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ABSTRACT

This report describes a program for increasing student readiness for and achievement in mathematics. The targeted population consists of third grade students in an expanding suburban community and kindergarten students in a culturally diverse urban community, both located in Northern Illinois. The problems of achievement in and attitudes towards mathematics is documented through published and teacher-made assessments and checklists focusing on motivational behavior. Analysis of probable cause indicates that student confidence, past success rate, and ability are deficient and impact student motivation. The professional literature reveals that teachers have not successfully matched math objectives with effective strategies to promote relevant learning and student-valued activities. A review of solution strategies suggested by knowledgeable others, combined with an analysis of the problem setting, has resulted in the selection of two major categories of intervention: (1) establishing goal setting with students; and (2) implementing a cross-age mentoring program to reinforce mathematical concepts and skills. Post intervention data indicated an increase in academic achievement in mathematics, an improvement in positive behaviors during math instruction, and a reduction in the number of off-task behaviors during math instruction. (Contains 27 references and 12 appendices.) (Author/DDR)

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# IMPROVING PRIMARY STUDENT MOTIVATION AND ACHIEVEMENT IN MATHEMATICS

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## ABSTRACT

This report describes a program for increasing student readiness for and achievement in mathematics. The targeted population consists of third grade students in an expanding suburban community and kindergarten students in a culturally diverse urban community. Both are located in northern Illinois. The problems of achievement in and attitudes towards mathematics will be documented through published and teacher made assessments and checklists focusing on motivational behavior.

Analysis of probable cause indicates that student confidence, past success rate, and ability are deficient and impact student motivation. The professional literature reveals that teachers have not successfully matched math objectives with effective strategies to promote relevant learning and student valued activities.

A review of solution strategies suggested by knowledgeable others, combined with an analysis of the problem setting, has resulted in the selection of two major categories of intervention: establishing goal setting with students, and implementing a cross-age mentoring program to reinforce mathematical concepts and skills.

Post intervention data indicated an increase in academic achievement in mathematics, an improvement in positive behaviors during math instruction, and a reduction in the number of off-task behaviors during math instruction.

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## CHAPTER 1

### PROBLEM STATEMENT AND CONTEXT

#### General Statement of the Problem

Students of the targeted kindergarten and third grade classes show an inadequate degree of student readiness for and achievement in mathematics. Evidence for the existence of this problem includes observations of student behaviors, journal entries of teacher observations, and published and teacher made assessments that indicate student academic performance.

#### Immediate Problem Context

##### School A

School A is one of eight neighborhood schools located in a midwest suburban unit district. Built in 1972 as an open concept school it housed kindergarten through sixth grade students. The facility was closed in 1991 due to a decrease in student population. As a result of local growth and flight from a neighboring school district, School A re-opened with a modified floor plan in 1994 as a pre-kindergarten through third grade building. Interior walls were necessary to provide for technology-enhanced classrooms. At the present time, School A is comprised of five double classrooms and twelve single classrooms, with an average class size of twenty-five. Overall, the building

is in sound structural shape and the size remains adequate for the current student population. Currently housing first through fifth grades, the total population consists of: 94.2% White, 3.4% Hispanic, 1.2% Asian/Pacific Islander, .7% Black, and .5% Native American. None of these students have been identified as Limited-English-Proficient. Low-income families account for 16.1% of the student population. Attendance patterns indicate a 95.9% rate with a mobility rate of 14.8%. Two students account for a .6% rate of chronic truancy.

The academic team consists of: one principal, three district coordinators, three first grade teachers, three second grade teachers, three fourth grade teachers, and two fifth grade teachers. Support staff includes: one and one-half Reading Recovery teachers, one half-time special education resource teacher, one half-time speech and language clinician, one half-time nurse, a part-time social worker, a part-time psychologist, and a part-time physical therapist. Additional support staff consists of: two part-time physical education teachers, two part-time art teachers, two part-time music teachers, and a half-time learning center director. The teaching experience of the academic staff ranges from one year to twenty-seven years, with three of the seventeen teachers holding a masters' degree. The office staff consists of one secretary, two part-time office aides, and five part-time general program aides, who assist in teacher material preparation.

The team teaching approach is used to cover the core subjects. The time devoted to each core subject within a five day week are as follows: reading and language arts, 735 minutes, mathematics 240, minutes, science 90, minutes, and social studies 90,



minutes. Curriculum integration allows for commercially purchased programs such as, Positive Action, which is used to compliment the mission of School A, which is stated similarly as the following: In unity with its families and communities, the facility is to recognize and challenge individual differences and to provide opportunities for growth and exploration within a safe, nurturing, non-competitive environment to foster life-long learning (Olson Park Elementary School, 1996 ).

### School B

Elementary public School B which includes grades kindergarten through sixth is located in a northwest quadrant of a large midwest urban area. The school programs are delivered by a staff that includes regular education teachers and extensive support staff. The building is conducive to management of its school improvement plan initiatives.

The population of School B is diverse racially and socioeconomically. The site is unique with its high attendance rate; yet it also has a relatively high mobility rate. The ethnic background of students enrolled is: 58.9% White, 33.8% Black, 5.2% Mexican-American, 2% Asian/Pacific Islander, and 0% Native American with a total enrollment of 343 students. Students are considered to be low-income if: they are from families receiving public aid, living in institutions for neglected or delinquent children, being supported in foster homes with public funds, or having eligibility to receive free or reduced-price lunches. School B has 53.9% of the population considered low-income. The attendance rate is 92.8% at this site, with the actual number of chronic truants who were absent from school without valid cause for 10% or more of 180 school days at 21 students or 6% of the total population. The number of students who enroll in or leave

the school during the school year is 33.7%.

The philosophy of School B is to provide a foundation of knowledge to students in a positive, caring, safe, and orderly environment to facilitate optimal individual growth and a desire for life-long learning . The school programs and instructional strategies include: the Success For All reading program, Everyday Mathematics, cooperative learning, Activities Integrating Math and Science (AIMS), thematic instruction, social skills development, and technology integration.

The Success For All reading program organizes resources to focus on prevention and early intervention. It ensures that virtually every student will succeed in reading throughout the elementary grades. The components of Success For All include: tutors for first through third graders, eight-week assessments to monitor progress, reading and writing programs, cooperative learning, a family support team to facilitate planning for students with difficulties, and a full-time facilitator to monitor implementation of the program (Johns Hopkins University, 1996 ).

The Everyday Mathematics program was developed by the University of Chicago's School Mathematics Project for the elementary grades. The program supports the district, state, and national goals for School B. The program creates an environment which: stimulates learning, promotes thinking and communicating mathematically, and involves children in both doing and thinking math. It follows a spiral curriculum that teaches a concept at least five times in order to allow children many opportunities for mastery. Basic facts are critical to the program and developed through the use of games. Children are involved in activities focusing on: numeration, counting, operations,

relations, problem solving, mental arithmetic, data collection, analysis, geometry, measurement, money, rules, and patterns.

Cooperative learning is used regularly throughout the instruction of reading and math. It is also used in other content areas in order to organize classroom activities so that students can interact with and learn from one another as well as from the teacher and the world around them. Cooperative pairs or groups of three, four, or five build on each other's ideas and strengths.

A hands-on method approach to teaching science is used by most teachers for instruction. Activities Integrating Mathematics and Science (AIMS) is a primary source for materials. This program integrates: mathematics, science, language arts, and social studies. It offers support to the teachers that are planning thematically around a social studies or science theme.

School B uses preventative and proactive strategies for dealing with conflict. A program currently used focuses on: feelings, empathy, conflict resolution strategies, and anger management. A school-wide social skills curriculum is in place with a different focus for each month and teachers support this focus in daily lesson planning.

A computer lab holding 26 computer stations is the primary area developed currently for technology development. At present, a technology committee has been formed to further develop areas of technology to enhance curriculum goals and objectives.

