

# **Pine-Richland School District High School Mathematics Curriculum Report**

Spring 2005

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## Chapter 1

### **Mission and Vision**

By Michelle Holloway

#### MISSION

We do:

- address the Pennsylvania System of School Assessment standards and the National Council of Teachers of Mathematics Standards 2000.
- build on and make connections to prior mathematical knowledge.
- assure that sufficient new mathematical concepts be provided at each grade level.
- use real world problem solving to promote mathematical thinking and reasoning skills.
- provide problems with multiple solutions and encourage alternate methods to the solutions.
- utilize graphing calculators along with other forms of technology to enhance student's understanding of mathematical concepts.
- use differentiated instruction to meet a wide range of student needs.
- use a variety of assessment strategies.

#### VISION

We will:

- use real world problem solving to make learning meaningful for all students.
- use hands-on learning for visual confirmation of math concepts, to explore new mathematical concepts and for assessment purposes.
- use reading/writing activities and assessments to promote the ability to communicate mathematical concepts.
- provide sufficient high quality practice activities.
- provide activities for students to use critical thinking skills on all levels of Bloom's Taxonomy.
- use a variety of questioning techniques to challenge students to think on all levels of Bloom's Taxonomy.

As a Math Department we are committed to assisting students in becoming autonomous learners and thinkers, explore important questions, and build and integrate deeper understandings of mathematical knowledge.

## Chapter 2

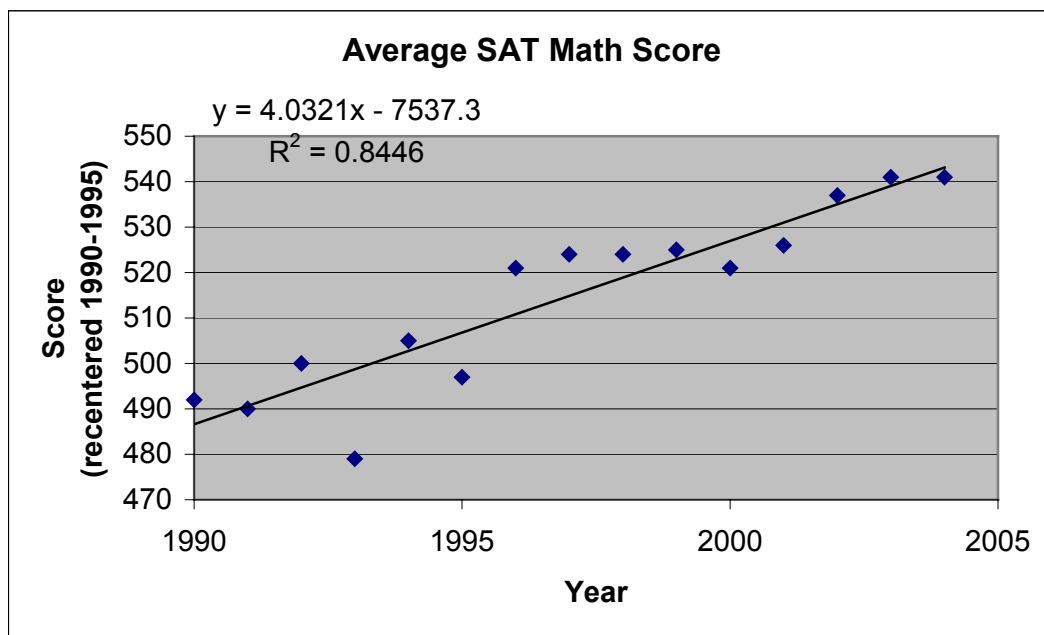
### Data-Driven Decisions

By Michelle Switala

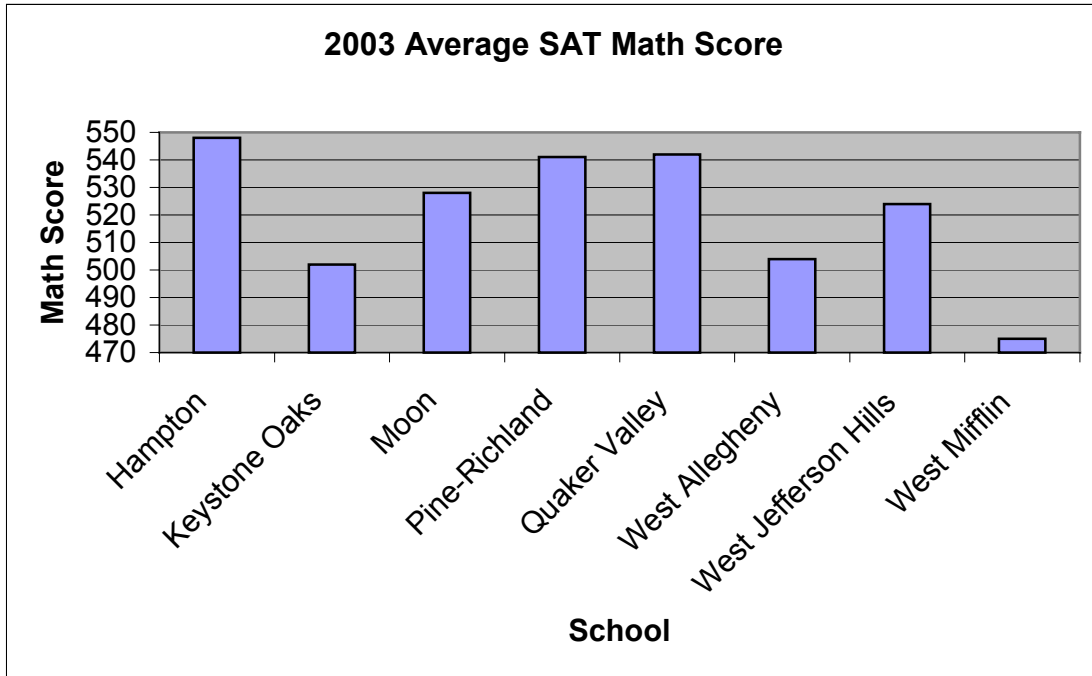
It is fortunate that external data in the form of SAT results and PSSA results exists for high school mathematics. The SAT results allow us to track our progress over a number of years and the PSSA results allow us to track performance on both overall standards and standards for individual students.

