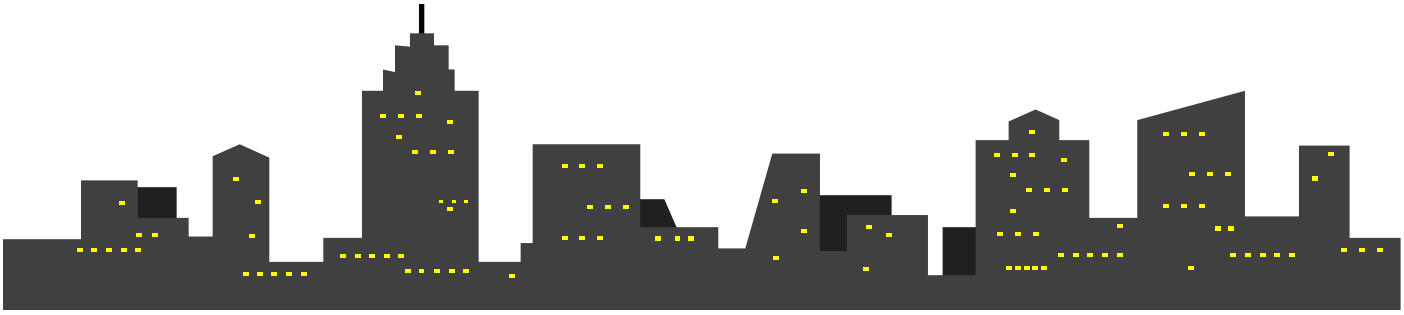

NUMEL NEWS

OCTOBER, 2000

Because of all the charts in this issue I changed the look at little bit. There are several feature articles in this issue. Please note the announcement of the Regional School Support Centers. Commissioner Mills will be announcing shortly the schools that the centers were created to work with. I have also included an analysis of the implementation of the mathematics standards of the schools around the state that had program reviews. These districts have members in NUMEL so the report should be of interest to you. The feature article concerns manipulatives and is the last of the topics impacting the standards that I will be addressing. In the future the newsletter will only be giving SED updates on mathematics education.

RESULTS OF JUNE 2000 ELEMENTARY and INTERMEDIATE MATH ASSESSMENTS

The student results from the June 2000 CTB assessments have been mailed to the schools. You have probably just received them. The building and district summary reports will be mailed to the districts this week. There will be a press conference by the Commissioner sometime between October 11-13 to announce the information to the media at which time the school report cards will be released.

STATE MATHEMATICS ASSESSMENTS 2000-2001 SCHOOL YEAR

Neither Regents exams nor RCT's are scheduled for Mondays. This is done as a security measure so Regents examinations and competency tests will not have to be stored in daily-delivery schools over the weekend. Examinations are scheduled so that most students will not have to take more than two examinations on any one day. For this reason, many of the examinations within the same subject area (such as mathematics) are scheduled on the same day. The examinations are scheduled so that the number of students testing during each examination session is manageable. Mathematics teachers often find themselves among the last exam givers but this on this year's draft schedule they are not last! Please remember that regents exams are not to be removed from the building. SED designated Friday, June 22, as a rating day. If you find yourself in the situation of being required to have grades in by Thursday afternoon you could point this out to your superintendent of schools. For any assessment below that has a status of "tentative" you can have your superintendent recommend changes up to October 10 by faxing 518-474-1989; attention to Gerald DeMauro or write directly to: Office of State Assessment, Room 771 EBA, Albany, NY 12234.

Date	Time	Assessment	Status
January 23	1:15	Sequential Math Course I	Final
		Mathematics A	Final
January 24	9:15	RCT in Mathematics	Final
January 26	9:15	Sequential Math Course II	Final
		Sequential Math Course III	Final
May 15-16	Any time	Intermediate Math Assessment	Final
May 16-18	Any time	Elementary Math Assessment	Final

June 15	1:15	Math A	Tentative
June 19	1:15	Sequential Course I	Tentative
June 20	1:15	RCT in Math	Tentative
		Sequential Course II	Tentative
		Sequential Course III	Tentative
		Math B	Tentative

COMPONENT RE-TESTING

Starting with next year's freshmen the "Safety Net" will no longer be to pass the RCT if the Sequential Course I regents is failed. The new "safety net" will be the Component Retest for Mathematics A. The Component Retests are still in the development stage and are being piloted now. There are some things that we know about the test and some that we think are probable. I will try to make the distinctions clear below.

What we Know

- Measurement Incorporated is in charge of developing and piloting the items and conducting turnkey training on the types of items that will be used, how to score them and the diagnostic plan that schools need to use to determine a student's eligibility and the appropriate tasks for the student to take.
- Educational Testing Service (ETS) reviews all items for relevance, difficulty and sensitivity.
- There will be four component retests available for mathematics: Modeling and Multiple Representation, Measurement, Uncertainty, and Patterns/Functions. Mathematical Reasoning, Numeration and Operations will be subsumed within the other four components.
- The districts should have targeted coursework to help the student on the tasks that are the most appropriate for him or her.
- There will be an item map for each Math A regents telling what performance indicator was being assessed by each item.
- A "diagnostic" profile is being drafted to assist schools in determining what components a student needs to focus on. When this "diagnostic" profile has been finalized, it will be shared with the field and there will be regional meetings conducted by Measurement Inc. to help schools identify student skill deficits and how to prepare them for the Component retest.

What we Think

- Eligibility to take the test is limited to seniors who have attempted the Math A Regents twice and failed it.
- Schools will manage their own scoring of the Component Retests with turnkey training provided by Measurement, Inc.
- A component retest will consist of multiple choice and student constructed response items and will take 2 or 3 class periods to complete.

CORE CURRICULUM COMPANIONS ALL GONE

There are no more copies left of the Core Curriculum companion. It is, however, now available on our website. Direct access at **http://www.emsc.nysed/ciai/mst/mathcompanion.pdf**. I've been told that you can download the whole document but not just sections. You can print specific pages though. So if you want just one lesson, you can copy just that one lesson.

MINIMUM ACCEPTABLE SCORES FOR APPROVED ALTERNATIVES TO MATH REGENTS EXAMS

The minimum acceptable scores on alternative examinations that giv3en below are equivalent to passing the Mathematics A Regents Examination or the Sequential Course I and II Regents Examinations with a 65. The standard setting for Mathematics B has not been completed.

Approved Alternative Examination	*Minimum Acceptable Score*
Advanced International Certificate of Education (AICE) Mathematics Examination	E
Advanced Placement Calculus AB Examination	3
Advanced Placement Calculus BC	3
International Baccalaureate Mathematics Studies Standard Level Examination	4

International Baccalaureate Mathematics Methods Standard Level Examination	4
International Baccalaureate Mathematics Higher Level Examination	3
International General Certificate of Secondary Education (IGCSE)	A
SAT II Mathematics Level IC	470
SAT II Mathematics Level IIC	510

HELP!