School B has both regular education teachers and support staff. The staff consists of 14 regular education classroom teachers with two teachers at each grade level from

kindergarten through sixth grade. The building hosts one full time physical education instructor, a three-fifths time art instructor, and a two-fifths time music instructor. One administrator heads additional court-ordered support staff that includes: a curriculum implementor who is responsible for upholding guidelines for instruction, a Success For All reading implementor who oversees full implementation of the reading program, a student support specialist who emphasizes positive social skills, and a parent liaison who works as a link for home and school communication. Title I services are delivered to all children by two Title I teachers. Two reading teacher/tutors and two teacher aides offer added instructional services for the Success For All reading program. One special education resource teacher and four full-time inclusion aides offer assistance to students identified with special needs. The special education department includes: a part-time psychologist intern, social worker, speech and language pathologists, physical therapist, occupational therapist, and a school nurse. One computer aide and one library aide support existing programs.

Building B, built in 1950, is a well-maintained single level site located near its business partner, which is a community hospital. Grade level classrooms are located next to or across from one another throughout the building. Primary classrooms of grades kindergarten, first, and second are housed in one wing of the school with intermediate levels of third, fourth, fifth, and sixth occupying the other wing. All rooms used are closed off from one another. Average class size for kindergarten is 20.7 students; first grade is 25.5 students; third grade is 25.5 students; and sixth grade is 20 students. Assignment of students to each classroom must meet a +/- 15% minority/majority ratio

for the building. The minority population consists of Blacks and Mexican-Americans. The office, library, gymnasium, art room, music room, special education resource room, and computer lab are centrally situated to allow access for all students. Additional facilities include: a separate cafeteria for breakfast and lunch programs, a parent and volunteer resource room that also serves as a site for peer mediations, a teacher resource room and annex for books, supplies, and educational tools. A shortage of classrooms forces the two Title I teachers to share a room and the Success For All teacher/tutors to share a room and still instruct reading groups of 8 to 16 students simultaneously.

### The Surrounding Community

#### School A

The school district currently serves an expanding suburban community of 33,700 residents. The district is located 15 miles south of the state line and 90 miles northwest of the third largest city in the nation. Two cities make up the district's 20 square attendance miles. Households without children account for 51.1% of the population. Married couples with children under 18 years of age comprise 41.3% of the total households with single-parent families standing at 6.2%. The median family income within the district is \$36,076 (Harlem School District Demographic Report, 1993).

While a majority of residents 25 years of age and older have graduated from high school, a significant 23.8% do not have a diploma. A college education or a post-high school degree has been earned by 30.8% of the residents.

The work force in the community is predominantly blue collar with an employment rate of 94.8%. This work force is categorized as: 32.2% Technical/Sales/

Administration, 20.5% Operators/Fabricators/Laborers, 18.4% Managerial/Professional, 15.9% Precision Production Workers, 12% Service Workers, and .9% Farming/Forestry/Fishing.

The district serves the needs of 6,300 students who range in age from three to twenty-one. Students living more than one and one-half miles from their neighborhood school are eligible for district provided transportation. Special education services are available to: mentally impaired, hearing impaired, visually impaired, and learning disabled students. Additional intervention services available are Reading Recovery, Chapter One, Children At Risk Educationally (C.A.R.E.), and transitional programs. A magnet school housing an academic academy is offered to students who excel in academics and fine arts.

Growth within the district has brought about the reopening of schools and relocation of the district pre-kindergarten and kindergarten programs. Some of this growth may be attributed to the district's proximity to a large metropolitan school district that is currently experiencing an on-going discrimination lawsuit. This lawsuit has resulted in flight from the adjacent district into the subject district.

The educational needs of the subject district are overseen by the central office. The administration consists of a superintendent, an assistant superintendent for business services, and an assistant superintendent for human resources. An elected school board meets twice monthly. This board deals with situations pertaining to: budget, staffing, discipline, facilities, and curriculum.

## School B

Community characteristics play a large part in the function of School B. The School B district is located in a large unit district with a desegregation mandate currently operating. The size and location of the city also influences the population and socioeconomic make-up of School B.

Public School B exists in a district that serves a midwest urban population of 145,465. The ethnic background of the district's student population is: 62.5% White, 26.2% Black, 8.2% Mexican-American, 2.8% Asian/Pacific Islander, and 0.2% Native American with a total enrollment of 26,752 students. The school district has 39.3% of its population that is considered to be low-income. Attendance rate in the district is 91.7% with student mobility of 20.7% and chronic truancy is 8.8%.

The teachers' ethnic, racial, and gender background are as follows: 90.6% White, 5.5% Black, 2.5% Mexican-American, 1.0% Asian/Pacific Islander, and 0.4% Native American. Male teachers in the district constitute 26.2% of the faculty while female teachers constitute the other 73.8%. The total number of teachers employed is 1,706. The average teaching experience is 16.7 years with 33.6% of teachers completing Bachelor's degrees and 66.4% completing Master's degrees or higher. Elementary schools have an 18.6:1 pupil-teacher ratio and the average class size at kindergarten is: 21.3, grade one is 22.1, grade 3 is 22.7, and grade 6 is 23.7. Pupil-administrator ratio is 259.8:1. Central office administration consists of: a superintendent of schools, an associate superintendent of equity and educational services, an associate superintendent of management services, an assistant superintendent of human services, and additional

general directors to oversee: pre-kindergarten, elementary, middle, secondary, and magnet programming. A parent center has recently been operating to make student assignments. Seven elected school board members meet at least twice a month.

The school district is now in its sixth year of a discrimination lawsuit that was filed in 1991. A number of citizens formed a group known as, "People Who Care" (PWC), in 1989, and protested the closing of many schools located in neighborhoods on the west side of the city that are predominantly minority populated. Because of the school closings and additional patterns of racial discrimination, a lawsuit was filed in the United States District Court.

The Second Interim Order, an agreement between all parties, was reached in 1991. It was agreed that some schools would be reopened, a new school would be built, teachers would receive additional training, the curriculum would be changed, new programs would be implemented for minority students, and voluntary integration efforts would be made.

The district was then found guilty by Judge Stanley J. Roszkowski in 1994 on eleven counts of willful discrimination in the following areas: student tracking and ability grouping, within-school integration, student assignment, faculty and equipment disparity, employment disparities, staff assignment, transportation, extra curricular activities, bilingual education, special education, and composition of the Board of Education. An order was handed down to the district to begin remedies to eliminate racial and ethnic discrimination and to provide an equitable education for all students. The district is currently implementing programs and services, recruiting teaching staff,



and initiating use of a controlled choice assignment plan to resolve discrimination findings.

This city is the second largest urban area in the State. Located along a river in the north-central part of the state, it is approximately 90 miles northwest from the largest metropolitan area. Due to location of this city, the labor force is made up of primarily blue collar workers. In September, 1995, the unemployment rate was at 4.3%. Manufacturing of goods is a leading industry. The median family income is \$37, 533 and per capita income is \$14, 273.

#### National Context of the Problem

There is growing concern for the lack of student motivation to achieve. This problem is evident through national studies, student perceptions on school and learning, and the ever-growing number of instructional interventions. In our changing society, Stipek claims it is necessary for educators to transfer diffident students into learners who exhibit behaviors that indicate a level of motivation by working well independently, beginning and completing tasks on time, volunteering to respond, and paying attention (as cited by Fulk & Montgomery-Grymes, 1994).