#### SAT Data

In the past ten years, Pine-Richland's average SAT Math score has risen by 44 points:



The Pine-Richland average math score compares favorably to the average SAT math score of the seven schools the state considers most similar to us (the data is from the Pittsburgh Post-Gazette):



Do we expect our results to continue to rise and to be comparable to schools similar to us? The updated SAT test (first administered in March 2005) contains more Algebra II than in previous years. The College Board changed the math portion of the test because “according to the National Center for Education Statistics, 70 percent of all high school students finish Algebra II or the equivalent by the end of their junior year. College Board research indicates that 97 percent of college bound-students complete Algebra II or the equivalent by the time they graduate, and about 75 percent complete four or more years of math” (presentation by College Board representatives at the National Council for Teachers of Mathematics Annual Conference 2004).

At this time, Pine-Richland is expecting a junior class enrollment of 349 students in 2005-2006. 274 of the juniors have requested Algebra II, Honors Algebra II, or a higher math class, representing 78.5% of the class. This leaves 75 students (juniors) in courses lower than Algebra II; if these students follow the same pattern as the senior class of 2005-2006, about 30 of the 75 students will take Algebra II as seniors. Thus, by the time the class of 2007 graduates, about 87% will have taken Algebra II or a higher course; these students will have covered the material being tested on the math portion of the

SAT. It is unlikely that every student of the class of 2007 is college-bound; it is likely, however, that of the students that *are* college-bound, most of them will have had Algebra II or a higher math course:

Number of juniors = 349

Number of college-bound juniors = 89% of 349 = 311

Number of juniors who will take Algebra II or higher = 87% of 349 = 304

Percent of college-bound juniors who will take Algebra II or higher =

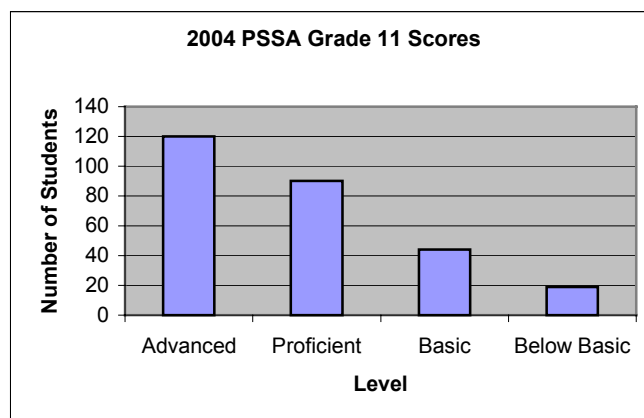
$(304/311)*100 = 98\%$  (exceeding the 97% expected by the College Board)

One of the reasons we chose the Holt, Rinehart, and Winston Algebra series a few years ago was the series' inclusion of probability, statistics, and data analysis. The Algebra II classes cover most of this material, which helps our students perform well on both the SAT and the PSSA exams. The 2004 PSSA test results indicate that 82% of our students were at least proficient in Statistics and Data Analysis, 86% were at least proficient in Probability and Predictions, and 80% were at least proficient in Algebra and Functions.

### PSSA Data

#### Profiles of students

Of the 273 students who took the PSSA in 2004, 120 students scored "Advanced," 90 students scored "Proficient," 44 students scored "Basic," and 19 students scored "Below Basic."



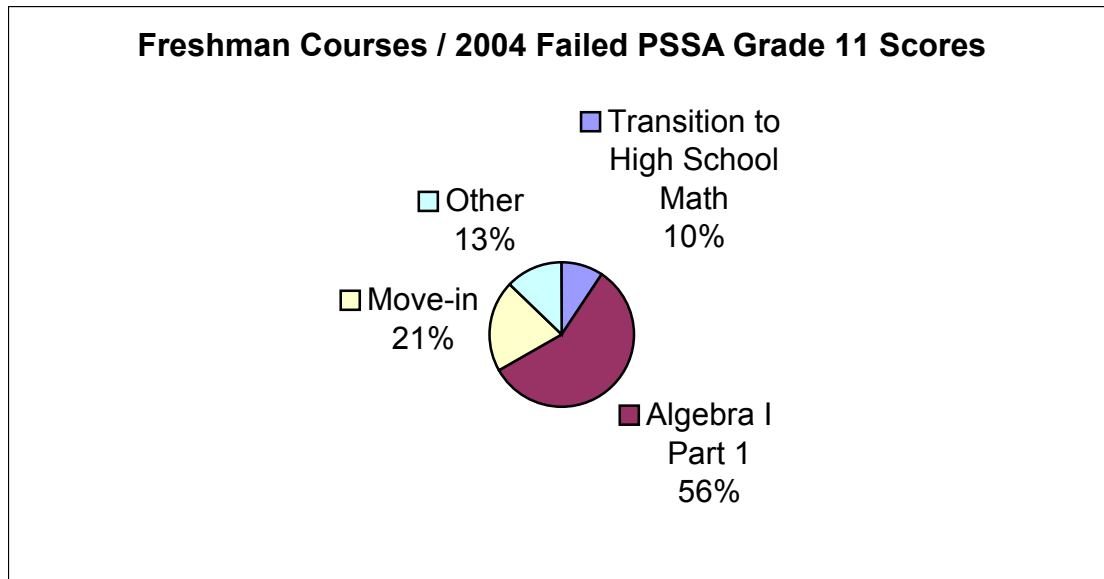
All together, 63 students who took the PSSA “failed” the exam (23%) by scoring Basic or Below Basic. **The rest of this chapter will focus on these 63 students.**