We need some videos of lessons where the teacher is preparing students for the **Math B** curriculum or a lesson using a graphing calculator that could be considered part of the Math B curriculum. This would be broadcast as part of a new "Tools for Schools" teleconference. If you will be teaching such a lesson between now and November 3rd and would be willing to let us tape your lesson please let Jackie Marcano know. Please let her know the name of your school, your principal's name, whether you are urban, suburban or rural, your name, the lesson topic, whether you will be using the graphing calculator and the date and time of the lesson to **jmarcano@mail.nysed.gov** or 518-473-9471 (phone) or 518-473-0858 (fax).

INTERMEDIATE MATH ASSESSMENT FOR ACCELERATED SEVENTH GRADERS

School administrators may allow seventh grade students to take the intermediate mathematics test this school year if they so desire. The test should only be administered to students who have completed all the material in the Intermediate Level (5-8) Mathematics Core Curricula and are being considered for placement in an accelerated high school-level course when in grade eight.

Acceleration policy is a local decision. It is recommended that multiple measures be used to determine acceleration eligibility.

Students are permitted to take the test only once and their score will be reported the following year with the student's cohort. At that time these scores will be part of the school's report card and will be used in computing the school's accountability index.

Seventh grade students who score below the appropriate state level of performance on these tests will be required to have academic intervention services (AIS) the following semester even if they have been accelerated.

A memo to this effect will be mailed to your district with the order form for you CTB assessments in the next two weeks.

DATES FOR MEETINGS

Organization: New York State Staff Development Leadership Council
Date: October 26-27, 2000
Location: Albany Crowne Plaza, Albany
Title: A Working Symposium
Contact: Mark Bower, 716-392-1000 ext. 6051 or **mbower@hilton.k12.ny.us**

Organization: Mathweb2000
Date: October 30—November 17
Location: your computer
Title: Assessment: Benchmarks for Success
Contact: **http://www.groupjazz.com/mathweb2000**

Organization: Nassau Association of Math Supervisors and Nassau County Math Teachers' Association
Date: November 18, 2000
Location: Mineola High School
Title Calculators/Computers Help All Teachers
Contact: Eva Demyen **evajd@aol.com**
Lynn Unger **taxtilt@aol.com**

Nick Restivo njrestivo@aol.com

Organization: NYSED
Date: October 11, 2000 (3pm – 4 pm)
Location: Teleconference-your local PSB station
Title: Tools for Schools : Professional Development
Contact: Teresa Moore, tmoore@questar.org

HELP FOR LOW PERFORMING SCHOOLS
CLOSING THE GAP

Identification of Low Performing Schools

Schools will bE designated as low performing based on results on state assessments in mathematics and ELA. The performance index described in the last newsletter will be used to find which schools have the lowest percentage of students meeting state standards for grades Pre K to eight. At the high school level achievement of the standards is based upon the performance of a 4-year cohort of students in terms of meeting the graduation requirements in mathematics and ELA (90% must meet the graduation requirements). The annual dropout rate is also considered (must be less than 5%)

Schools farthest from state standards are potential schools under registration review (SURR). The Commissioner reviews additional data and information to determine whether a school is among those most in need of improvement. The Commissioner may also identify as "poor learning environments" any school that does not meet school performance standards and has conditions that are seriously detrimental to the health, safety and/or educational welfare of students.

Notification

The Commissioner notifies the Board of Education of a school that has been placed under registration review. When a school is under registration review, it runs the risk of having its registration revoked and being closed. The Commissioner's notification includes the explicit progress that the school must make in order to be removed from registration review. Schools are given up to three years to meet the performance targets determined by the Commissioner. He will prove the school with Adequate Yearly Progress (AYP) or targets for each year.

Schools targeted as low performing will include more than just SURR schools. This year's targeted schools will be announced by the Commissioner publicly on October 17. Districts will receive notification at least ten days before it is made public.

The department has developed three strategies to help these low performing schools.

1. **Regional School Support Centers**

Nine upstate centers have been recently created to provide assistance to SURR, Title 1 and other school in need of improvement. Their primary roles will be to help with needs assessments and comprehensive planning, to connect the low performing schools with and set up regional partnerships, and to provide direct assistance in Title I and CSRD. The centers are housed at a BOCES but are separate from the BOCES. Not all of them are staffed as of this writing but we expect they will be by October 17. The centers and their locations are given in the chart below.

REGION	LOCATION
Mid-State	Onondaga-Cortland-Madison BOCES
Hudson-Mohawk	QUESTAR III
Mid-South	Otesgo-Northern Catskills BOCES
Mid-West	Monroe I BOCES
North Country/Mohawk Valley	Madison-Oneida BOCES
Mid-Hudson	Orange-Ulster BOCES
Western	Erie 1 BOCES
Long Island	Eastern Suffolk BOCES
Lower Hudson	Southern Westchester BOCES

2. **ELA and Mathematics Initiative**

Schools that are designated as farthest from state standards or below state standards will be eligible for funds to assist them to meet the needs of their students in ELA and mathematics. The funds may be used for program reviews (classroom observations to determine what staff development is needed-see article on performance reviews in this issue), curriculum development, professional development (can include peer coaching), use of master teachers, And classroom mentoring.

The grants that will be awarded are from Goals 2000 funds and can range from $50,000 to $200,000. The grants are awarded through the Regional School Support Centers listed above and their staff are available to help any eligible school district write a fundable grant proposal. The Regional Support Centers have been awarded different amounts of funds based upon region needs. When the allotted money is gone there is no more. The grant period ends August 31, 2002.

3. Leadership Academies

The Professional Development Leadership Academies are also supported by Goals 2000 funds. The first grant period runs from September 1, 2000 through August 31, 2000. The second runs from September 1, 2001 through August 31, 2002. The grants have already been awarded to each Regional School Support Center. It is expected that they will confront the mounting concern about assuring energetic and intelligent leadership through the next decade. Mentoring, succession planning, sustaining professional development, and recruitment are common activities that have been included in these projects. Further, identifying the requisite skills and knowledge desirable in educational leaders is a specific emphasis of most of the academies.

STATE OF THE STATE: STANDARDS IMPLEMENTATION IN THE MATHEMATICS CLASSROOM

Since January 1998 I have had the opportunity to work with fifteen school districts in the state that are high needs and have large percents of at risk students. Most of these districts have representatives in NUMEL. I have conducted program reviews for 45 of their school buildings and have been in 252 of their classrooms observing the degree to which the state mathematics standards are being implemented. In order to do this I have used the instrument included in this report. Although classroom instruction is only one part of the picture of standards implementation I have found it to be a pretty good indicator of the achievement of the students in the school. For example, one also has to look at whether a district has a curriculum aligned to the standards and has an assessment system that supports students on the new assessments. Absentee rates also seem to have an effect.

The criteria that I use to determine aspects in need of improvement is that there is more than 50% of the instruction is “present but needs strengthening” and “no evidence observed”. The criteria that I use to determine strengths is more than 50% of the classes show the aspect as “strong”.

I have been asked to share the instrument that I use for these reviews and thought that a Program Review of all the schools combined would be helpful in determining some program and professional development needs for the state. I have looked at K-4, 5-8 and 9-12 separately as I find the needs although similar observations are not exactly the same.