Nationally, students are exposed to conditions that can negatively affect learning and potentially cause academic decline. Schorr in 1988 and Dryfoos in 1990 reported startling statistics: at least 24 million children live in poverty in the United States, a child is abused every 2 minutes, school dropout rates range from 25% to 50% of the student population in different communities, with minority students being the most vulnerable, and thousands of robberies, burglaries, aggravated assaults, and rapes are committed by

students in primary and secondary schools every year (as cited by Serna & Lau-Smith, 1995). These can have serious implications for learning. Additionally, the 1992 United States Census Bureau reported that the number of poor Americans continues to grow, reaching 14.7%. For children, the figure was 20%, and for Blacks and Mexican-Americans it reached close to 50%. Hedelin and Sjoberg's study (1985) found that student attitudes become increasingly negative by the time they reach ninth grade. Studies suggest that we are moving away from the belief that all children begin school ready and willing to learn or that they maintain enthusiasm for learning.

Students have perspectives of their own on school and learning. Freshman students from two California school districts were involved in a two-year study to identify factors that affect students' engagement with schools and learning. Students listed that classrooms where they feel they know the teacher and the other students are needed. They also place value on having teachers who care. They prefer an active role in learning rather than one of a passive learner with textbooks (Phelan, Davidson, Cao, 1992).

Researchers, Bandura and Schunk, have theorized that motivation is affected substantially by students' beliefs regarding their ability to meet task demands (as cited by Fulk & Montgomery-Grymes, 1994). It is, therefore, necessary to implement practical strategies to optimize student motivation. These strategies should involve students in decision making, promote and maintain interest for students, and foster a nonthreatening, positive classroom environment (1994).

## CHAPTER 2

## PROBLEM DOCUMENTATION

## Problem Evidence

In order to document student achievement in mathematics, an individual baseline math test was administered to kindergarten and third grade students during the first two weeks of the school year. Currently, both school districts want children to be at grade level. The purpose of the initial testing was to show grade level equivalent scores.

There were 47 students tested. The data presented in the table below represents the results of the Piat assessment tool. The data is presented in Table 1.

Table 1.

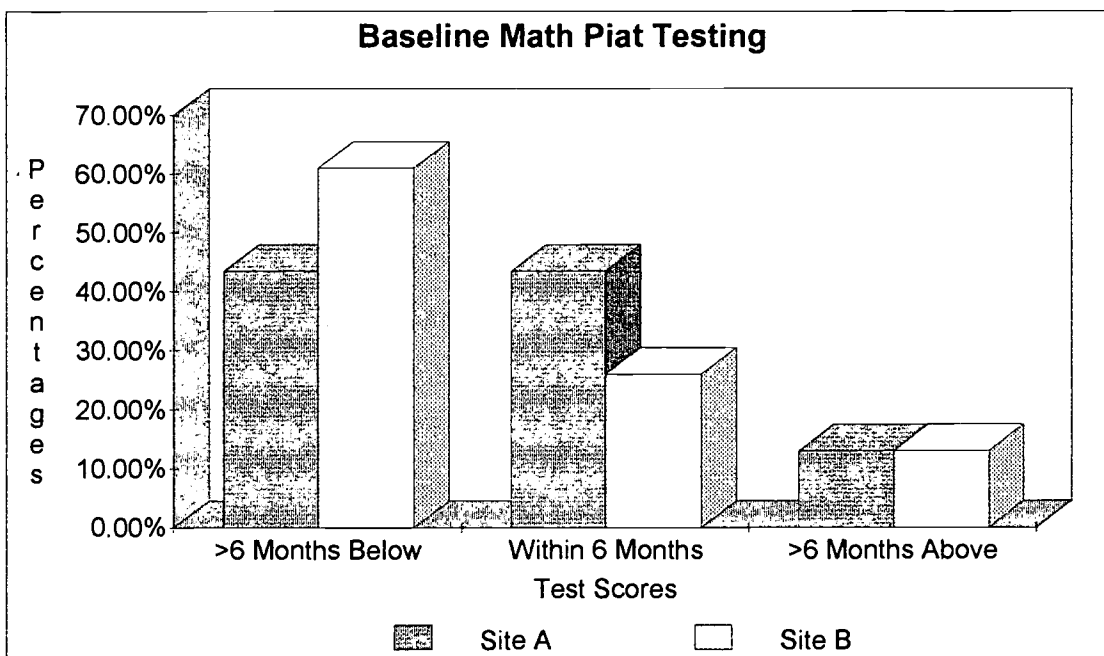
Number of Students Achieving Below, Within, and Above Grade Level

	More Than 6 Months Below Grade Level	Within 6 Months of Grade Level	More Than 6 Months Above Grade Level
Site A	10	10	3
Site B	14	6	3

Of the 47 students tested, 53 percent of the students are more than six months below grade level. We considered all kindergarten students that had a grade level equivalency below kindergarten entry level to be in this category. Test data reflected that Site A has a wide span of abilities in math, with scores falling to 2.9 years below grade level to 3.4 years above grade level. Further analysis of the testing revealed that Site A

students showed significant deficits in the following: telling time, having number sense, multiplying, and dividing, while Site B showed significant deficits in adding and subtracting in problem solving, identifying numbers, understanding spatial relationships, identifying and counting money, and comprehending math vocabulary.

The data presented in Table 1 is illustrated in the following figure.

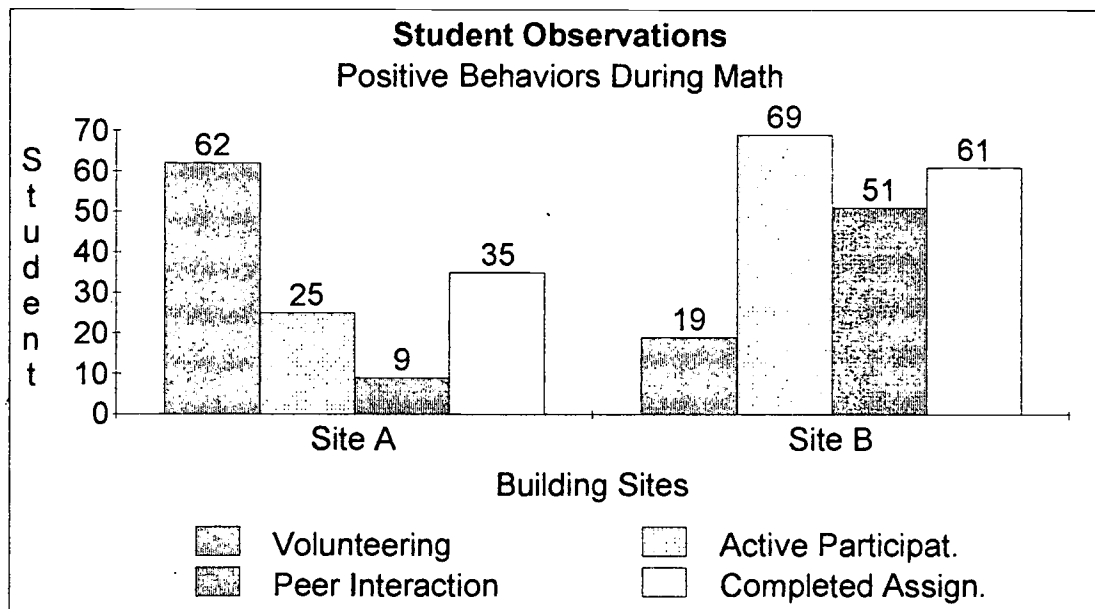


	More Than 6 Months Below Grade Level	Within 6 Months of Grade Level	More Than 6 Months Above Grade Level
Site A	43.50%	43.50%	13%
Site B	61%	26%	13%

**Figure 1.** Percentage of students scoring more than 6 months below grade level, within 6 months of their grade level, and more than 6 months above grade level.

Students at both sites were observed three times during a three week interval during math direct instruction and independent math activities. At the kindergarten level, students were observed for 20 minute periods. Third graders were observed for 45 minute intervals. Positive behaviors consisted of volunteering, active participation, peer

interaction, and completed assignments. A summary of the number of positive behaviors observed is shown in the following figure.