### *Course Selection as Freshmen*

Six students were enrolled in Transition to High School Math in 2001-2002 (freshman year). Of these six, one dropped out of school, one moved into the PRIDE program, and two are now at Beattie Alternative. With the exception of the student who dropped out and the PRIDE student, all four of the remaining students failed the PSSA as juniors.

Thirty-six freshmen were enrolled in Algebra I Part 1 in 2001-2002. Of these 36, only 7 (19%) passed the PSSA as juniors. Twenty (56%) failed the exam, eight (22%) did not take it, and 1 (3%) moved out of the district prior to the exam administration.

Thirteen of the 63 students moved into the district during their high school years or spent time in alternative placements. This represents 21% of the students who failed the exam as juniors at Pine-Richland High School.

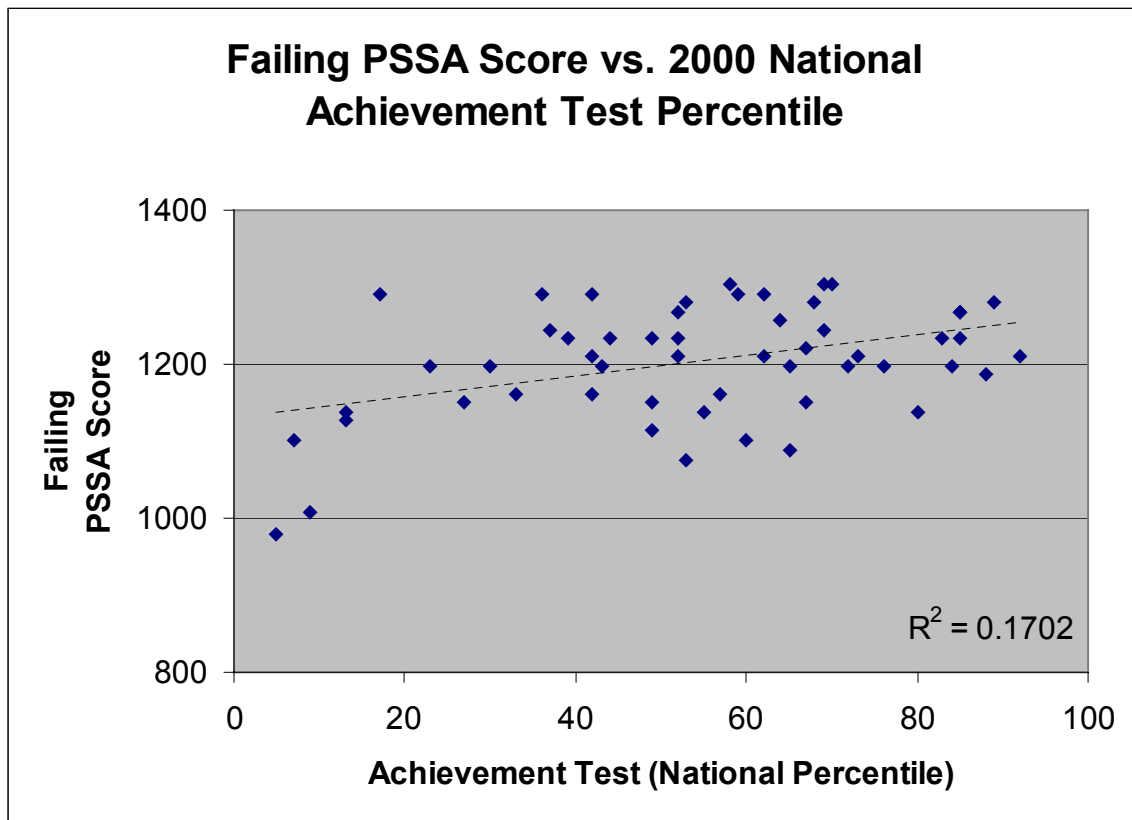


### *Attendance*

The average number of absences and tardies during the students’ junior year was 18.6 days, ranging from zero days to 88 missed days during 2003-2004 (junior year).

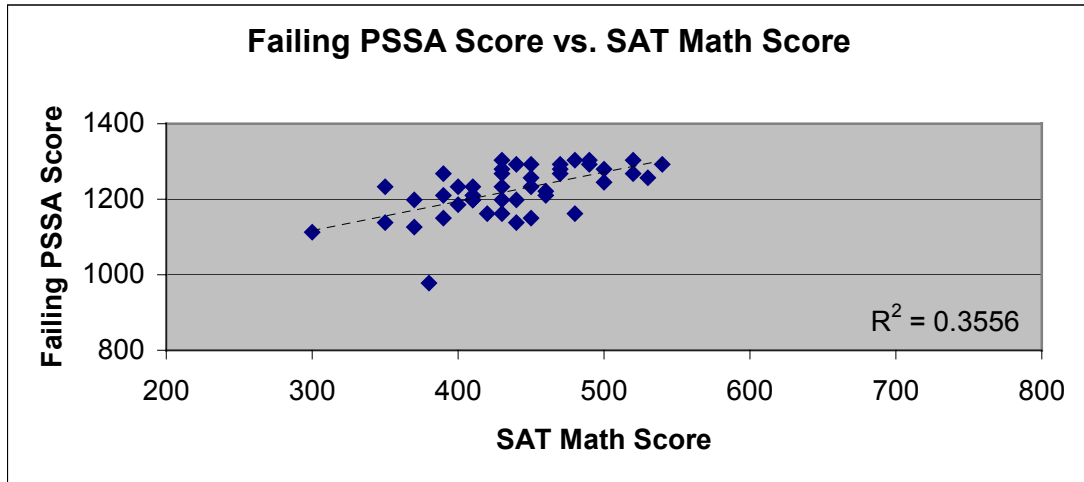
*Are Students Taking the Test Seriously?*