Program Review for New York State’s High Needs Districts January 1998-June, 2000

The Observations

Classroom observations were made using a check sheet that includes aspects of classrooms and instruction that we consider important in preparation of students for the new state math assessments. Four categories are used in the observation. A designation of 2 means that the aspect appears to be a consistent feature of the class. A designation of 1 means that although there was some indication of the aspect it needs to be developed more. A designation of 0 means there was no evidence that this aspect is present in the classroom. NA means that the particular aspect was not appropriate to the class observed or since these aspects were not added to the check sheet until late 1999 they were not looked for in some schools.

Enclosed is a summary of each aspect of the classroom observations. Each column of the summary sheet gives the percent of classrooms in which the aspect was rated by that designation. Any aspect that is weak or not present in more than 50% of the classrooms would be a prime target for consideration for staff development. However, one needs to take into account that classrooms were visited for about 40 minutes on a single day. The observations represent a snapshot and although an aspect was not apparent on the day observed does not mean that it might not be included on other days.

The aspects on the summary chart are divided into four basic areas. The first fourteen deal with instructional strategies that help students learn (especially those who do not learn mathematics easily). They should be a consistent part of teacher practice. Aspects 15-17 represent specific things that teachers can plan ahead of time as part of their lessons. Most of these are directly related to what students are expected to do for the state math

assessments. Aspects 18-22 concern classroom climate and are important aspects not just for math but for all subjects. Aspects 23 to 28 concern what and how mathematics is presented to students.

The aspects reflect key words from the Mathematics Standard of the *New York State Learning Standards for Mathematics, Science and Technology* (1996). The standard is given below with key words underlined.

Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.

Each category will be discussed below:

Instructional Strategies

The category of instructional strategies can benefit the most from staff development.
When students are discussing alternative strategies and algorithms there is great opportunity for them to explore mathematics concepts. If children believe that they are capable of discovering their own mathematics and learn how to verify their ideas, they will develop what is called "mathematical power". Mathematical power not only provides them with self-confidence in mathematics but also makes it possible for them to discover mathematics ideas on their own. It has been found that discussions and discoveries aid students in achievement with problem solving and in understanding of mathematics concepts. Mathematical power will also give them the confidence they need when tackling questions on the state assessment that they are not totally familiar with.

In many cases, mathematics topics being introduced are conceptually related to what students have already learned. For example, decimals are related to common fractions. It can be easier for students to read or compare decimals by writing them in their fraction form. When students have opportunities to talk to others (other students as well as teachers) about their mathematics ideas they tend to deepen and clarify them. Student discourse helps students see connections between different mathematical ideas.

Students in all grades can benefit from using manipulative materials and having them connected to diagrams and symbols for the mathematics concepts they are learning. Strictly relying on abstract symbolic manipulation and the memorization of algorithms and rules is not sufficient for many students.

Although students are capable of sustaining concentration for an entire class period, it has been noted that when a lesson is basically "chalk and talk" many students tune out. Even though they may not be disruptive, they are not paying attention and benefiting from instruction. Ways to avoid this are providing for active involvement of the students and changing the levels of activity of their participation.

Planning

These aspects should be considered when planning lessons. Most of them are directly linked to performances required of students on the new state mathematics tests. In many cases if teachers are given resources that have examples of writing activities, applications, and problems it may help them include the aspects in their lesson design.

The new elementary and intermediate math assessments are 100% in context. Math A and B are 50-60% in context. They require that students be able to communicate their understanding of problems and mathematical ideas with words, pictures, or symbols. This requires a deep understanding of mathematics as well as practice in writing coherent, concise responses. If students do not get experience in class answering questions that require them to generalize, they will not be able to provide such responses during a testing situation. For the same reason, they need practice writing their understandings in words. The same holds true for reading. The new assessments require that students read the problems, understand what information they have been given, and what they are being asked to find.

If students do not have opportunities to solve multiple step problems, they will not do well on them in a testing situation. If opportunities for application of mathematics are not part of student instruction, students will have difficulty knowing when and how to use mathematics as a tool to solve everyday or work related problems.

Teachers often find that they run out of time to get through the entire curriculum but yet it is often noted in observations that class time is not well utilized.

Classroom Climate

Aspects concerning classroom climate are important to a classroom, which nurtures student learning. It is not specific to mathematics learning but is an important aspect for all disciplines. If there are not high expectations of students, they tend not to demonstrate the best they can do.

Mathematics Content

One reason students may not show high achievement on a state assessment could be that all the topics of the CORE CURRICULUM for the assessment may not have been taught. This may have been true for the intermediate assessment of 1999 since a number of schools did not include the topic of trigonometry and some did not include algebra either. This may be a reason why students did not do as well in 1999 on Key Idea 7 as they did on other key ideas. There is also the issue of spending excessive amounts of time on topics that are not part of the standards at the sacrifice to those that are. I think in particular of the number of classes that I have observed in which symbolic logic was being taught. Some teachers have told me that they feel that symbolic logic helps students remember the logical arguments and will spend perhaps one week developing concepts of symbolic logic and two days on logical argument. I believe that integrating logical argument with geometry as in the following examples would be a better use of class time. Some examples are given below.

Biconditional: With x a natural number: x is even, x is a multiple of two the biconditional is "x is even if and only if x is a multiple of 2"

Compound statement: A triangle is isosceles and/or it is obtuse.

Conjunction: A triangle is isosceles and obtuse.

Disjunction: A triangle is isosceles or obtuse.

Conditional: If two rectangles have the same length and width then they have the same area (true)

Contrapositive: If two triangles do not have the same area, then they do not have the same length and width (also true)

Inverse: If two triangles do not have the same length and width then they do not have the same area (Not necessarily true).

Converse: If two triangles have the same area, then they have the same length and width. (Not necessarily true).

Students who understand the nature of mathematics often find it more accessible. They also must grapple with the ideas of mathematics to make it understandable to themselves and therefore to be able to utilize it at some other time.

Data

The over all ratings on each grade level band on each aspect are given below. At the end of the charts I will discuss strengths and then areas that appear to need attention. The percents can be used to determine the severity or lack of severity of a need for attention from the district, school and teacher.