**Figure 2.** Number of positive behaviors observed at each site during math instruction .

Baseline observations at site A consisted of students volunteering 62 times, actively participating 26 times, interacting with peers 9 times, and completing assignments 36 times. At site B, students volunteered 19 times, actively participated 69 times, interacted with peers 51 times, and completed assignments 61 times. Observations at site A were done approximately two-thirds during direct instruction, while the other one-third was done during independent activity. Two observations at site B were done during direct instruction while the other observation was during exploration of math manipulatives. Site A considered that volunteering was occurring when students raised hands to give or share information while active participation was marked as occurring when students modeled or performed tasks. Site B looked at volunteering as responding to a task willingly and active participation happened when students modeled, completed

tasks, and showed behaviors of active listening. Classroom management differed at site A and site B. Site A students are asked to raise hands in response to questions. Site B engages students through a different management style that does not necessarily require students to raise hands to respond, thus there are marked differences in volunteering and active listening at the two sites. There are a considerably larger number of peer interactions tallied at site B because one of the observation times was during a time when students were allowed to work and talk with others.

Off-task behaviors consisted of those that were passive and aggressive. Passive behaviors were any behaviors off a prescribed activity which included: looking around, staring into space, doodling, or any other observable movement off the task at hand was included. Aggressive behavior was that of any movement off a prescribed activity which included: distracting sounds, out of place, physical contact, or destruction with another person or another person's property, or any other observable movement that is off the task at hand was included. A summary of the percentage of aggressive behaviors is shown in the following figures.

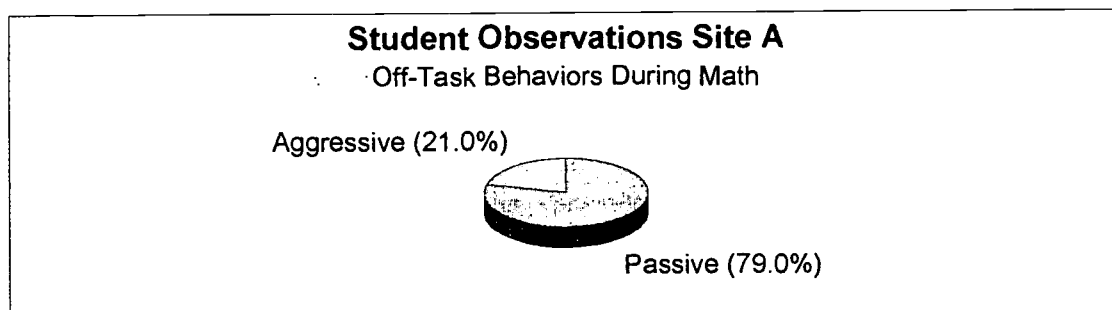


Figure 3. Percentage of off-task behaviors observed at site A during math instruction.

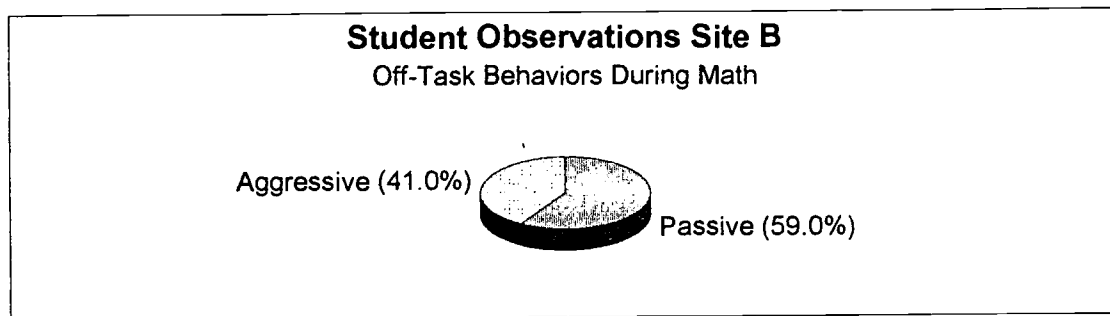


Figure 4. Percentage of off-task behaviors observed at site B during math instruction.

Observations done at site A consist of students showing passive off-task behaviors 79 percent of the time and aggressive off-task behaviors were exhibited 21 percent of the time. Site B students showed passive off-task behaviors 59 percent of the times observed and aggressive off-task behaviors 41 percent of the time.

#### Probable Causes

In analyzing the sites, there may be underlying causes for inadequate student readiness for and achievement in mathematics. Class size is a problem at Site A, while the mobility of students, teachers, and administrators; a discrimination lawsuit; and declining parental involvement may all be factors in Site B. Both sites have withstood recent curriculum changes without, often times, adequate teacher training.

At Site A, there has been an ever-increasing flight of students from a neighboring school district causing class size to rise to the maximum number of children allowed without overages at each grade level. This creates a ratio of 1 teacher to 28 students in each classroom. It becomes difficult for teachers to individualize instruction and meet the needs of so many children.

Site B has a mobility rate for students of 34%, as noted in Chapter 1. The current teaching staff consists of only 4 teachers out of 25 that have been in the building for more than three years. There has also been three different administrators in the last four years. This lack of mobility in students, teachers, and administration causes inconsistencies in programming and interventions which can effect student motivation.

The current discrimination lawsuit has effected Site B in some of the following ways. Choice Advantage, a remedy in place to integrate schools, is causing some families to enroll students into schools that are no longer in their neighborhoods. Taxes, due to the lawsuit, are at a record high, with parents and community members in constant protest. Local media has reported mismanagement of funds and lack of program success in raising standardized achievement results. These circumstances, certainly may be cause for the lack of parental commitment in the schools, which, in turn, effects the lack of commitment from students.

Both sites have noticed continuing curriculum changes. Site A has been implementing a computer technology program for three years with little initial training and no follow-up training since. Textbooks are outdated for all curriculum areas, except reading, and aren't conducive to the use of effective teaching strategies for instruction. Site B has an ever-changing curriculum. Teachers lack the time to effectively master curriculum content before it changes. In addition, Site B has implemented a new reading program, math program, writing program, and science series in the last two years. Teachers at both sites find it difficult to keep up with the constant changes with minimal support or training.



The literature suggests several underlying causes for inadequate student readiness for and achievement in mathematics. The causes can be categorized under the following headings: student attitudes and abilities, teacher abilities, and developmental considerations.

There are several factors that effect student attitudes and abilities in the classroom. According to Ringness (as cited by Main, 1993), students have negative feelings about school and school tasks. Students feel that many classroom tasks are irrelevant and boring. Students see little connection between school learning and their lives outside the classroom. In addition, students lack the skills and strategies in order to take responsibility to complete tasks, nor do they have the ability to set goals to make task completion relevant (Lumsden, 1994; Main, 1993; Ornstein, 1994). Classroom tasks are often too difficult for students to complete with success (Main, 1993; Ornstein, 1994). Keller (as cited by Main, 1993) reports that student expectancy for success is based on these prior experiences. In short, students show negative feelings towards school, a lack of volition to learn, and minimal successes in their studies.

Teacher abilities play a role in preparing students for readiness and achievement in mathematics. Often times, teacher presentation of lessons is inadequate. Instructional methods are ineffective according to Main (1993) and Ornstein (1994). Teachers lack knowledge of strategies that facilitate the fostering of intrinsic or extrinsic motivation (Newby, 1991). In addition, Newby states that students need to be aware of why they are learning and its value. Linking of lessons to student interest, future activities, and past

experiences is a process that attempts to provide relevance to learning. Not only are lessons not presented effectively, but not enough time is spent honing skills (Main, 1993). Teachers also do not inform learners of the importance of the learning outcome (Main, 1993), therefore, relevant goal-directed activities are not implemented (Ford, 1995). Teachers, often times, fall short of giving student feedback as learners progress towards a desired goal (Ford, 1995). Teachers lack knowledge of effective instructional methods, fail to make lessons relevant, and provide insufficient feedback to students.