Since the PSSA scores have not been reported on the students' transcripts as yet, one might question whether or not the students are taking the PSSA seriously. The PSSA scores can be compared to the scores on other high-stake exams (such as the eighth grade Achievement tests or the SAT) that the students probably do take seriously:



The correlation is not strong when just looking at the *failing* PSSA scores. A better analysis would include all of the PSSA scores, but Pine-Richland does not currently have an electronic database containing this information and to obtain it manually would be labor intensive. Also, the National Achievement test data was from the students' eighth grade year, and many social and emotional developmental factors affect students between eighth and eleventh grade.

The comparison of the failing PSSA scores and the SAT Math Scores shows a greater correlation (possibly due to a comparison of eleventh grade to eleventh grade):



#### Specific Standards Results

The 2004 PSSA test result analysis indicate that our Below Basic and Basic students are *weakest* in:

- Numbers, Number Systems, and Number Relationships (27%\*)
- Measurement and Estimation (27%)
- Mathematical Problem Solving (25%)
- Algebra and Functions (20%)
- Trigonometry (21%)
- Calculus (22%)

The test results indicate that our Below Basic and Basic students are *most proficient* in:

- Computation and Estimation (15%)
- Mathematical Reasoning and Connections (11%)
- Statistics and Data Analysis (19%)
- Probability and Predictions (14%)
- Geometry (18%)

\*Percentage of students who scored in this area as opposed to scoring in Proficient or Advanced for this standard.

Only a minimal comparison can be made between the juniors' eleventh grade assessment and their eighth grade assessment, because the 2001 PSSA data was not reported with as much detail. It looks like these students (*overall*, not just the Basic and Below Basic) were weakest in Mathematical Reasoning and Connections, Statistics and Data Analysis, Geometry, Trigonometry, and Concepts of Calculus in the eighth grade.

#### Current Practices:

Throughout the fall semester, Bob Utz and Patty Cekella at the Middle School identified eighth grade students who required remediation. Mr. Utz and Ms. Cekella pulled these students during their home base twice a week, once for more instruction and once for computer-based skill-reinforcement (using StudyIsland.com). In March, a mock PSSA was created using Homework.com and administered to all of the eighth graders.

Teachers analyzed the results and identified students who were performing at the below basic level and the strands on which they were deficient. Several special education interns have also been working with these below-basic students.

A few teachers at the sixth and seventh grade levels have also started pulling students for extra help during their home base period, but this practice is not widespread.

Next year, the Middle School math teachers will use the results of the fall-administered SAT 10 to identify students performing below grade-level and will cluster those students into remediation pods during their home base, cutting back on the students' music and art options if necessary.

At the high school, low-level students are generally placed into either Transition to High School Math or into Algebra I Part 1. In analyzing the data on juniors who failed the Grade 11 Math PSSA in 2004, it was found that all of the students who were placed into Transition to High School Math as freshman and who were still enrolled in PRHS as juniors failed the PSSA. Of the juniors who were placed into Algebra I Part 1 as freshmen and who were still enrolled in PRHS as juniors, 56 % failed the PSSA. The math department has chosen to focus on these courses to hopefully effect the largest change in the students' scores.

The failing scores can be attributed to many causes, such as poor attendance, natural ability and aptitude, motivation, and learning disabilities; regardless, the math department recognizes that we should modify what we can control to help these students be more successful in their early high school years, which will hopefully make their progress in their later courses (and on the PSSA) more successful.

### Suggestions

1. Next year, the duty of each math teacher will be as a Math Tutor while monitoring a study hall with another teacher from a different department. Ideally, there would be a math teacher available to help students during each period of the day. Math teachers, resource teachers, and administrators can assign students of need into help sessions with the math teacher on duty during the students' study hall or lunch. *Unfortunately, all of the math teachers will be teaching six periods a day next year, some with three preparations and will not be available for a duty.*
2. Transition to High School Math will now be two periods a day. Most of the students assigned to Transition are also in the learning support program. The first period of the block would be for instruction, and the second period would be for homework, individual tutoring, computer-based skill-building, and other remediation. So as not to disrupt the students' schedules, this second period would replace one of their resource periods a day, which in the past has been spent mostly on mathematics.

The Transition to High School Mathematics instruction would be through real-life projects as much as possible to increase motivation. Students could spend a month "running" a pizza parlor, for instance, and learn/review math skills in the process. In addition, the teacher would use the data from the Grade 8 PSSA (which should come in August) to differentiate the instruction for the students. The teacher (or any other math teacher) would make use of the cataloging of our resources under [www.pinerichland.org](http://www.pinerichland.org), Student Services, Special Programs to sort for topics such as scientific notation. While all of the materials in the PRIDE room have already been cataloged, the materials spread throughout the math department have not but will be catalogued and entered into the

database by Michelle Switala in June of 2005. Materials include videos, alternative textbooks, workbooks, project books, and manipulatives. All high school math teachers will be trained how to access and use the in-house searchable database during the 2005-2006 school year.