Observation

School/Classes 19 schools/119 classes__ District_ 9 districts_____

Grade/Course 9-12 /Pre-C1, C1, Math A Years_1998-2000_____

Classroom

2 means "strong aspect"; 1 means "aspect present but needs strengthening"; 0 means "no evidence observed"; NA means *does not apply to lesson observed or could not tell.*
All given as percents in each category

Instruction

2	1	0	NA	Aspect
14	15	67	4	1.Teacher uses flexible grouping within classroom.
18	34	32	16	2. Teacher accepts alternate strategies and algorithms and demonstrates how to check their accuracy
22	32	28	18	3. Teacher makes effective use of objects, diagram, and pictures to help students discover mathematics concepts.
17	55	23	5	4. Teacher's questioning techniques motivate pupils' analysis, requiring pupils to substantiate their answers.
6	27	51	17	5. Teacher encourages pupils to "discover" for themselves concepts in mathematics by experimenting, observing patterns, and making generalizations (inquiry)
8	63	23	7	6. Teacher uses a variety of instructional techniques and varies levels of student activity.
10	22	47	21	7. Teacher uses a variety of instructional materials, such as manipulative materials, puzzles, games, audio-visual aids, calculators, computers, and models.
20	62	12	6	8. Teacher uses strategies which challenge students abilities yet allows them to experience success.
45	36	14	5	9. Individual seatwork (paper and pencil) takes up only a small part of class time.
43	4	3	50	10. Pupils have rulers, compasses, protractors, calculators, and other needed tools appropriate to the lesson.
28	34	12	26	11. Teacher helps students see connections between previously learned material and new material.
22	35	17	26	12. Teacher emphasizes multiple representations of concepts and their connections.
25	32	26	16	13. Teacher connects concepts with symbolic representation.
12	66	12	10	14. Pupils are actively involved during the development phase of the lesson.
13	35	50	2	15. Attention is given to developing the reading and writing skills of pupils as needed for effective communication and comprehension.
20	20	44	15	16. Attention is given to the application of subject matter.
27	19	41	13	17. Students are involved in solving problems that require multiple steps, a variety of strategies, and/or have multiple answers.
34	58	7	1	18. Teacher maximizes learning time within the classroom
35	54	1	10	19. Expectations for all students in the classroom are uniformly high.
86	14	0	0	20. Students treat teacher and each other with respect
92	7	1	0	21. Classroom control is adequate.
92	14	3	0	22. Teacher maintains a friendly, supportive classroom atmosphere.
48	13	3	36	23. The mathematics content was significant and worthwhile
49	13	0	38	24. The mathematics content was appropriate for the developmental levels of the students in this class
8	49	3	40	25. Students were intellectually engaged with important ideas relevant to the focus of the lesson
53	5	1	41	26. Teacher presented information was accurate
57	5	0	41	27. The teacher displayed an understanding of mathematics concepts (e.g. in his/her dialogue with students
3	17	36	43	28. Mathematics was portrayed as a dynamic body of knowledge continually enriched by conjecture, investigation, analysis, and/or proof/justification.

Observation

School/Classes 15 schools/81 classes_ District__8 districts_____

Grade/Course__5-8 math_____ Year_1998-2000_____

Classroom

2 means "strong aspect"; 1 means "aspect present but needs strengthening"; 0 means "no evidence observed"; NA means *does not apply to lesson observed or could not be determined*
All are given in percents.

Instruction

2	1	0	NA	Aspect
28	14	58	0	1.Teacher uses flexible grouping within classroom.
20	37	18	25	2. Teacher accepts alternate strategies and algorithms and demonstrates how to check their accuracy
25	29	32	14	3. Teacher makes effective use of objects, diagram, and pictures to help students discover mathematics concepts.
28	60	11	0	4. Teacher's questioning techniques motivate pupils' analysis, requiring pupils to substantiate their answers.
10	30	53	7	5. Teacher encourages pupils to "discover" for themselves concepts in mathematics by experimenting, observing patterns, and making generalizations (inquiry)
22	54	22	1	6. Teacher uses a variety of instructional techniques and varies levels of student activity.
32	10	38	20	7. Teacher uses a variety of instructional materials, such as manipulative materials, puzzles, games, audio-visual aids, calculators, computers, and models.
32	57	11	0	8. Teacher uses strategies which challenge students abilities yet allows them to experience success.
67	21	11	1	9. Individual seatwork (paper and pencil) takes up only a small part of class time.
42	1	0	57	10. Pupils have rulers, compasses, protractors, calculators, and other needed tools appropriate to the lesson.
21	41	10	28	11. Teacher helps students see connections between previously learned material and new material.
17	25	23	35	12. Teacher emphasizes multiple representations of concepts and their connections.
19	31	23	27	13. Teacher connects concepts with symbolic representation.
26	63	11	0	14. Pupils are actively involved during the development phase of the lesson.
19	24	57	0	15. Attention is given to developing the reading and writing skills of pupils as needed for effective communication and comprehension.
19	23	40	18	16. Attention is given to the application of subject matter.
38	9	51	2	17. Students are involved in solving problems that require multiple steps, a variety of strategies, and/or have multiple answers.
28	57	15	0	18. Teacher maximizes learning time within the classroom
54	33	9	4	19. Expectations for all students in the classroom are uniformly high.
83	12	2	2	20. Students treat teacher and each other with respect
84	14	0	2	21. Classroom control is adequate.
81	15	1	2	22. Teacher maintains a friendly, supportive classroom atmosphere.
60	21	1	17	23. The mathematics content was significant and worthwhile
68	19	6	7	24. The mathematics content was appropriate for the developmental levels of the students in this class
25	56	2	17	25. Students were intellectually engaged with important ideas relevant to the focus of the lesson
62	20	0	19	26. Teacher presented information was accurate
70	11	0	19	27. The teacher displayed an understanding of mathematics concepts (e.g. in his/her dialogue with students
8	34	40	18	28. Mathematics was portrayed as a dynamic body of knowledge continually enriched by conjecture, investigation, analysis, and/or proof/justification.

Observation

School/Classes: 11 schools/52 classes____ District: 6 districts_____

Grade/Course_K-4 (mostly 2-4) math___ Year__1998-2000_____

Classroom

2 means "strong aspect"; 1 means "aspect present but needs strengthening"; 0 means "no evidence observed"; NA means *does not apply to lesson observed or could not determine.* All are in percents.

Instruction

2	1	0	NA	
35	27	35	4	1.Teacher uses flexible grouping within classroom.
31	29	25	15	2. Teacher accepts alternate strategies and algorithms and demonstrates how to check their accuracy
33	44	12	12	3. Teacher makes effective use of objects, diagram, and pictures to help students discover mathematics concepts.
29	50	19	2	4. Teacher's questioning techniques motivate pupils' analysis, requiring pupils to substantiate their answers.
15	31	50	4	5. Teacher encourages pupils to "discover" for themselves concepts in mathematics by experimenting, observing patterns, and making generalizations (inquiry)
44	38	18	0	6. Teacher uses a variety of instructional techniques and varies levels of student activity.
46	23	17	13	7. Teacher uses a variety of instructional materials, such as manipulative materials, puzzles, games, audio-visual aids, calculators, computers, and models.
46	52	2	0	8. Teacher uses strategies which challenge students abilities yet allows them to experience success.
87	11	2	0	9. Individual seatwork (paper and pencil) takes up only a small part of class time.
44	6	4	46	10. Pupils have rulers, compasses, protractors, calculators, and other needed tools appropriate to the lesson.
27	44	6	23	11. Teacher helps students see connections between previously learned material and new material.
37	37	15	11	12. Teacher emphasizes multiple representations of concepts and their connections.
33	17	20	30	13. Teacher connects concepts with symbolic representation.
46	50	2	2	14. Pupils are actively involved during the development phase of the lesson.
17	40	37	6	15. Attention is given to developing the reading and writing skills of pupils as needed for effective communication and comprehension.
44	15	27	13	16. Attention is given to the application of subject matter.
31	27	35	7	17. Students are involved in solving problems that require multiple steps, a variety of strategies, and/or have multiple answers.
52	48	0	0	18. Teacher maximizes learning time within the classroom
54	37	0	9	19. Expectations for all students in the classroom are uniformly high.
96	4	0	0	20. Students treat teacher and each other with respect
98	2	0	0	21. Classroom control is adequate.
87	13	0	0	22. Teacher maintains a friendly, supportive classroom atmosphere.
67	27	0	6	23. The mathematics content was significant and worthwhile
88	6	0	6	24. The mathematics content was appropriate for the developmental levels of the students in this class
30	58	4	8	25. Students were intellectually engaged with important ideas relevant to the focus of the lesson
69	23	0	8	26. Teacher presented information was accurate.
69	25	0	6	27. The teacher displayed an understanding of mathematics concepts (e.g. in his/her dialogue with students.
16	27	51	6	28. Mathematics was portrayed as a dynamic body of knowledge continually enriched by conjecture, investigation, analysis, and/or proof/justification.

