and 186-187, also enclosed with the resource packet accompanying this report (join at www.nctm.org); watch the TV show "NUMB3RS" and brainstorm extensions/related ideas to what they used – see the TI website for grades 6-12 activities related to each episode --- http://education.ti.com/educationportal/activityexchange/ActivitySearch.do?cid=us; contact community people for students to job shadow to see how math is used, e.g., body shop, drugstore, contractor, beautician.

- **To engage students in real-world scenarios and deeper understanding of content, purchase, if you do not already have them, the NCTM *Navigations* series (www.nctm.org). Components can also be purchased separately: *Navigating through Algebra* or *Navigating through Data Analysis* or *Navigating through Geometry* or *Navigating through Probability*.**
- **Ask students what they are interested in (e.g., nature, football, video games, animals—Animal Planet, basketball, TV shows, NASCAR, music) and use those themes for collecting data, making up problems, generating open-response questions, or let the students think of scenarios, write the problems, and exchange with others to solve. Recent brain research and other educational research suggest that students learn more, retain more, and are able to apply the math they learn when the math they are learning is embedded in interesting contextual problems.**
- **Purchase and display in prominent places, not just the classroom, creative, colorful, interesting, engaging mathematics posters that promote math in the real world and in the workplace, posters or signs that show the connection between the classroom and the real world. Have the students research a topic and make posters or signs as well.**
- **Seek funding to provide additional mathematics software, up-to-date videos, or Internet sites for students so that they can see applications of mathematics in life. Subscribe to Scholastic Math (grades 6-9) magazine for motivating, current problems in math. Also, see the K-12 "Hands-On!" newsletters from TERC (www.terc.edu) with many math-science activities, the Futures Channel (http://www.futureschannel.com/), the E-line newsletter (www.emck.net/eling), the Marilyn Burns Newsletter (www.mathsolutions.com), Marco Polo [redacted] website , or the ENC website (www.goENC.org). All have some free resources on their websites.**

[redacted] Math Standard 6-Professional Environment: Inspires collegiality and understanding among the faculty and the administrative staff to work together to implement an effective mathematics program.

4	6.1 Teachers can articulate the school's instructional goals for mathematics.
4	6.2 The school and district support teachers' continuing education in mathematics and provide opportunities for them to expand their mathematical knowledge or strategies for teaching math, e.g., differentiated learning, use of technology.
3	6.3 Professional development (PD) programs in mathematics have had impact on instruction, school culture, etc.
4+	6.4 Teachers have been trained on the use of the program/materials that they have adopted for the teaching of mathematics.
3	6.5 Administrators encourage and fund active involvement in local, state, and national professional mathematics associations, societies, and research activities.

4 6.6 Cross-grade collaboration and/or interdisciplinary planning strengthen mathematics teaching.
5 6.7 Interruptions during academic learning time are kept to a minimum.

Findings:

There is a sense that most, if not all, teachers are committed to providing the best math instruction possible. First, there are component meetings at which time the teachers develop the math component of the [redacted] *Second, they meet weekly during common grade-level planning times to discuss how to use the Power Period for additional math work and enhancement, how many multiple-choice and open-response questions to include on assessments, to make sure the curriculum map matches the blueprint, and to recommend changes in the* [redacted] *to remedy gaps and weaknesses. Third, they know they need to target specific students in order to close the achievement gap. In the school year 2006-2007, the teachers had a goal to show a 5% decrease in NCLB identified achievement gaps as measured by the* [redacted] *The principal commended the teachers on their efforts and stated that all teachers except one have buy-in. She indicated on her questionnaire that the teachers have developed a collaborative vision for math instruction.*

The principal confirmed that the school and district encourage and support continuing education as well as attendance and participation at math conferences. The district pays for release time for teachers to attend the math academy. The school is in its second year of participation in the Math [redacted] *Other opportunities offered the teachers and attended by some of the teachers include Transition to Algebra, Geometry for All,* [redacted] *Middle School Association Annual Conference, Teaching Styles and Strategies for Math and Science Institution, SMART Master's Program, K-12 Mathematics Teachers' Workshop Program on Geometry, Investigations training, Rational Numbers Project, AMSP training on Core Content for elementary teachers, and* Connected Math *training. Those teachers who were unable to go to Michigan for the* Connected Math *training are being mentored at school by those who went. The principal stated that most teachers regularly participate in math workshops. There is also teacher-to-teacher training or sharing during the component meetings.*

Two teachers are members of the National Council of Teachers of Mathematics (NCTM). One has attended a state math conference and one has attended a regional math conference. No teachers are members of the Virginia Council of Teachers of Mathematics. Opportunity to attend these conferences and other workshops are emailed to the teachers. Four (4) teachers indicated that they read professional journals including Teaching Math in the Middle School, NMSA, and Email. *It is expected that those who read professional mathematics journals and the participation in professional development and continuing education workshops have a positive impact on the mathematics instruction at* [redacted] *County Middle School.*

During the observations, there were no interruptions in class instruction.