StudyIsland.com, the computer-based program being used at the Middle School, is the program that would be used for skill reinforcement. Teachers can select the PA Chapter 4 standards from which the program would create materials. The program can print worksheets as well as modify game modules to practice/test certain standards. A student can log into the program either at school or at home and practice until he or she achieves a specified level of mastery. The teacher can get information on how long a student spent on the program, the level of difficulty, level of mastery, and the time on-task. Ideally, the students in Transition would spend two periods a week on StudyIsland.com, but our hardware resources at the high school may not consistently support this amount of time. The math department could buy a set of 10 Macintosh iBook laptops on a cart with an AirPort and printer for about \$11,000. A class of 20 could split in half and alternate which days the students used the computer program. Dr. Willie has money available in federal grants to support licenses for the Transition students for StudyIsland.com, but the computers would have to be purchased from another monetary source.

Students will also be given a midyear PSSA-type test and a final PSSA-type test to monitor their progress. If a site license for Homework.com is purchased next year, this program would create the exams for us and the students would take the test on the computer. Homework.com would immediately give us aggregated, useful data. If the Homework.com license is not purchased (which would be understandable given its cost of \$4000), the tests would be created by the teachers and scored/analyzed manually.

If possible, we would also like volunteers (possibly retired members of the community) to help decrease “class size” during the study/homework time the other three days of the second period.

3. All high school and middle school math teachers would have literacy training. Many of our students struggle with mathematics because their reading comprehension is poor. If a student cannot understand what a problem asks, how can he or she be expected to solve it? Reading literacy is not just the responsibility of the Language Arts teachers; it is everyone's responsibility. Andrea Miller of the AIU's Regional Math and Science Collaborative has been approached to help us find a trainer for our in-service days in 2005-2006. The cost of a trainer would be partially covered under one of our Federal Grants, and we hope the rest of the cost will be covered under Dr. Golmic's Professional Development budget.

4. The Algebra I Part 1 curriculum and class will be examined in a way similar to the Transition to High School Math class next year and changes will take place in 2006-2007. One problem is that our current textbook is low-level enough to provide some success for our below-basic students, but two semesters of Algebra I Part 1 and 2 do not equal our Algebra I course. How do we increase the rigor and expectations in the Algebra I Part 1 and 2 courses without sacrificing motivation? The question is not an easy one to answer. One possible solution is to create a second period similar to the Transition to High School Math class for basic skill building (the lack of which makes learning algebra very difficult for these students). Another idea—which we will try during 2005-2006—is to have multiple teachers teach the Algebra I Part 1 class (each with their own section) so the teachers can team-plan and cross-observe each other.

## Chapter 3

### **Parent/Community Internet Survey**

By Kim Palonder

Parents expressed concern about a lack of low-level classes and attention to the students who schedule these classes. Our department's remedy for this is to request a full time math tutor who would be available to all students throughout the entire school day. Students could seek assistance during their lunch period or study hall. Until a math tutor can be afforded, we are requesting that each math teacher's duty would be monitoring a study hall and would function as the math tutor during that period. Another goal for the math department is to make the "Transition to High School Math" course a double period. This would include one typical class period, and a second period for homework help, reviews, project introduction/work-time, and remediation of basic math facts.

Some concerns centered around the age of certain textbooks and connection of supplementary materials to lessons in the existing textbooks. Next year, we will be selecting new textbooks for the Algebra 1 Part 1, Honors Trigonometry and Introductory Analysis, and AP Calculus courses. The following year we will consider new textbooks for the Introductory Analysis and Trigonometry course and the Geometry course. As for the concern over supplementary materials, our teachers agreed to place textbook references at the bottom of each handout so students can reference corresponding material in their textbook.

In the Best Practices chapter of this report, we express an interest in developing better questioning techniques during our lessons. We feel this would address other concerns in the survey, namely reviews of test/quizzes, lesson presentations, and student comprehension.

We solicited responses from parents of over 1200 students in the Pine-Richland school district and received only 64 elaborations.

## Chapter 4

### **Math Department's Perceptions of Strengths and Weaknesses**

By Dan Brower and Dimitri Tsambis

A survey was completed by the ten members of the Pine-Richland High School Math Department addressing the perceived strengths and weaknesses within the department.

The teachers surveyed answered a series of questions using the following scale:

1	2	3	4	5
Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Very Poor	Poor	Average	Good	Excellent.

#### 1. Textbooks

The survey did not identify the current textbooks and the selection process as a weakness. The teachers identified several textbooks for review, including trigonometry, calculus, geometry, and algebra 1, parts 1,2. In order of priority, the department has targeted the review of algebra 1, parts 1 and 2 for next year and trigonometry, calculus, and geometry for the following school year.

#### 2. Student Preparedness

The department believes that our incoming students are prepared for future high school courses as well as post-high school programs.

#### 3. Student Deficiencies

The department feels that we are adequately addressing our high school student's overall mathematical deficiencies. Recent initiatives include a math tutorial available to students throughout the school day. The department will also increase the teacher-to-student contact time for students demonstrating mathematical deficiencies.

#### 4. Technology

The department is satisfied that present-day technology is available to both teachers and students and is adequately incorporated into classroom instruction. The results also show that additional resources, i.e. manpower, should be employed to explore new technology.