Developmental abilities need to be taken into account in order for students to show readiness for and achievement in mathematics. Student abilities for learning need to be recognized first. It would be unreasonable to try to teach a primary student abstract concepts in the field of chemistry, for example. In addition, considerations need to be dealt with in regards to emotional development. Younger students view praise differently than older students. Younger students interpret effort as a part of ability. As a result, when younger students are praised for effort, it increases their self-confidence (Lumsden, 1994). It would be reasonable to assume, then, that areas of development must be examined in order to maximize chances for success.

## CHAPTER 3

### THE SOLUTION STRATEGY

#### Literature Review

Analysis of probable cause data suggests that six components of education need to be addressed in order to increase student readiness for and achievement in mathematics. The classroom structure needs to be tailored to student learning; learners need to have control in educational decisions; reward systems play a part in motivation to learn; student interest in what is being taught is important; self-efficacy and attributes of students influence learning; and social interactions in the classroom enhance learning. In addition, programs have been developed to promote student motivation.

The classroom structure consists of the actual classroom environment and instructional approaches used within the classroom. Okola (as cited by Fulk, Montgomery-Grymes, 1994) says that a non-threatening positive classroom environment that encourages risk-taking is conducive to motivation. In this type of classroom, teachers would refrain from criticism or calling attention to poor performance (Fulk, Montgomery-Grymes, 1994). The classroom is comfortable, orderly, and pleasant (Ornstein, 1994). Teachers make a conscious attempt to monitor vocal delivery,

gestures, body movement, eye contact, and facial expression to enhance the degree of enthusiasm conveyed in one's teaching (Lumsden, 1994). A variety of instructional strategies are implemented, including direct instruction, cooperative learning, peer tutoring, hands-on activities, group projects, debates, discussions, game formats, computer-assisted instruction, and other individual activities (Beirne-Smith, 1991 and Johnson & Johnson, 1986 as cited by Fulk, Montgomery-Grymes, 1994; Ornstein, 1994). Closure of lessons is imperative and teachers must provide feedback to students that is frequent, clear, constructive, and encouraging (Lepper & Malone, 1987 as cited by Fulk, Montgomery-Grymes, 1994; Ornstein, 1994). In short, teachers offer many chances for success within a "learning oriented" classroom (Lumsden, 1994).

Students need to feel that they have impact on decision-making in the classroom. Responsive teachers do not relinquish power, they share power and responsibility, providing a continually evolving balance between choice and structure; they negotiate with students within appropriate arenas; they provide ground rules; and they make clear what the "givens" are and what students' options are within those given areas (Oldfather, 1993). Students are allowed, within the classroom setting, opportunities to pursue interests without formal evaluation (Corno, 1992). It is imperative that students be allowed to make choices in issues ranging from simple to more complex as age appropriate (Fulk, Montgomery-Grymes, 1994; Pardes, 1994).

Although there are conflicting views on extrinsic rewards, educators should understand that extrinsic rewards often have "multiple effects on children's motivation". When applying extrinsic rewards, it is critical for teachers to take into account individual

differences in student interest, performance, and ability (Lumsden, 1994). Teachers should not become overly reliant on extrinsic rewards. If students work only to receive extrinsic rewards, they may seek to meet only the required minimum standards for performance (Brophy, as cited in Lumsden, 1994). Existing intrinsic motivation should be capitalized upon by gearing tasks to students' interests, incorporating novelty, and varying tasks (Lumsden, 1994). Programs like the Incentives for Improvement have been developed for students to compete against themselves. Students start with a base score in any given subject area and try to beat that score on a weekly basis. Based on students' improvement points, a reward system can be developed (MacIver, Reuman, 1994). Traditional approaches usually are ineffective in motivating students because the approaches do little to ensure that each and every student faces a goal that is reachable yet challenging.

When taking student interests into account, teachers must also be sure that classroom tasks are perceived as valuable, and, that students can fulfill the basic requirements of completing the tasks (Ornstein, 1994). It is helpful if these tasks are actively engaging and promote student ownership in learning. Content instruction is centered on issues of optimal challenge with lesson introductions, clear expectations, and varying presentation styles (Fulk, Montgomery-Grymes, 1994). During instruction, teachers need to activate students' prior knowledge on specific topics and point out inconsistencies between newly learned information and prior knowledge (Lepper, 1988 and Okolo, 1992 as cited by Fulk, Montgomery-Grymes, 1994). In order to adequately plan lessons, use graphic organizers to show the overarching goals, identify main topics

of instruction, and choose assessment pieces with engagement of students in mind (Perrone, 1994). It is important to carefully plan lessons with student interests in mind, but also be prepared to support student spontaneity when it reinforces student academic interests, as well (Lumsden, 1994).

Self-efficacy deals with learners' confidence, their personal view of their abilities, and their tendency to attribute success to active engagement in learning. In order to provide positive feelings that result from task accomplishment, students can self-record, graph, and self-reinforce their progress toward specified goals by using simple grids (Fulk, Montgomery-Grymes, 1994). It is important to make students responsible for their own learning and help them to develop their own internal goals (Pardes, 1994). The setting of goals for performance provides a mechanism for self-assessment and supports student responsibility for success and/or failure (Alderman, 1990). As teachers, we can support student self-efficacy by helping students set reasonable goals and grading and returning assignments in a timely manner while recognizing students as they achieve self-set goals (Fulk, Montgomery-Grymes, 1994; Ornstein, 1996).

Social interactions, such as peer tutoring, cross-age tutoring, and mentoring, move the teacher away from center stage and encourage students to help each other. Similar to cooperative learning, the use of peer tutoring results in notable changes in classroom organization. Students appear to like these changes, and when content is appropriately presented, they can result in significant academic success (Casanova, 1990). Cross-age tutoring involves students from one grade level and students from another grade level working in short, targeted study sessions towards improvement.

Improvement is certainly gained by younger students, but the added benefit is the improvement in attitudes and social skills of older students (Bogan, 1997). Mentoring programs also motivate students to learn. One inner city mentoring program provided minority students with role models to show them what is possible in life and to give some understanding of what is needed to get there (Abi-Nader, 1991).

In addition to the components mentioned above that play a part in affecting student motivation, programs like the I CAN and SCORE have been developed to support student engagement. The I CAN strategy was developed to help students learn to affirm, on a daily basis, that every individual can be successful in the tasks they approach. It involves contracting, charting, and parent reporting forms. It allows teachers to document student growth more accurately on a daily basis, while providing teaching colleagues and parents with a better understanding of the students' progress and educational program (Swanson, 1992). SCORE stands for Success, Curiosity, Originality, Relationships, and Energy. In order for students to feel successful, they must also have a clear articulation of the criteria for success. The other qualities are developed by providing clear, immediate, constructive feedback. These goals provide knowledge for students to deal with the complexity, confusion, and repetition of given assignments, and supply the drive needed to complete tasks. Students then see success as a valuable aspect of their personality (Strong, Silver, Robinson, 1995).

### Project Objectives and Processes

As a result of goal setting with students with emphasis on mathematical concepts and skills, during the period of September 1997 to December 1997, the kindergarten and third grade students from the targeted classes, will increase academic achievement in mathematics and improve attitudes towards mathematics as measured by teacher observation of student behaviors, journal entries of teacher observations, and published and teacher made assessments that indicate student academic performance.

In order to accomplish the project objective, the following processes are necessary:

1. Collect and review materials that incorporate the use of goal setting with students to increase student motivation and self-regulated learning.
2. Baseline concept skills will be identified for math.
3. Lesson plans for mathematics will be modified to infuse goal setting and to provide opportunities to apply concepts and skills.
4. Develop goal sheets for student/teacher planning/goal-setting sessions.