Recommendations

- **During the component meetings and the grade-level meetings, be sure to include in your discussion the *why* and *how* you will teach to meet curriculum goals, if you are not already doing that. Know that you are preparing students to be successful in the 21st century and for jobs that do not yet exist. Ask yourself questions such as the following:**

  --What do you want your students to be able to do with the mathematics they learn from you in grades 6-8, besides passing the [redacted]ests?
  --How will you teach them so that they can reach that goal (not just assess them)?
  --Do you believe they need to be actively engaged or passive spectators?
  --Do you want them to be able to use math skills in real life?
  --Do you want them to be able to use skills to solve problems?
  --Do you want them to be critical thinkers?
  --Do you want them to be able to work with others?
  --What is the difference between improved student learning for every student and improved student achievement?

--What does assessment for learning mean as opposed to assessment of learning?
--Do you want students to be technologically literate in math?

As you ask yourself the above questions and others like them, go to www.marcprensky.com/writings and read Mr. Prensky's writings. A couple of recommended articles are "Listen to the Natives" and "Engage Me or Enrage Me." Many of the others are just as good. Also go to www.metiri.com and then click on presentations. There are many informative presentations on this link about 21st Century learning and skills to help you understand the "why" and "how" of some of your instructional goals and to enhance the vision you have for teaching mathematics.

- **During your meeting times, share strategies, such as quality questioning, use of manipulatives, use of calculators, use of computers, writing in math, problem solving, applying mathematics to the real world. Continue discussions of curriculum, assessment, and skill gaps. Discuss collaborative classroom needs/concerns; discuss how math teachers can learn to help special needs students and how special education teachers can learn more mathematics content. Additionally, use these meetings to discuss how to promote mathematics among the students as recommended in Standard 4.**
- **Actively pursue professional development to sustain the implementation of the adopted math textbook as mentioned in the recommendations for Standard 2, so that the students can get the utmost benefit from the program. Other professional development workshops have been suggested in Standards 1, 2, and 3. Determine which one(s) each individual needs and especially try to participate in those that are job-embedded. Using your math goals, create an instrument to document and assess the implementation of the techniques and processes learned due to the professional development or the strategies implemented as a result of book studies or other plans and their impact on the mathematics instruction at the school. See the [redacted] website at [redacted] or PBS TeacherLine at http://www.pbs.org/teacherline for additional information on professional development and resources.**
- **Join [redacted] The NCTM national conference is in Salt Lake City on April 9-12, 2008. If anyone attends this conference or any others, bring back activities and strategies to share with the other teachers.**
- **Ask the librarian to join NCTM with an institutional membership and subscription to the middle level journal *Mathematics Teaching in the Middle School* (5-8) so that teachers can have access to engaging activities, teacher-friendly research, and 20% off prices for materials and registration for NCTM regional and national conferences --- www.nctm.org.**
- **Be creative in scheduling classes to allow for interdisciplinary teaching. For example, schedule math and science for the same group of students back-to-back so that students could engage in an interdisciplinary lesson. This would offer the students an opportunity to apply their math knowledge in another discipline. Such a plan would also offer the students a teaming environment like in the workplace.**

[redacted] Math Standard 7-Community: Involves the parents and the community in a collaborative effort to develop mathematical knowledge among students.

3	7.1	The school encourages families to expect and support achievement by all students in mathematics; teachers use various forms of reporting student progress, achievement, and participation to parents.
3	7.2	Parents are informed about the purpose and structure of the math instructional program, of available academic support and instructional assistance in mathematics, and of students' curriculum options and future career possibilities.
1	7.3	Joint school/community activities related to the mathematics instructional program take place regularly.

Findings:

It is clear that the staff of [redacted] County Middle School makes efforts to inform parents/guardians about the academic achievement of their children. Parent-teacher conferences are held twice a year and mid-term reports and school report cards are sent home. Teachers will call home as needed as well. The state test results are given to parents and explained individually. The school is open and accessible; parents can request weekly reports if they so desire.