Strong Aspects

Common to all grade levels is the strength of the classroom climate. Teachers in the state tend to have classrooms that are supportive and friendly. Teachers and students tend to get along well with each other across the state. Also strong is the accuracy of the information given to students

Intermediate and elementary mathematics classes also seem to have strengths in the areas of not excessively utilizing worksheets, having high expectations for students, significant mathematics (mathematics observed supported the Core Curriculum), and was developmentally appropriate. Elementary teachers also tended to make use of every minute of time more than teachers in the upper grades who had defined time allotments for math lessons.

Aspects in Need of Attention

This information has been given below by grade level because there are more differences between grade levels here than in areas of strength. It needs to be pointed out that about half of the classes that were observed in grades 9-12 were preparing students for the Course 1 or Course 2 regents and not Math A. They did not have to be as concerned about reading and writing mathematics or problem solving as teachers of grades K-8. However, they still tended to pay approximately as much attention to these two areas as teachers of grades 5-8.

Observation-Areas in Need of Attention
School/Classes 19 schools/119 classes District 9 districts
Grades 9-12/Pre C1, C1, C2, Math A Years 1998-2000

Classroom Summary:

NS means "needs strengthening (1) or "no evidence observed"(O).

Instruction

NS%	Aspect in need of attention
82	1. Uses flexible grouping.
66	2. Teacher accepts alternate strategies and algorithms and demonstrates how to check their accuracy
60	3. Teacher makes effective use of objects, diagram, and pictures to help students discover mathematics concepts.
78	4. Teacher's questioning techniques motivate pupils analysis, requiring pupils to substantiate their answers.
78	5. Teacher encourages pupils to "discover" for themselves concepts in mathematics by experimenting, observing patterns, and making generalizations (inquiry)
86	6. Teacher uses a variety of instructional techniques and varies levels of student activity.
69	7. Teacher uses a variety of instructional materials, such as manipulative materials, puzzles, games, audio-visual aids, calculators, computers, and models.
74	8. Teacher uses strategies which challenge students abilities yet allows them to experience success.
52	12. Teacher emphasizes multiple representations of concepts and their connections.
58	13. Teacher connects concepts with symbolic representation.
78	14. Pupils are actively involved during the development phase of the lesson.
85	15. Attention is given to developing the reading and writing skills of pupils as needed for effective communication and comprehension.
64	16. Attention is given to the application of subject matter.
60	17. Students are involved in solving problems that require multiple steps, a variety of strategies, and/or have multiple answers.
65	18. Teacher maximizes learning time within the classroom
55	19. Expectations for all students in the classroom are uniformly high.
52	25. Students were intellectually engaged with important ideas relevant to the focus of the lesson
53	28. Mathematics was portrayed as a dynamic body of knowledge continually enriched by conjecture, investigation, analysis, and/or proof/justification.

Observation-Areas in Need of Attention
School/Classes 15 schools/81 classes_ District__8 districts_____
Grade/Course__5-8 math_____ Year_1998-2000_____

Classroom

NS means "needs strengthening (1) or "no evidence observed"(O).

Instruction

NS%	Aspect in need of attention
72	1. Uses flexible grouping.
55	2. Teacher accepts alternate strategies and algorithms and demonstrates how to check their accuracy
61	3. Teacher makes effective use of objects, diagram, and pictures to help students discover mathematics concepts.
71	4. Teacher's questioning techniques motivate pupils analysis, requiring pupils to substantiate their answers.
83	5. Teacher encourages pupils to "discover" for themselves concepts in mathematics by experimenting, observing patterns, and making generalizations (inquiry)
76	6. Teacher uses a variety of instructional techniques and varies levels of student activity.
68	8. Teacher uses strategies which challenge students abilities yet allows them to experience success.
51	11. Teacher helps students see connections between previously learned material and new material.
54	13. Teacher connects concepts with symbolic representation.
74	14. Pupils are actively involved during the development phase of the lesson.
81	15. Attention is given to developing the reading and writing skills of pupils as needed for effective communication and comprehension.
63	16. Attention is given to the application of subject matter.
60	17. Students are involved in solving problems that require multiple steps, a variety of strategies, and/or have multiple answers.
72	18. Teacher maximizes learning time within the classroom
58	25. Students were intellectually engaged with important ideas relevant to the focus of the lesson
74	28. Mathematics was portrayed as a dynamic body of knowledge continually enriched by conjecture, investigation, analysis, and/or proof/justification.

Observation-Aspects in Need of Attention
School/Classes: 11 schools/52 classes____ District: 6 districts_____
Grade/Course_K-4 (mostly 2-4) math___ Year__1998-2000_____

Classroom Instruction

NS means "needs strengthening (1) or "no evidence observed"(O).

NS%	Aspect in need of attention
62	1. Uses flexible grouping.
54	2. Teacher accepts alternate strategies and algorithms and demonstrates how to check their accuracy
56	3. Teacher makes effective use of objects, diagram, and pictures to help students discover mathematics concepts.
69	4. Teacher's questioning techniques motivate pupils analysis, requiring pupils to substantiate their answers.
81	5. Teacher encourages pupils to "discover" for themselves concepts in mathematics by experimenting, observing patterns, and making generalizations (inquiry)
56	6. Teacher uses a variety of instructional techniques and varies levels of student activity.
54	8. Teacher uses strategies which challenge students abilities yet allows them to experience success.
52	12. Teacher emphasizes multiple representations of concepts and their connections.
52	14. Pupils are actively involved during the development phase of the lesson.
77	15. Attention is given to developing the reading and writing skills of pupils as needed for effective communication and comprehension.
62	17. Students are involved in solving problems that require multiple steps, a variety of strategies, and/or have multiple answers.
62	25. Students were intellectually engaged with important ideas relevant to the focus of the lesson
78	28. Mathematics was portrayed as a dynamic body of knowledge continually enriched by conjecture, investigation, analysis, and/or proof/justification.