As a result of cross-age mentoring with emphasis in the content area of mathematics, during the period of September 1997 to December 1997, the kindergarten and third grade students from the targeted classes, will increase academic achievement in mathematics and improve attitudes towards mathematics as measured by teacher observation of student behaviors, journal entries of teacher observations, and published and teacher made assessments that indicate student academic performance.

In order to accomplish the project objective, the following processes are necessary:

1. Collect and review cross-age mentoring materials.
2. Train student mentors to work with targeted students.
3. Employ goal sheets for mentoring use to guide in concept/skill instruction with targeted students.



## Project Action Plan

### **Objective One; Process Statement One:**

WHAT: Find articles to support the strategy.

- Complete and ERIC search for professional journal articles on the goal setting topic.
- Go to the library and gather information relevant to the topic.

WHEN: Collection of all research materials will completed during summer 1997, not exceed July 15, 1997.

WHY: Goal setting with students increases motivation to learn and aids in ability to self-regulate learning.

### **Objective One; Process Statement Two:**

WHAT: Examine curriculum objectives, teacher resources for instruction, and assessment pieces to select concepts/skills that meet the following criteria:

- math program objectives
- district goals and objectives
- state goals

WHEN: All concepts and skills will be identified during summer 1997, not to exceed August 1, 1997.

WHY: Teachers and researchers know that a limited number of concepts/skills should be focused on during a given time frame that are also at students' developmental levels in order to increase motivation to learn.

### **Objective One; Process Statement Three:**

WHAT: Identify lessons that teach chosen concepts/skills:

Clearly state objectives and relevance for mastery of skills at start of each teaching lesson.

Follow lessons (Sample lesson in Appendix A and Appendix B) that teach identified skills using the following format:

- Name the skill to be taught
- Define, describe, and/or model the skill to be taught.
- Provide activities to practice the skill that was taught.
- Reflect on the skill that was taught.

**WHEN:** Initial identification of lessons will be completed by September 1, 1997. Lessons may be modified weekly, as needed, through mid December 1997. Clearly stated objectives will occur daily during math instruction and during any other instruction that incorporates identified math skills from September through December. Math lessons will occur daily for 30 minutes in the kindergarten classroom and for 40 minutes in the third grade classroom from September through December.

**WHY:** Student needs have to be addressed and personalized in order for students to perceive tasks as valuable. Modeling, practice, and reflection are effective tools for learning. Putting value to tasks and using effective teaching techniques, in turn motivates students to learn.

**Objective One; Process Statement Four:**

**WHAT:** Plan the format for the goal setting sheet.

Insert the list of identified math concepts/skills into the goal sheet format.

Create the goal setting sheet that will be used (See sheet in Appendices C-I).

Schedule individual or small group sessions with students following these criteria:

- Identify areas that need improvement.
- Goals set should be attainable.
- Students will not concentrate on more than three skills per week.
- Small group sessions will contain students with like abilities and will not exceed four students at one given session.

**WHEN:** Goal setting sheet will be completed during summer 1997, not to exceed September 1, 1997 in order to use by mid September. Individual or group goal setting sessions will occur weekly, not to exceed 5 minutes per session.

**WHY:** Students are more motivated to learn and perform better on tasks when they help set their own goals. Goals need to be attainable, close-at-hand, and specific for elementary students.

**Objective Two; Process Statement One:**

WHAT: Find articles to support cross-age mentoring.

- Complete and ERIC search for professional journal articles on the mentoring topic.
- Go to the library and gather information relevant to the topic.

WHEN: Collection of all research materials will be completed during summer 1997, not to exceed July 15, 1997.

WHY: Social interactions between students increases academic performance and promotes motivation to learn.

**Objective Two; Process Statement Two:**

WHAT: Develop a tutoring packet for mentors to use when tutoring which includes the following materials:

- Student goal sheets will have identified skills that need reinforcement.
- Instruction cards will be provided for mentors to use to reinforce skills.
- Manipulatives will be available for use in completing tasks.
- Stickers and award certificates will be enclosed for use in rewarding achieved goals.

Model tutoring process to prospective mentors, emphasizing the following:

- Fact practice and number counting procedures will be reviewed.
- Use of instruction cards to reinforce skill instruction will be explained.
- Processes for constructive helping instead of doing will be given.
- Positive reinforcement phrases will be listed and later available for use.
- Developmental levels of students to be worked with will be discussed.

Practice a tutoring session with one of own peers before actual tutoring takes place.

WHEN: Begin developing tutoring packets during summer 1997. Finalize initial packets by the end of August to be ready for mentor training and the first tutoring session with students. Packets will be updated weekly to meet students' goals. Tutor training will be completed during the first week of September 1997.

WHY: Peer tutoring is more effective when peers are trained. Modeling and practice are effective tools for teaching students.

**Objective Two; Process Statement Three:**

**WHAT:** Introduce goal sheets at mentor training, explaining the following components to students:

- Concept/skill column tells what is appropriate for the grade level that is being tutored.
- The goal column will be circled or checked off telling what areas need reinforcement.
- The comment column will be used by the tutors to document progress made or difficulties that taking place.

Success marks will be used to document achieved goals:

- Stickers will be put on the goal column when a concept or skill is achieved.
- Award certificates will be filled out by the mentor for each skill that is mastered.

Reflective discussions will take place in the mentor classroom and the tutored classroom following each tutoring session to address the following:

- Positives that occurred during the tutoring session.
- Negatives that occurred during the tutoring session.
- Interesting or unclear events that occurred during the tutoring session.

**WHEN:** Tutoring will take place from mid September to mid December 1997. Tutoring sessions will occur twice a week for 20 minutes.

**WHY:** Peer tutoring is an effective way to improve academic achievement and foster positive learning attitudes, while allowing social interactions between students. Rewards should only be given for improving performance or mastery of skills.

#### Methods of Assessment

The data collection methods that will be used to assess the effects of goal setting with students and cross-age mentoring are published assessments that indicate student academic performance, observations of students during mathematical instruction, journal entries of teacher observations, and teacher-made assessments. Initial baseline testing will be done using the Peabody Individual Achievement Test-Revised for math for both classrooms at each site. Teachers will observe students at least once a week during a three week time period beginning September 2, 1997 during math instruction. Two

student observation checklists will be used. One to record volunteering, active participation, completed assignments, and peer interaction. The other will be used to record off-task behaviors. Student observation definitions have been developed and will be used to aid in identifying behaviors (Definitions in Appendix J). Teachers will keep weekly journals reflecting on events occurring in the classroom. Additional concepts and skills will be assessed throughout the fall semester at the conclusion of each unit.

The Peabody Individual Achievement Test-Revised will be used again at the end of December and will be compared to the baseline testing to analyze mathematical growth. Additional student observations will be done beginning December 1, 1997 to show changed behaviors during math instruction. Concept and skill checks will be analyzed throughout the semester to ensure that student needs are being met and focused on during peer tutoring sessions.

## CHAPTER 4

### PROJECT RESULTS

#### Historical Description of the Intervention

The objective of this research project was to increase academic achievement in mathematics and improve attitudes towards mathematics. Implementation of goal setting with students and use of cross-age mentoring were chosen to affect the desired changes.

In order to set goals with students, concepts and/or skills had to be selected for each of the targeted grade levels. These concepts were chosen based on relevance in terms of each school's current math program objectives, each district's goals and objectives, and the state's goals. After teacher resources were examined, a limited number of actual skills to target at each grade level were selected. This selection process also involved examination of skills that could be concretely measured through assessment. These concepts were then inserted into a goal setting sheet that was formatted so that areas could be selected by the students to work on, goal achievement could be readily identified, and comments could be included (See Appendix K).

In addition, teachers outlined lessons that would teach and support the skills that were selected by students for goal setting (See Appendices C-I). Teachers used a format when teaching that specifically named the skill or skills that were to be taught; defined,

described, and/or modeled the skill for students; provided practice activities for students; and allowed for reflection on the skill. Reflection in both classrooms helped teachers to redefine lessons to aid in increasing understanding. Direct classroom instruction occurred daily for 30 minutes in kindergarten and 40 minutes in third grade.