#### 5. Student Achievement

The department believes that the method for evaluating student achievement is effective. We further believe that Pine-Richland students' level of achievement rates high as compared to students in other local communities.

## 6. Curriculum Structure

The department feels the sequence of courses and the particular courses offered is optimal.

## 7. Integration

While the department feels that we are adequately integrating “real-world” applications into classroom instruction, integration between other high school departments is rated low.

## 8. Classroom Instruction

The survey results show that the department’s questioning techniques, classroom management, and assessment techniques were all above average. The department plans to continue improvement in the above-mentioned areas through self-evaluation, peer evaluations, bloom’s taxonomy training, and other professional development activities.

## 9. Professional Development

Relative to the other topics covered by the survey, the professional development section had a low score. Professional development appears to be an area in need of improvement. Recent professional activities conducted within the department include (or will include): 1) Peer-evaluation of questioning techniques using Bloom’s Taxonomy, 2) Summer reading, and 3) Self-evaluation using video.

The department feels that professional development should include attendance at national and regional math conferences and seminars, visitations to other school districts to observe best-practices, additional in-service time dedicated toward professional development, and the additional resources to fund such activities.

## Chapter 5

### **Best Practices**

By Emily Gerega

“If we want to improve student learning, we must find a way to improve teaching in the average classroom. Even slight improvements in the average can positively affect millions of students” (Stigler and Hiebert, 2004, pp.12). Because quality classroom instruction improves student learning, the high school mathematics department decided to investigate one of the most important aspects of instruction: questioning. “One of the most striking aspects of teaching is that the teacher’s speech consists of questions. These questions are central to the type of learning that takes place in the classroom” (Manouchehri and Lapp, 2003, pp.563). As mathematics teachers, we recognize the importance of asking questions that will allow students to verbalize not only correct answers but also to verbalize their reasoning processes. Currently the emphasis in mathematical processes requires students to reason, learn to argue a point of view, and examine mathematics from multiple perspectives (NCTM Standards 2000). Mathematics is no longer being simply assessed by looking for a correct answer; we now assess every step a student takes and examine their conceptual understanding. This type of open-ended questioning is present on standardized tests such as the PSSAs and the SATs. We must then incorporate open-ended questions into our classes every day. “Using open-ended questions allows teachers to assess the process by which students do mathematics, thus sending the message that process by which students do mathematics is just as important as final product when it comes to solving problems” (Hancock, 1995, pp.496). Our role as educators is to prepare our students by providing an atmosphere in which questions of all levels are present.

Our initial work in questioning techniques included two tasks. First, we observed each other (in pairs) teach a class and analyzed the questions being asked. Second, we met as a department to discuss our findings with the intent of improving areas in which we may be lacking. The question types were scored according to Bloom’s Taxonomy, which uses six levels of increasing sophistication: knowledge, understanding, application, analysis, synthesis, and evaluation. As observers, we tallied the number of

questions asked by the teacher, what level of question was asked, and the sex of the student asked.

After our collection of data we compiled our data and found that the area we were lacking was the inclusion of higher-level questions in our lessons. A large majority of the questions asked were considered lower-level questions such as knowledge, understanding, and application. We met as a group, discussed articles from the journals *The Mathematics Teacher* (NCTM) and *Educational Leadership* (ASCD), and brainstormed ways to improve in this area. One suggestion was to use “guiding questions” to set-up a lesson. “A guiding question is the fundamental query that directs the search for understanding” (Traver, 1998, pp.70). For example, in Algebra I, Systems of Equations are taught. Instead of the teacher assessing the students’ understanding of systems of equations by asking, “What are the slopes and y-intercepts of the two lines:  $y = 2x + 1$  and  $y = 3x - 1$ ?” the teacher can replace this lower-level application problem with an evaluation question. The teacher could ask, “Based on the trend in the chart below, will the life expectancy of men and women in the United States ever be the same?”

Life Expectancy in Years at Birth (United States)		
Year	Men	Women
1988	71.4	78.3
1989	71.7	78.5
1990	71.8	78.8
1991	72.0	78.9
1992	72.3	79.1

(Holt, Rinehart, and Winston, 2001, pp.340). This question is both open-ended and an evaluation-level question. It requires the students to graph two lines of best fit to represent the life expectancy of men and women, evaluate the graphs, and find that the slopes of the two lines are the same. Because the slopes are the same, the lines will never intersect and therefore the life expectancy of men and women will never be the same, based on the data provided.

One of the most important characteristics of open-ended questions is that these questions “offer students multiple approaches to [problems] by placing little constraint on students’ methods of solution” (Hancock, 1995, pp.496). Incorporating thought-provoking, high level questions in the classroom allows students to gain a deeper understanding of the material and hence a better chance of retaining the information.

An example of guiding question for a geometry class is “What would be a good container to hold 1000 cubic centimeters of candy?” The ensuing lesson would include discussion of container shape, packing, surface area, volume, shelf display, type of material, cost, manufacturing, and aesthetic interest. Formulas for surface area and volume could be derived when the students were ready to consider them during the lesson. This approach to teaching allows students to construct their own learning and make connections.

As a department, we agreed to incorporate higher-level questions and guiding questions into our lesson planning. “The ability to think- to be a lifelong seeker and integrator of new knowledge-is based on the ability to ask and consider important questions (Richetti and Sheerin, 1999, pp.58).” In order to improve instruction, we need to constantly reflect on our teaching and make adjustments. Improving our questioning is one way to improve instruction and thus increase student learning.

Hancock, Lynn C. (1995), “Enhancing Mathematics Learning with Open-Ended Questions,” *Mathematics Teacher*, 88:6, pp. 496-499.