FEATURE ARTICLE

Manipulatives

Manipulatives are not being utilized in the mathematics classrooms of the state to the degree to which they could prove to be helpful to students. For evidence for this statement I refer you to the above charts concerning aspects of standards implementation in 252 classrooms. Aspects 3,7 and 10 deal with the use of Manipulatives. You will notice that "**Teacher makes effective use of objects, diagram, and pictures to help students discover mathematics concepts" (aspect 3**) is an aspect in need of attention at all grade levels. "**Teacher uses a variety of instructional materials, such as manipulative materials, puzzles, games, audio-visual aids, calculators, computers, and models" (Aspect 7)** is an aspect in need of attention at the high school level. Although not an area in need of attention at the intermediate or elementary level, it is not a strength at either. The good news is that when there is an appropriate need for the tools of mathematics such as rulers, protractors, calculators, etc (Aspect 10) , these tools are available to students and are being used. Although it is questionable that calculators and computers are manipulatives by definition sometimes they are used as such.

The definition generally used for manipulatives is that they are any concrete objects that can be moved about and handled. They can be everyday objects or commercially prepared objects specifically designed to teach mathematical concepts. In this article I will share with you the department's position on the use of manipulatives, some research on manipulative use, and specific recommendations for each grade level.

SED Position

The State Education Department has had a position on the use of manipulatives for many years. In the last years of the third and sixth grade PEP tests we provided a list of "allowable items" that students could be allowed to use when taking the tests. The new state mathematics assessments also allow the use of manipulatives. I would like to share with you our official position on manipulatives and their use by quoting from two publications on manipulatives published by the department.

"The State Education Department's Bureau of Mathematics Education strongly recommends that, when ever appropriate, manipulative materials be used throughout the mathematics education program, K-12, to develop understanding, concepts, and skills, to improve student attitudes and interest, and to assist with necessary remediation.

Following are some Postulates of Manipulatives:

1. Manipulatives help students understand mathematics.
2. Manipulatives are "objects" that appeal to several senses and that can be touched, moved about, rearranged and otherwise handled by children.
3. Manipulatives are "objects" that represent mathematical ideas that can be abstracted through physical involvement with the objects.
4. Research supports the use of manipulatives at all school levels.
5. Manipulatives are an integral part of instruction; not a supplement to it.
6. Manipulatives result in improvement in motivation, involvement, understanding, and achievement.
7. Manipulative materials promote problem-solving and computational skills.
8. A proper use of manipulatives may remove the need for later remediation.
9. Manipulatives selected for use should be appropriate for students' developmental level and learning style.
10. Selecting manipulatives for use in mathematics instruction is an important responsibility of teachers."

-from ***Using Manipulatives to Teach Mathematics, K-3*** printed by NYSED in the late 1980's.

A quote from a later NYSED publication, ***M*** ^{6} = *Manipulative Materials Make Math More Meaningful* published in the early 1990's follows:

"Strong evidence supports the claim that the use of manipulative materials generates improvements in motivation, involvement, and achievement while helping children to understand mathematical concepts. Also, learning theories suggest and research supports the fact that children whose mathematical learning is firmly grounded in manipulative experiences will be more likely to bridge the gap between the world in which they live and the abstract world of mathematics.

Such beliefs, though not always practiced, have long been the prominent focus of primary mathematics programs. Also manipulative materials have long been used successfully with students with handicapping conditions….

Children demonstrate their need for the use of manipulative materials when they count on their fingers. Instead of recognizing this need, an adult often responds to the child with a scolding!

When choosing which objects to use as manipulative materials, there are certain criteria to consider. Some important considerations are:

Cost
Accessibility
Adaptability or versatility
Ease of use and storage
Durability
Attractiveness
…

Using manipulative materials in math class need not be at all expensive. …In most cases, …easily obtainable 'odds and ends' serve adequately. Ordinarily, these are either free or can be 'scrounged'. They include such things as egg cartons, beans, pasta, containers of all kinds, bottle caps, buttons, shells, Popsicle sticks, Q-tips, clocks. The list is endless. So are their uses.

Various games of a mathematical nature can also be classified as manipulative materials. Games are also an excellent, as well as enjoyable, medium for developing logical thinking and providing practice in arithmetic operations.

One more important fact about the use of manipulative materials needs to be stated. That is, the use of manipulatives in and of themselves can be practically useless. Because the use of concrete materials very often forces students to obtain a correct answer, it is important that the representation of the same concept be expressed in several different ways-with **manipulatives, pictorially, and symbolically,** so that a student can see the ***manipulative/abstract connection.***

MANIPULATIVE→PICTURES→OTHER SYMBOLS→ABSTRACT

The chart below gives a list of easily obtainable materials that NYSED approved for use with the third and sixth grade PEP tests. Also included are examples of how each could be used. These are not allowed on the new state mathematics assessments however they are provided here to give you ideas of objects that are possible for even the highest need districts to make available to their students.

Item	*Suggested Material*	*Examples of Use*
Counters	Buttons, bottle caps, beans, chips, Popsicle sticks with rubber bands, pasta, cubes, interlocking cubes, fraction bars	▪ To assist and validate computation ▪ To represent place value and grouping ▪ To compare numbers for probability investigations ▪ To represent fractions (part of a group)
Graph paper	Centimeter, inch, dot	▪ To show base ten grouping ▪ To show fractional relationships ▪ To explore geometric relationships ▪ To assist and validate computation ▪ To make and use hundreds charts ▪ To construct number lines
Paper	Lined, blank, construction, greeting cards	▪ To make illustrations ▪ To construct geometric shapes ▪ To make counters, play money, fractional representations, etc. ▪ To make tangrams
Scissors	Left handed, right handed	▪ To construct geometric models ▪ To construct fraction pieces ▪ To make counters, play money

		paper models of rulers, protractors
Crayons/colored markers	6 or 8 basic colors	▪ To construct models ▪ To color illustrations ▪ To represent fractional parts ▪ To assist in probability investigations
Straightedge	Ruler, cardboard/tagboard strips	▪ To compare numbers ▪ To make number lines ▪ To construct geometric shapes ▪ To measure
Protractor and/or compass	Paper model, commercial compass	▪ To construct and measure geometric figures
Money	Paper models, commercial, real	▪ To assist with computation and problem solving ▪ To compare amounts of money
Clock	Paper model, commercial, real	▪ To assist with computation and problem solving
String	Twine, yard, thread	▪ To measure ▪ To construct geometric shapes ▪ To group objects ▪ To make Venn diagrams
Cube	Paper/tagboard model, commercial, containers, children's' blocks	▪ To examine surfaces, edges, vertices, spatial relations
Round paper plate	Commercial	▪ To examine circle graphs ▪ To assist in probability investigations ▪ To make models for fractional parts and operation algorithms ▪ To assist with geometry investigations.