Baseline testing was done to identify ability levels for all students using the Peabody Individual Achievement Test-Revised for math. It was decided that it was not only necessary to measure where students started in order to show growth, but also to provide information regarding the skills that students currently possessed to help in beginning goal setting. Both teachers also did three observations of students during math instruction time. Teachers were looking for off-task and positive behaviors (See Appendix L).

The original plan was to work with individuals or small groups to help students identify areas that needed improvement. The plan was to move to small group work but it wasn't feasible. Throughout the entire intervention, teachers continued to only work with students on a one-on-one basis. It was decided that teachers should aid in helping students to set attainable goals, thus each student would not concentrate on working towards and meeting more than three goals per week.

Tutoring packets were created for use by students and peer tutors. These packets contained a goal sheet, instruction cards, manipulatives, stickers, certificates, and a sheet of positive reinforcement phrases. Areas were identified for each student to work on prior to the initial tutoring session. Tutoring packets were updated weekly.

Both sites conducted training for peer tutors. At Site A, sixth graders were chosen, while at Site B, fourth graders were selected. Training consisted of introducing students to the created tutoring packets, discussion of peers' developmental levels, role play fact practice and student games and/or activities. The importance of positive feedback, as well as processes for constructive helping instead of doing were discussed. Tutors were introduced to the goal sheets and how to complete each child's sheet upon completion of the tutoring session. Peer tutors received student assignments towards the conclusion of the training session. Students were paired according to ability level and personality. The training ended with a question and answer discussion and both sets of tutors gave written feedback at the close of the training.

Tutoring sessions occurred twice a week during the intervention period. These sessions lasted 20 minutes each. Overall, students were motivated, excited, and anxious to meet again. After the initial mentoring session, there were few partner conflicts. As our goal setting and tutoring sessions progressed, other adjustments were made. It was necessary to meet and discuss regularly about student noise levels and appropriate reinforcement phrases. At the end of each session, student successes and teaching strategies were shared. At Site A, sixth graders continued to give written feedback after every tutoring session, which was not part of the original plan, but useful for the teacher. At Site B, students were divided up to work in two separate rooms to better manage noise levels and allow for more concentrated sessions. Fourth grade students were unable to appropriately reward students for meeting goals. The tutors wanted to give students certificates and stickers more often than kindergartners deserved. We adjusted this part



of the intervention so that the teacher monitored for goals met and then rewarded stickers. Peer tutors were then allowed to issue certificates at the following tutoring session.

The original action plan for intervention was followed with minor adjustments that were necessary due to grade levels involved. Disruptions to the original expectation of delivering two tutoring sessions per week occurred due to school scheduling.

### Presentation and Analysis of Results

In order to assess the effects of goal setting and peer tutoring on achievement in mathematics, baseline testing and post testing was done to monitor any changes. There were 47 students tested at the onset of the intervention, while only 46 students remained at the conclusion of the intervention. The data presented in the tables below represent the results of the Piat assessment tool. The data are presented in Table 2 and Table 3.

Table 2.

#### Number of Students Achieving Below, Within, and Above Grade Level at Site A

	More Than 6 Months Below Grade Level	Within 6 Months of Grade Level	More Than 6 Month Above Grade Level
Baseline Testing	10	10	3
Post Testing	6	8	9

Table 3.

#### Number of Students Achieving Below, Within, and Above Grade Level at Site B

	More Than 6 Months Below Grade Level	Within 6 Months of Grade Level	More Than 6 Month Above Grade Level
Baseline Testing	14	6	3
Post Testing	7	11	4

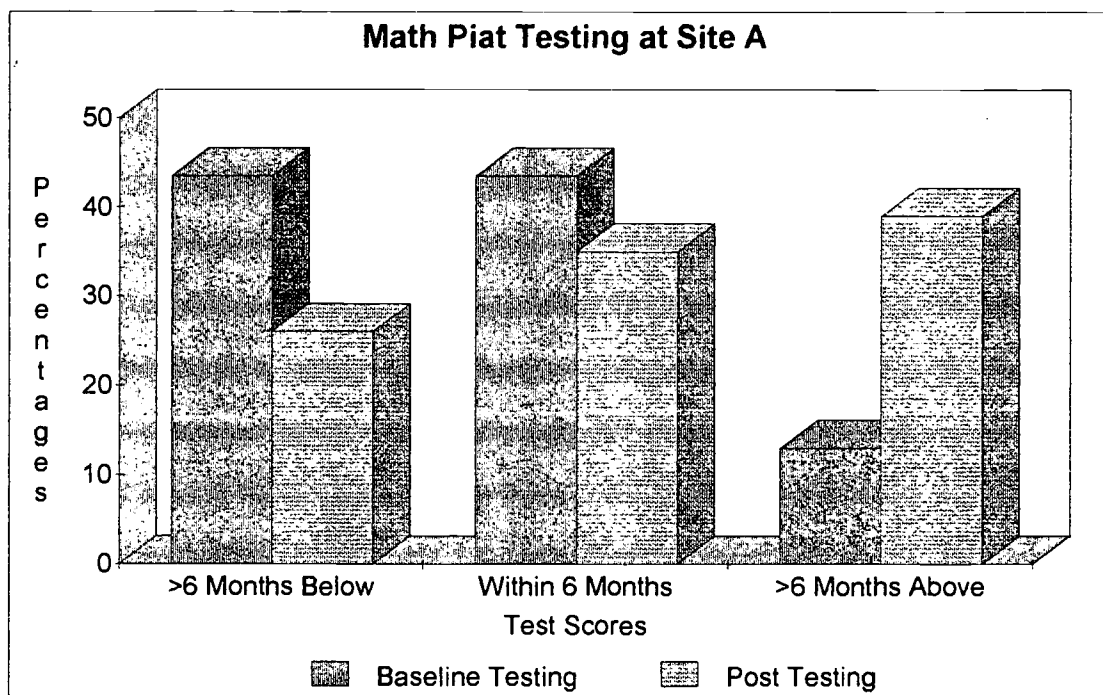
The interventions seem to have had a positive effect at both sites. At Site A, there was a noticeable increase in the number of students who are above grade level with fewer students achieving at the below and within grade level status. At Site B, the greatest number of students have moved from the below grade level category into the within grade level realm. There was relatively little movement into the above grade level area. With a 26 percent increase at Site A into the above grade level category, these interventions appeared to make the most drastic difference to those students already achieving within 6 months of their grade level, while at Site B, there was a 24 percent increase in the number of students achieving within their grade level which shows that the interventions had the greatest effect on those students achieving below grade level.

Site A had 91 percent of the students involved in the intervention showing growth. Of those 21 students, five students were scoring below grade level on the pretest and scored at or above grade level on the posttest. Three students scored below grade level and then scored within grade level. Four students scored within grade level and then scored at or above grade level. Four students below grade level, three students within grade level, and two students at or above grade level remained at the same scoring levels but did show some growth, just not enough to move to another category. Two students regressed according to the results of the Piat testing.

Site B had 82 percent of the students involved in the intervention showing growth. Of those 18 students, one student was scoring below grade level on the pretest and scored at or above grade level on the posttest. Six students scored below grade level and then scored within grade level. One student scored within grade level and then scored at or

above grade level. Four students below grade level, five students within grade level, and two students at or above grade level remained at the same scoring levels but did show some growth, just not enough to move to another category. Two students scored the same on the pretest and posttest and two students regressed according to the standardized testing scores.