Manouchehri, Azita and Douglas A. Lapp, (2003), “Unveiling Student Understanding: The Role of Questioning in Instruction.” *Mathematics Teacher*, 96:8, pp. 562-566.

Richetti, Cynthia and James Sheerin, (1999), “Helping Students Ask the Right Questions.” *Educational Leadership*, pp. 58-62.

Stigler, James and James Hiebert. (2004), “Improving Mathematics Teaching.” *Educational Leadership*, pp. 12-17.

Traver, Rob, (1998), "What is a Good Guiding Question?," *Educational Leadership*, pp.70.

## Chapter 6

### **Standards and Curriculum Mapping**

By Janine Murray, Joe Rivosecchi, and Ashlyn Brill

#### Synopsis:

Clear expectations and guidelines allow faculty, students and parents to know what is essential to be successful in any course. The establishment of state standards allows schools to be sure all students within the state are meeting the same benchmarks in a mathematics program. A comparison of the Pine-Richland High School Mathematics Department course curriculum to the Pennsylvania State Standards as well as to the widely accepted National Council of Teachers of Mathematics (NCTM) standards provide us with insight as to whether we are providing our students with the necessary learning opportunities to be competitive with other students across the state and the Nation.

#### Our Findings:

- State and NCTM standards are easily accessible to students and parents.
- A comparison of the high school math curriculum to the **state standards** show that *students who complete courses through Geometry* cover 57 of the 68 grade 8 standards and 50 of the 70 grade 11 standards.
- A comparison of the high school math curriculum to the **state standards** shows that within the department courses, student objectives are aligned with 62 of the 68 grade 8 standards and 69 out of 70 grade 11 standards.
- A comparison of the high school math curriculum to the **NCTM standards** show that *students who complete courses through Geometry* cover 46 out of 50 of the grade 6-8 standards and 36 out of 61 grade 9-12 standards.
- A comparison of the high school math curriculum to the **NCTM standards** shows that within the department courses, student objectives are aligned with 50 of the 50 grade 6-8 standards and 53 out of 61 grade 11 standards.
- Throughout the department, we align our daily student objectives to the State Standards.

- Textbooks for Algebra I and II, Honors Algebra II, and Honors Geometry are aligned with the State and NCTM standards.
- Students not taking math courses beyond Geometry do not acquire significant knowledge in the statistics and calculus-based State standards.
- Students not taking math courses beyond Geometry do not acquire significant knowledge in data analysis and probability based NCTM standards.
- From Pine-Richland's Class of 2005, 90.5% (248/274) of students have taken math courses through Geometry. 79.6% (218/274) of students have taken math courses beyond Geometry.
- From Pine-Richland's Class of 2004, 92.9% (275/296) of students have taken math courses through Geometry. It is not known how many students have taken math courses beyond Geometry.
- The NCTM curriculum standards establish expectations for math that match world standards and stress math understanding and application as well as basic math skills. As a department, all 18 of these skills are being used to enhance mathematical learning and communication.
- A comparison of the NCTM curriculum standards and the State math standards indicated that the NCTM standards exceed the expectations described in the state standards.

**Recommendations:**

- As a department, we need to continue to align our daily student objectives to the State and NCTM standards.
- The department needs to examine new textbooks for courses such as Introductory Analysis and Trigonometry and Honors Trigonometry and Introductory Analysis that are better matched to our State Standards.
- Lower level courses, such as Algebra I, Algebra I part 1 and 2, Transition to High School Mathematics, need to incorporate more higher level standards in Statistics, Data Analysis and Probability.

## Chapter 7

### Enrichment

By Michelle Holloway

At the elementary level, students are being tested at the end of the third and fourth grade with two out-of-grade level assessments (third graders take an end of the year 4<sup>th</sup> grade test and a 5<sup>th</sup> grade test). These assessments, along with the SAT 10 and teacher recommendations, are used to group students into enrichment groups. The enrichment group uses the same materials as the regular classroom, but the students work at a faster pace and also work on extensions of the problems. They may use some supplemental resources. The number of students could vary each semester based on re-evaluations. Students from the Enrichment group may also be placed into an Enrichment Plus group. The Enrichment Plus group is not an accelerated/skipping grade level group. They work at an individual pace in some higher grade level work, but they do not study the entire 6th grade curriculum.

The implications of these elementary level groupings for the high school seem to be minimal at this point. Our *most* accelerated students will take Pre-Algebra in sixth grade, but most of the students' needs will be satisfied with Math 6 or an enriched Math 6. If a student takes Pre-Algebra in 6th grade, his or her schedule might look like this:

Grade 6	Pre-Algebra
Grade 7	Algebra I
Grade 8	(Honors) Geometry
Grade 9	Honors Algebra 2
Grade 10	Honors Trigonometry and Introductory Analysis
Grade 11	AP Statistics or Introductory Calculus
Grade 12	AP Calculus AB, AP Calculus BC, and/or AP Statistics

One of the courses offered at high schools in other states is a multi-variable calculus course (a third semester college calculus class). This is a course that we can consider in the future but do not anticipate enrollment for at this time. In the past, only two students

were eligible for a multi-variable calculus course and they took it through a Penn State on-line course with one of our math teachers available as a resource. Since the population of students who need such a course is very small, we will probably not staff such a course ourselves but encourage students to take the multi-variable calculus class through an on-line program.

Differentiated Instruction in the Honors Algebra 2 classes was piloted this year. The teacher (with the help of the gifted education coordinator) gave an assessment that essentially permitted students to test “out” of a chapter in the Algebra 2 curriculum. The students who passed the pre-test worked on both short and long term enrichment activities for that particular chapter.