Research Reference

Evelyn Sowell conducted a meta- analysis of the results of 60 studies on the effectiveness of mathematics instruction with manipulative materials (1989). The students ranged in age from kindergartners to college age and a variety of mathematics topics were included. Results showed that

- mathematics achievement is increased through long-term use of concrete instructional materials. (Long term means a school year or longer.)
- students' attitudes toward mathematics are improved when they have instruction with concrete materials provided by teachers knowledgeable about their use.
- Instruction with pictures and diagrams did not appear to differ in effectiveness from instruction with symbols. (The category of pictorial includes animated audiovisual presentations, observed demonstrations with concrete materials by the teacher, or pictures in printed materials.)

In the following sections we will take a look at manipulative materials that can be used at different levels of education. We will point out some specific research studies and some materials that are appropriate to the content and developmental levels of the students with suggestions of how many of them to get for a standard sized class.

Elementary (Pre K-4)

Commercially available Manipulative Materials

The commercially available manipulatives in the chart below are basic to a developmentally based mathematics program. The quantities listed are for a classroom of 20 students. These quantities give the teacher and students ready access to materials for whole class activities as well as allow for the establishment of learning stations so that students may use the materials as they proceed at their own pace. This is only a sample list and not intended to include all possibilities.

Grade	***Manipulative***	***Amount***	***Concepts***
Kindergarten	Pattern blocks	5 tubs	Patterns, one-to-one correspondence, sorting, classification, size, shape, color, spatial visualization
	Unifix cubes	1000 cubes	Number concepts, counting, classification, sorting colors, patterns, spatial visualization.
	Balance beam	1	Greater, less than and equal to
	Balance scale	1	Weight, mass, equality, inequality, measurement, estimation
	Color cubes	2 sets	Number concepts, counting, classification, sorting, colors, patterns, graphs
	Building materials such as Legos, Lincoln Logs	1 set	Spatial visualization, estimation
Grade 1	Pattern blocks	5 tubs	As in kindergarten plus geometric relationships, problem solving, logical reasoning, symmetry
	Unifix cubes	1000 cubes	As for kindergarten plus fact strategies, equality, inequalities, operations on whole numbers, even and odd number, graphing (bar graphs), measure length
	Geoboards	20	Size, shape, counting, estimation, spatial visualization, logical reasoning, symmetry
	Balance beam	1	As for kindergarten plus operations on whole numbers, open sentences, equations, fact strategies, measurement, logical reasoning
	Balance scale	1	Same as for kindergarten
	Color cubes	3 sets	Same as for kindergarten plus fact strategies, equality, inequalities, compare lengths or amounts, symmetry,

			probability
	Attribute blocks	6-8 sets	Sorting, classification, investigations of size, shape, color, logical reasoning, sequencing, patterns, symmetry, similarity, thinking skills, geometry
	Place value models (bean cards, coffee stirrers, digi-blocks	Classroom set	Addition and subtraction facts, place value
	Building materials	1 set	Spatial visualization, estimation
Grade 2	Pattern blocks	5 tubs	Same as grade 1 plus fraction concepts
	Multi-link cubes	1000 cubes	Same as Unifix cubes plus introduction to averages, commutative and associative properties, fractions, measure length
	Tangrams	Bag of 20 sets	Geometric concepts, spatial visualization, logical reasoning, fraction concepts, classification, sorting, patterns
	Geoboards	20	Same as grade 1
	Balance beam	1	Same as Grade 1
	Balance scale	1 with metric weight set	Same as grade 1
	Color tiles	3 sets	Color, shape, patterns, estimation, counting, number concepts, equality, inequality, operations on whole numbers, probability, measurement, even and odd numbers, probability, spatial visualization
	Attribute blocks	20 sets	Same as Grade 1 plus organization of data
Grade 3	Pattern blocks	5 tubs	Same as Grade 2 plus ratio, geometry, tessellation
	Multi link cubes	1000 cubes	Same as Grade 2 plus plane and solid geometry, perimeter, area and volume, prime numbers, composite numbers, square numbers
	Tangrams	Bag of 20 sets	Same as Grade 2
	Geoboards	20	Same as Grade 2 plus area, perimeter, circumference, symmetry, coordinate geometry, square numbers, polygons,
	Balance Beam	1	Same as Grade 2 plus

			equality, inequality, equations, multiplication and division facts, open sentences, relationship between addition and subtraction and between multiplication and division.
	Balance scale	1 with metric weight set	Same as Grade 2 plus equations, multiplication of whole numbers estimation
	Color tiles	3 sets	Same as Grade 2 plus area, perimeter, prime & composite numbers, ratio, percent, integers, square numbers.
	Attribute blocks	20 sets	Same as Grade 2 plus sequencing
	Base-ten blocks	2 sets with lines	Place value, operations on whole numbers, decimals, comparing, ordering, classification, sorting, number concepts of square numbers, area, perimeter, metric measurement.
Grade 4	Pattern blocks	5 tubs	Same as grade 3 plus similarity, congruence, angles
	Tangrams	25 sets	Same as Grade 3 plus congruence, angles
	Geoboards	25	Same as Grade 3 plus angles, circle concepts
	Color Tiles	3 sets	Same as Grade 3 relationship between multiplication and division
	Attribute blocks	1 set for every 2 students	Same as Grade 3 plus similarity, congruence
	Base-ten blocks	2 intermediate classroom sets	Same as Grade 3 plus decimal-fraction-percent equivalencies, percent
	Cuisenaire rods	12 trays of 74 rods	Classification, sorting, ordering, counting, number concepts, comparisons, fractions, ratio, place value, patterns, even & odd numbers, prime & composite numbers, logical reasoning, estimation, operations on whole numbers
	Balance beam	10 with metric weight sets	Same as Grade 3
	Metric beaker set for volume	1 set	Measurement, capacity, volume, estimation

Manipulatives provided with the Elementary Mathematics Assessment are: Square Counters, Pattern Blocks, Ruler with both customary and metric measurements. Students are only assessed with the metric measure. These manipulatives are provided as tools for students to use to answer questions and solve problems. It is essential that they have experiences with these manipulatives in order to be able to utilize them in the testing situation**.**

Intermediate (Grades 5-8)

Commercially Available Manipulative Materials

The quantities listed are for a classroom of 25 students. At the intermediate grades it would be ideal to have all the manipulative materials available in each classroom. If this is not possible, an adequate supply, as listed below, could be shared at each grade level. At these grade levels, it would also be beneficial to have a classroom set of Fraction Bars or the Fraction Factory, as well as a classroom set of Decimal Squares. This is only a sample list and not intended to include all possibilities.