There is an open house at which time teachers communicate expectations to parents and students. Some, if not all, teachers have a class web page that families can access for information about classroom goals, what is happening in class, and links to websites that can be used to help students at home. In addition, the teachers send home a general letter about classroom expectations and procedures along with information about the purpose and structure of the math program. The teachers stated that the [redacted] program has academies for parents three (3) or four (4) times a year and the Youth Service Center provides family workshops on math literacy. The parents stated that it is difficult to help their children when textbooks are not brought home and they do not see classroom tests and assignments. They requested examples they could use to help their children.

There have been no Math Fairs or Math Nights. There is a Career Fair, but it is unclear who participates in this event, if it is a math-related event, and how involved the community is in this event.

Recommendations

- **Continue the communication you have with parents. Be sure parents know what they can do to help their children achieve in math. Other suggestions to enhance that communication:**

  --be sure all teachers at the beginning of the school year send home a syllabus or expectations for what students will learn, perhaps even having the parents sign these documents as an indication of receipt, if not already done;
  --invite parents to come into the classroom and see a hands-on math lesson, a lesson using the calculators, manipulatives, or a creative lesson using the Smart Board presented by students;
  --have a math display in the lobby of the gym during a basketball game or another centrally located place for the public to see;
  --keep the school website and teacher web pages up to date, remembering that not all parents have access to the Internet;
  --make every effort to explain to parents how important math is to their children's future in preparation for high school, postsecondary education, and/or careers.

- **Request that articles and pictures of math events, achievements and students working on mathematics tasks be printed in the local newspapers.**

- **Plan a Math Fair or host a Math Family Night in collaboration with community businesses. This is a good way to promote the importance of math.**

[redacted] Math Standard 8-Organization and Leadership: Facilitates effective and consistent mathematics instruction.

4	8.1 The principal actively pursues professional development (PD) which will improve mathematics instruction; the design of the professional development program for mathematics is based on needs identified from analyses of student and teacher data.
5	8.2 Teachers are assigned mathematics classes at or under recommended size.
4	8.3 The main focus of the principal is instructional leadership that promotes and supports teaching excellence in mathematics.
5	8.4 The principal conveys high expectations for students, staff, and self.
3	8.5 The principal observes mathematics lessons and provides feedback to teachers, reinforcing effective practices and providing guidance to improve ineffective ones; he/she demonstrates effective interpersonal skills that enable facilitation of change in the school.
3	8.6 The principal can articulate his/her beliefs about effective instruction in mathematics.

3 8.7 An appropriate amount of time is scheduled for instruction in mathematics.

Findings:

According to the principal, the school is allotted money for professional development, which is funded through the professional development fund, [redacted] Title I, and [redacted]. Based on academic performance and test analysis, professional development in 2006-2007 was focused on standards-based curriculum, backwards planned standards-based units, best instructional practices, using formative and summative assessment, vertical and horizontal alignment of curriculum to name a few. These are included in the portion of the [redacted] that details how the staff will improve math scores and decrease academic gaps.

Class size on the day of the observations ranged from 16 to 24, the average being 20. The parents interviewed believe classes are not small enough.

On the Principal Questionnaire, the principal indicated that the teachers know that she is interested in good math education by discussing best practices in math with them. The principal mentioned being in the math classes often.

The interviews revealed that the principal and the two (2) assistant principals conduct walkthroughs while mathematics instruction is taking place and they provide helpful feedback to the teachers. It is unknown how the feedback is given to the teachers or what types of feedback are given. The principal's vision of effective mathematics instruction is all students receive high-level math and solve real-world problems.

Based on the master schedule submitted to the site reviewers, there is not equity for time scheduled for math instruction. For the sixth grade, the amount of time ranges from 60 to 70 minutes; for the seventh grade, 56 to 70 minutes; for the eighth grade, 57 to 71 minutes. These times do not include the Power Period.

Recommendations

Principal:

- **Continue to provide professional development based on needs identified from data analysis, observations, discussions, and from this report, and then support them in participating in those experiences, e.g., attendance at academies, materials for professional growth, workshops in the use of technology to teach math, implementing the *Connected Math* series.**
- **Keep a log of all professional development and training the mathematics teachers receive and require some kind of action plan on the part of the teachers to implement what they learn. Then monitor the implementation by using the action plans as a guide. Such training is meaningless if it is not implemented and the teachers not held accountable through monitoring.**
- **Maximize and equalize math class times to make learning experiences meaningful and consistent. Schedule at least 60 minutes of math instruction daily for all grades and classes. A difference of 5 minutes cuts out almost 3 weeks of 60-minute classes of mathematics learning over a year's time.**
- **Work with the math department on developing a vision for the mathematics program – how and why content should be taught in order for the students to be successful at [redacted] County Middle School. See the related recommendation in Standard 6.**

[redacted] Math Standard 9-Assessment and Evaluation: Continually assesses student achievement, evaluates program effectiveness, and uses the results to determine if there is a need for improvement.