The pilot revealed that students in the Honors Algebra 2 class have not seen a lot of the curriculum before and therefore were not able to “test out” often since the material was completely new to them (new topics included matrices, logarithms, roots of polynomial equations, and complex and imaginary numbers). Also, the range of abilities in this class was very wide, making it difficult to group students. We hope to condense this range of abilities with strict enforcement of the teacher recommendations (individual for each student) given to guidance prior to student scheduling.

We will continue to refine or process for differentiated instruction according to the model Diagnostic Testing/Prescriptive Instruction.

## Chapter 8

### **Technology**

By Michelle Switala

The high school mathematics department currently uses the following hardware in our courses:

Graphing Calculators (all kinds, but mostly TI-83Plus)

Macintosh Computers (in MAC labs)

Projectors (borrowed from the MAC lab)

CBL (microphones and other probes that connect to graphing calculators to gather data which is then analyzed)

We help students use the following software packages in our courses:

Geometer's Sketchpad (Geometry, Honors Geometry, IAT)

Excel Spreadsheets (Algebra I Part 2, HTIA, AP Calculus)

Scientific Notebook (with Maple, a calculus package)

We use the following software in our teaching/preparation of materials:

MathType 4.0 (formats equations)

Power Point (for presentations)

Word Processing programs

Websites (NCTM.org, mathforum, etc.)

In addition, students are asked to gather information and look at demonstrations from the Internet for Algebra, Geometry, Honors Trigonometry and Introductory Analysis, AP Statistics, and AP Calculus. While there are other hardware and software packages available to help us teach various topics in Algebra, etc., we feel that our current technology is adequate but could be improved.

One of the benefits of the Holt, Rinehart, Winston Algebra I and Algebra II series that we chose a few years ago is that the book is online. All students and teachers in Algebra get

passwords that allow them to find extra teaching materials, worksheets, guided practice, help, read the text from the computer so the textbook can remain at school, and gather information from the Internet to answer higher-level thinking questions about the current lesson.

As we have mentioned before, the Transition to High School Mathematics class will be using StudyIsland.com a few times a week next year in their double-period class. With the creation of a new computer lab at the high school, we do not anticipate having to buy our own computers. If we did, a set of 10 Macintosh iBook laptops on a cart with an AirPort and a printer would cost about \$11,000 (the licensing fee for StudyIsland.com is already covered under Dr. Wille's current budget). Also as mentioned before, using Homework.com would be an efficient way to monitor the progress of our at-risk students, but the cost is high (Dr. Wille is currently looking at the cost vs. benefit for our existing middle school use of Homework.com which is currently about \$4,000).

Recently Pine-Richland has been exploring the use of Smart Boards in the elementary classrooms. A Smart Board would be a terrific tool for our Transition to High School Mathematics classes and we would like to purchase one for the high school math department (cost approximately \$5,000).

Dimitri Tsambis recently attended a statistics conference and would like to use Minitab and a connected program called Statutor in AP Statistics. Statutor is available through the University of Pittsburgh but to use it we would need to upgrade our version of Minitab to 14.0, at a cost of \$1000 for our 30 students. It is not an absolute necessity but would provide our students with the most current technology at a relatively low cost (as compared to the cost for a business to purchase Statutor).

## Chapter 9

### Recommendations

By BJ Cole and Dimitri Tsambis

#### Textbooks

1. Review new text and submit for adoption in 2006-2007

Algebra I Part I at an average cost of \$58 per student text, an approximate need of 100 texts for a total targeted cost of \$5,800.

AP Calculus at an average cost of \$110 per student text, for approximately 40 students, at a total targeted cost of \$4400.

Honors Trigonometry and Introductory Analysis at an average cost of \$65 per student text for approximately 70 students at a total targeted cost of \$4,550.

2. Review new text and submit for adoption in 2007- 2008

Introductory Analysis and Trigonometry at an average cost of \$65 per student text for approximately 150 students at a total targeted cost of \$9750.

Geometry at an average cost of \$59 per student text for approximately 200 students at a total targeted cost of \$11,800.

#### Instruction

1. We recommend utilizing the math teacher's duty period to provide a "Help Session" during all lunch periods and study halls.
2. Increase teacher to student contact time and student skill-building by providing a double math period for all Transition to High School Math students. We will then review the success of the program and perhaps extend this opportunity to Algebra I Part I students as well.
3. Professional Development goals include literacy training, increased attendance at National and Regional Math Conferences and seminars, and peer observation and collaboration to improve our questioning strategies. We recommend that each faculty member attend an average of 2 workshops, seminars or mini-courses per

year. The estimated cost of \$9,500 per year would cover registration fees, travel expenses, substitute pay and required training materials.

## **Curriculum**

We will continue to align our curriculum, instruction, and assessments to the State and National Council for the Teachers of Mathematics standards and increase the amount of time spent on Statistics, Data Analysis, and Probability in our lower level courses.

We recommend that the graduation requirements for all students include as least one year of Algebra and one year of Geometry.

## **Technology**

1. We recommend the purchase of a set of 10 Macintosh iBook laptops on a cart with an AirPort and a printer (cost of about \$11,000) to support our remediation efforts in the Transition to High School Math, Algebra I parts 1 and 2, and our AP courses OR the creation of another computer lab at the high school.
2. We recommend the purchase of a Smart Board for our lower-level (Transition to High School Mathematics) classes (cost approximately \$5,000).
3. We recommend the purchase of an upgraded version of Minitab software for our AP Statistics class to allow us to use another teaching package, Statutor (upgrade cost \$1000).