Grades	Manipulative	Amount	Concepts
Grades 5 & 6	Pattern blocks	5 tubs	Patterns, sorting, classification, geometric relationships, symmetry, similarity, congruence, area, perimeter, reflections, rotations, translations, problem solving, logical reasoning, fraction operations, spatial visualization, tessellation, angles, ratio, proportion,
	Tangrams	25 sets	Geometric concepts, spatial visualization, logical reasoning, fractions, similarity, congruence, area, perimeter, ratio, proportion, angles, classification, sorting, patterns, symmetry, reflections, translations, rotations
	Geoboards	25	Area, perimeter circumference, circle concepts, symmetry, fractions, coordinate geometry, angles, estimation, percent, similarity, congruence, rotations, reflections, translations, classification, sorting, square numbers, polygons, spatial visualization, logical reasoning
	Pentominoes	25 sets	Logical reasoning, spatial visualization, reflections, translations, rotations
	Color Tiles	3 sets	Patterns, estimation,

			fraction operations, probability, area, perimeter, surface area, even & odd numbers, prime & composite numbers, ratio, proportion, percent, integers, square numbers, spatial visualization
	Base Ten Blocks	2 intermediate classroom sets	Decimals, decimal-fractional-percent equivalencies, comparing, ordering, number concepts, square and cubic numbers, area, perimeter, metric measurement, volume
	Cuisenaire Rods	12 trays of 74 rods	Number concepts, comparisons, fractions, ratio, proportion, patterns, even & odd numbers, prime & composite numbers, logical reasoning, estimation, operations on whole numbers, percent
	Balance scales	1 for every 3 students with metric and customary weight sets	Weight, mass, equality, inequality, equations, estimation, measurement
	Graduated cylinders and beakers	Sets for each 3 students	Measurement, capacity, volume, estimation, proportion
Grades 7 & 8	Geoboards	25 sets	Same as Grades 5 & 6 plus Pythagorean Theorem
	Color tiles	3 sets	Integers, fractions, probability, surface area, prime & composite numbers, ratio, proportion, percent, square numbers, combinations, algebra
	Algebra tiles	1 set for every 3 students	Integers, equations, inequalities, polynomials, similar terms, estimation
	Compasses	1 per student (Triman compasses or safe compasses)	Constructions, angle measurement
	Decimals Squares	1 per student	Decimals (place value, comparing, ordering, operations) percent,
	Geometric solids	1 set	Shape, size, relationship between area & volume, volume, classification, sorting, measurement, spatial visualization
	Miras	1 per student	Symmetry, similarity,

			congruence, reflections, rotations translations, angles, parallel & perpendicular lines, constructions
	Polyhedra models	1 set	Shape, classification, sorting, polyhedra, spatial visualization, probability
	Spinners	Various sets	Fractions, mental math, probability, generation of problems
	Thermometers	1 for every 3 students	Temperature, integers, measurement
	Two-color counters	20 per student	Number concepts, fractions, integer operations, probability, proportion
	Protractors	1 per student	Construction, angle measurement

Manipulatives provided with the Intermediate Math Assessment are: Protractor and Ruler with both customary and metric measurements. Students could be assessed with either the metric or customary measure. These manipulatives are provided as tools for students to use to answer questions and solve problems. It is essential that they have experiences with these manipulatives in order to be able to utilize them in the testing situation**.**

High School (Math A/B)

Commercially Available Manipulatives

It would be ideal to have all the manipulative materials available in each classroom. If this is not possible, an adequate supply, as listed below, could be shared at each grade level.This is only a sample list and not intended to include all possibilities.

Assessment	**Manipulative**	**Amount**	**Concepts**
Math A	Algebra tiles	1 set per student	Integers, equations, inequalities, polynomials, similar terms, factoring, estimation
	Dice, spinners	1 per student	probability
	Geometric models	3 sets	Study of solids, volume
	Tessellation tiles	Sets for each student	transformations
	Mirror or miras	1 per student	Transformations, symmetry
	Geoboards	1 per student	Area, perimeter, circumference, circle concepts, symmetry, fractions, coordinate geometry, slopes, angles, Pythagorean Theorem, estimation, percent, similarity, congruence, rotations, reflections, translations, polygons
	Conic section models	1 set	Circles and parabolas
	Volume demonstration kits	1 set	Volume, area, solids
	Compass/ruler	1 per student	Circles, constructions
Math B	Algebra tiles	1 set per student	Same as Math A

	Geoboards	1 per student	Same as Math A
	Tessellation tiles	Set for each student	Same as Math A
	Compass/ruler	1 per student	Same as Math A
	Conic section models	1 set	Same as Math A plus hyperbola, ellipse

For both Math A and Math B students should have available a straight edge and compass. A triman compass combines both of these tools.

Some vendors of Manipulatives

- Creative Publications, Customer Service, 5623 W. 115th Street, Alsip, IL 60803
- Cuisenaire/Dale Seymour, P.O. Box 5026, White Plains, NY 10602-5026
- Delta Education, P.O. Box 3000, Nashua, NH 03061-300
- Didax, 395 Main Street, Rowley, MA 01969-1207
- ETA, 620 Lakeview Parkway, Vernon Hills, IL 60061-9923
- Spectrum Educational Supplies, 7711 Welborn Street, Suite 111, Raleigh, NC 27615
- Trican Publishing, 6400 S. Crawford Rd, MT. Pleasant, MI 48858

QUERIES

1. ***If a school is identified as performing below the state performance standards will it still have to write a LAP or will the AYP take the place of it?***

"Yes, every school below the State standard must have a Local Assistance Plan (LAP) or an approved equivalent, CDEP. If a school below the State standard fails to make its AYP targets for two consecutive years, they must also have a school improvement plan. If a school receives Title 1 funding, there are other consequences for failing to make AYP. A school's Adequate Yearly Progress (AYP) targets will be reported on the report card with performance information showing whether they have met the targets."-Martha Musser

2. ***Does a special education student with an IEP in a self-contained class scoring in Level 2 on a state assessment need AIS services beyond the self-contained teacher?***

"The AIS criteria for determining need for services is that if a student scores below State standards that student is eligible for services. AIS services, for special education students, must be in addition to those services listed on the IEP."-Nancy Streeter

3. ***Does an IEP student receiving self-contained services as well as push-in AIS services also need pull-out AIS in addition to other services, regardless of intensity?***

"That depends on the intensity of the need of a student. If the less intensive push-in model provides what the student's needs indicate, then push-in alone is appropriate. However, if a student has more intense needs as determined by the district procedures, then other options should be added to the student's program."-Nancy Streeter

4. ***If a district houses all special education students from across the district in a single elementary building, are those students' scores reported with that building's test results or with the neighborhood school that he or she would have attended?***

"If the child is educated outside the district, e.g. at the BOCES, he is reported by the district of residence at the district-level. On the LEAP file, the school that provides services must also be reported. If a child attends school in the district of residence, he/she must be reported by the school he/she attends."-Martha Musser

A PERSONAL COMMENT

This is my last issue of NUMEL News! As some of you know already, Lynn and I are retiring at the end of this month. I want to thank the managers of EMSC for allowing me to communicate with you in this way. They have never censored anything that I have said to you and have been delighted to have me share with you all that has been shared. They have given me a great deal of professional freedom to share with the folks in the field and I have been gratified by your response to the information. Although I have not been replaced at this time, the plan is to replace me as soon as it can be accomplished. Until that time I recommend calling Jackie Marcano (518-473-9471) for any math questions. Dave Payton (518-474-5923) will continue to provide you with SED math updates through the same channels that I have been using.