4 9.1 Teachers and administrators examine a variety of qualitative and quantitative data, including state assessment results, survey results, student work, student feedback, effective and ineffective teaching practices, and other data to identify strengths and weaknesses in the math curriculum.

3 9.2 Mathematics program evaluations are made available to parents and interested parties and discussed in relation to state standards and school instructional and assessment goals.

4 9.3 Students have adequate opportunities to demonstrate their achievements in mathematics through multiple methods of assessment.

5 9.4 All affected teachers participate in developing the school improvement plan; the plan includes a mathematics component or mathematics program-related objectives that all teachers are aware of and use to guide instruction.

1 9.5 The school coordinates needs identification and improvement activities with the programs in other schools in the district, particularly schools in the feeder pattern.

Findings:

All teachers interviewed indicated that they participate in the disaggregation of the [redacted] results. The staff is aware of achievement gaps, especially for the disability subpopulation. The [redacted] results are also used to evaluate regularly the math program. This is reflected in the [redacted]. As noted in Standard 7, the [redacted] results are released to parents and explained individually at parent-teacher conferences.

In the classroom, teachers use a variety of assessment instruments. They mentioned using flashbacks every day, exit slips, cooperative group tests that are part of the Connected Math *program, [redacted] test, [redacted] test, spiral reviews, and [redacted] Math. During their interview, the students reported taking the following types of tests: multiple-choice, short answer, timed tests, problems in which they have to show their work, and open-response. Eight (8) students said they have done a math project with a poster or model as a means of assessment. The math projects included a bridge model and graphs done outside of class. Observations and the sample tests submitted to the site reviewers confirm all of the above assessment instruments except for the projects. The parents interviewed reported never seeing any classroom work to know what kind of tests their children take.*

[redacted] County Middle School administers the EXPLORE test to the eighth graders. The [redacted] test is administered to all students three (3) times a year in the computer lab and the students take the MAP test twice a year. According to the [redacted] the results of all three (3) of these assessments are communicated to parents through letters and conferences.

***All** 10 teachers indicated on the TSPQ that it is **very important** to use results of **classroom assessment** to plan/modify instructional decisions and all have had at least one professional development workshop on using a variety of assessment strategies to measure students' success.*

All teachers participate in curriculum development and in the development of the math components in the [redacted] The [redacted] has a goal specifically related to math with strategies as to how to accomplish this goal to raise the academic challenge and performance of each student. The teachers meet monthly to discuss the math component of the [redacted], but records of the minutes of these meetings to verify the agenda of said meetings were not made available to the site reviewers.

Currently there are no meetings with feeder schools or schools students will attend in order to coordinate the math programs, students' needs, and improvement strategies. In her interview, the principal stated that such meetings have been held in the past.

Recommendations

- **Be sure classroom assessments of student learning are rigorous and inclusive of a variety of methods. Continue to use [redacted]-like multiple-choice questions on tests. Consult recently released items on the [redacted] website to get the idea, as needed. Most [redacted] test questions are set up so that students have to at least consider or analyze the distracters. As you practice multiple-choice questions, have the students discuss why the distracters are incorrect instead of just finding the correct answer. Have the students discuss in small groups and make presentations of their findings. Put the questions in contexts or**

scenarios. Be sure all students have opportunity to become familiar with the format, types of questions, and many plausible distracters.

- **See the latest open-response released items on the [redacted] website, [redacted]. Note the format and requirements for students to respond. Just because a problem is scaffolded in parts or requires more challenging answers does not mean it qualifies for a [redacted] open response. "Show your work" is not necessarily the same as "Explaining" or even writing. It should require students to explain why or how or justify in writing, e.g., describe how you would select a sample for a survey; analyze and explain the relationship between your weight and eating a hamburger at a fast-food restaurant every day; or predict the next triangular number based on patterns and explain why. Be sure to use open-response questions regularly in classroom activities in all grades. If assessments are available from the textbook publishers that require students to apply mathematics rather than just recall knowledge or use an algorithm, then use those tests. If not, revise some (more) of the questions on your current assessments to require students to analyze, apply, synthesize or evaluate mathematics. For all grades, analyze teacher-made tests to be sure they are not just straight computation, recall, or algorithmic exercises, but that they require the students to apply mathematics in the real world or to evaluate, analyze, create, etc. The students need to be comfortable with those types of questions for the [redacted]. Continue to refer to the revised Bloom's Taxonomy website http://www.coe.ugs.edu/epltt/bloom.htm#end and others under "Bloom's Taxonomy Revised" and search for assistance in writing the higher-level questions. Again, students need to be comfortable and familiar with the format, thus creating a level of confidence in their ability to respond on all tests and write what they are thinking. Refer to the writing recommendation in Standard 1.**

- **Continue administering the EXPLORE and analyzing the test results because is a good indicator of success on the ACT PLAN (10th grade) and the ACT (11th and 12th grades). Along with assessment results about academic readiness for college, the students and staff are provided information that will help the students in career planning.**

- **Analyze student work to see if the work reflects the curriculum that was designed, taught, and actually learned. If you have not had training or professional development on how to analyze student work, it is highly recommended that you do so. There are protocols to follow to facilitate this process. See http://www.essentialschools.org/pub/ces_docs/resources.html or http://www.middleweb.com/LASW/LAWSmain.html. Even though it takes a lot of time and collaboration (this is a good topic during your math team meetings), the information and insight you acquire about the students' thinking and learning is invaluable. Remember that students are learning to be able to succeed in everyday life, in college, in careers, not just to pass the [redacted] Even though it may get lost in the NCLB chaos, keep reminding yourselves that it is about learning.**

- **Participate in professional development on formative assessment such as that offered through Dynamic Classroom Assessment: Linking Mathematical Understanding to Instruction (www.etacuisenaire.com/DCA). Participate in a book study or purchase for your professional development library Classroom Assessment for Student Learning by Richard J. Stiggens, et al. and Formative Assessment in Action by Shirley Clarke.**

- **Plan specific times to work with the high school math teachers on coordinating the mathematics programs, thus, easing the transition for students entering the high school and likewise with the schools that feed into [redacted] County Middle School. Discuss common professional development needs and how to prepare special needs students to improve their learning and performance. Since you have single-gender classrooms, you want to be sure there is articulation between the middle school and high school.**

[redacted] Math Standard 10-Financial and Material Resources: The mathematics curriculum is supported by adequate financial and material resources.

3 10.1 Funds allocated are sufficient to meet the needs generated by the mathematics program.

3 10.2 The school makes use of appropriate resources from other educational institutions, parents, businesses, industries, and service clubs.

4 10.3 Expenditures for the mathematics program are determined collectively by the affected staff.

4 10.4 Appropriate technology is available and in sufficient quantities to meet the needs of the mathematics instructional program.

4 10.5 Classrooms have adequate space and furnishings to facilitate a standards-based investigative program.

Findings:

From the principal and teacher interviews, there appear to be adequate funds for mathematics materials. The regular education mathematics teachers had no special requests and stated that the principal has offered to get materials for the new teacher, but the special education teachers would like document cameras and Smart Boards along with teacher materials to accompany the textbook. Although the teachers indicated that they have enough math materials, they stated they need more training in implementing the Connected Math *series.*

In the interviews, some teachers stated that they just have to ask or make a request for supplies; however, some teachers mentioned that expenditures are discussed in team meetings and the requests go through the component leader to the principal for approval. There were a couple of teachers unsure of the chain of command. The principal said more money is spent on mathematics than the other content areas. The parents stated that the principal brings reports and budgets to the [redacted] Council meetings.

The principal noted that a few years ago [redacted] gave $10,000 to the school to be used to buy rewards for students' achievement in all content areas. Local banks help with additional resources. Math Leadership Network has provided $1250 for manipulatives, calculators, and professional development stipends. The school is also in partnership with the [redacted]

The principal stated that each teacher has adequate storage space for equipment and materials. The site reviewers concur. Also, there are tables and/or mostly flat top desks sufficient for standards-based activities.

Recommendations

Principal:

- **Be sure there is equity in needed technology and teacher materials. Make sure that all teachers have had training in the use of the SMART Board and that they know how to use computers and the Internet as a tool for teaching mathematics, not just practicing skills.**
- **As noted in Standard 2, be sure that all teachers have professional development in the use of the *Connected Math* program and that the training is sustained.**
- **As also noted in Standard 2, purchase updated calculators and provide professional development on using them to enhance the learning of mathematics.**
- **Request an NCTM school membership from the media funds or other available resources.**
- **Consider including substitute teachers in professional development workshops when establishing the budget. It is good to provide training for those substitutes you employ frequently in order for classroom instruction to continue fluently.**
- **Purchase for your personal use the book Making Mathematics Curriculum Count: A Guide for Middle and High School Principals published by the National Association of Secondary School Principals. This book addresses all aspects of planning, implementing, monitoring, and funding a school-wide math program.**