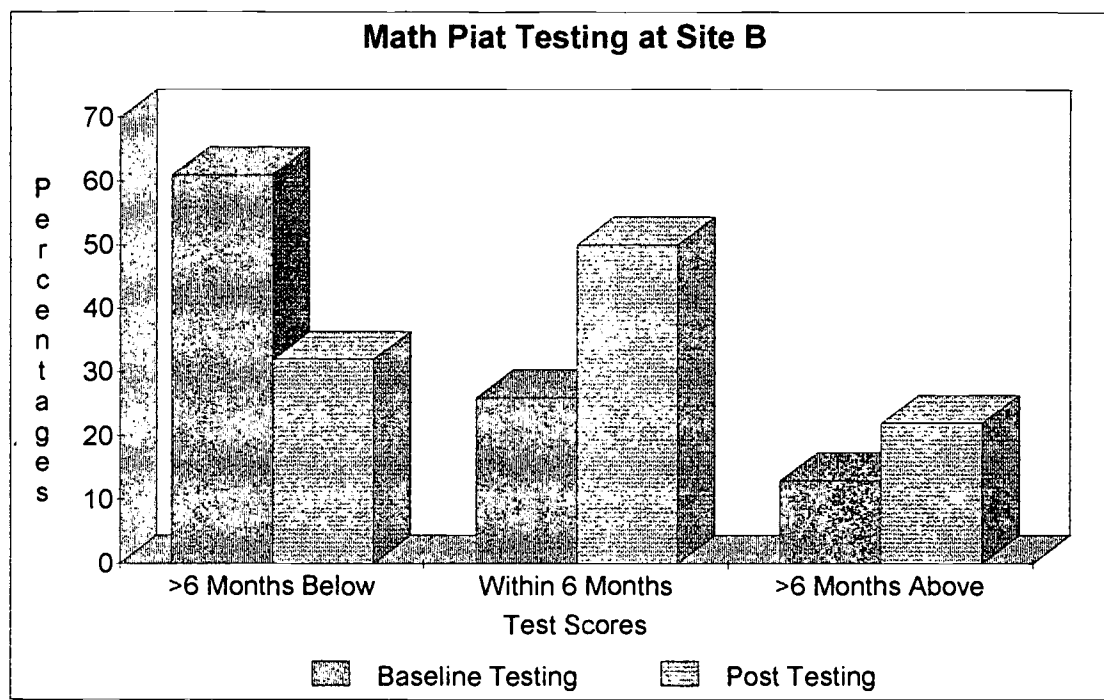
The data presented in Table 2 is illustrated in the following figure.



	More Than 6 Months Below Grade Level	Within 6 Months of Grade Level	More Than 6 Month Above Grade Level
Baseline Testing	43.50%	43.50%	13%
Post Testing	26%	35%	39%

Figure 5. Percentage of students scoring more than 6 months below grade level, within 6 months of their grade level, and more than 6 months below grade level at Site A.

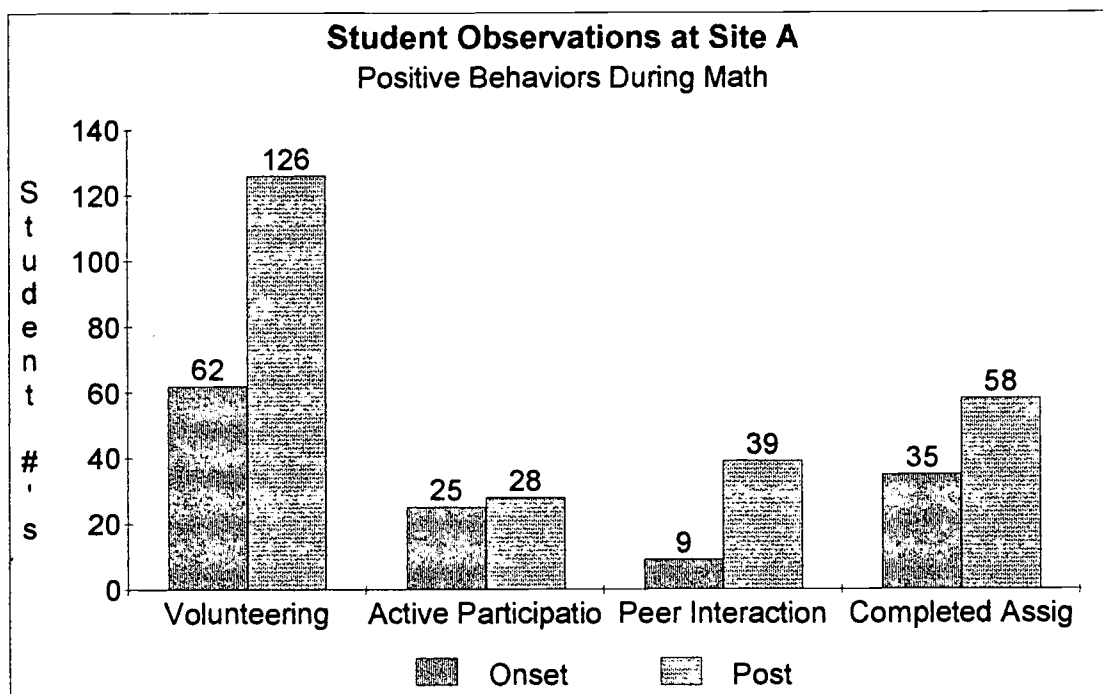
The data presented in Table 3 is illustrated in the following figure.



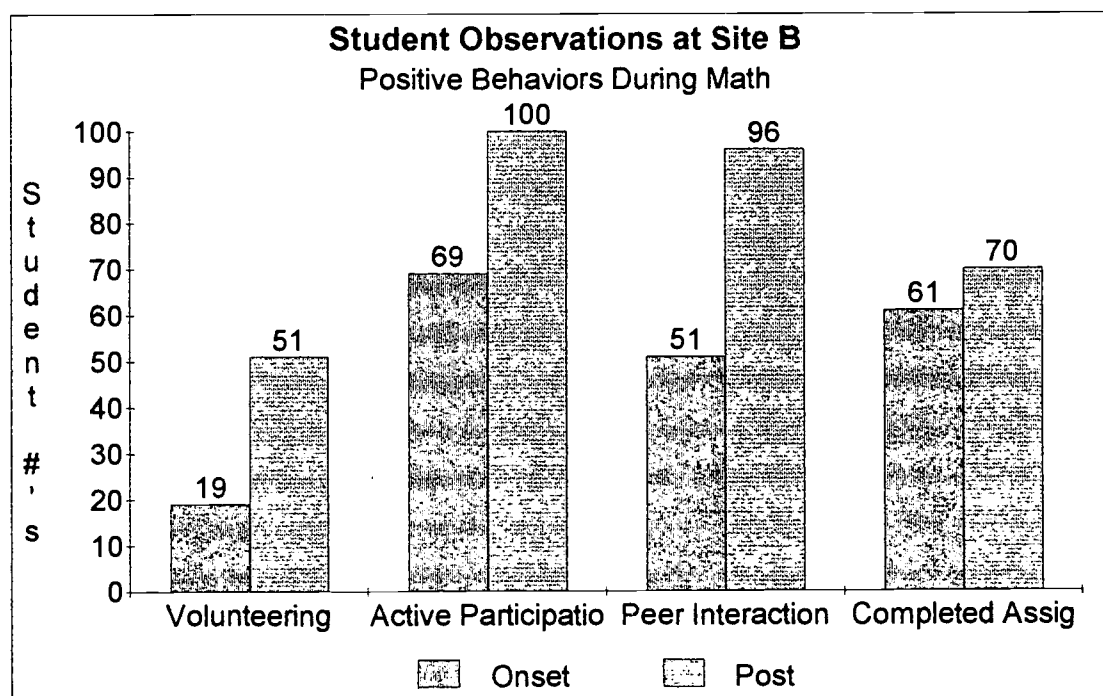
	More Than 6 Months Below Grade Level	Within 6 Months of Grade Level	More Than 6 Month Above Grade Level
Baseline Testing	61%	26%	13%
Post Testing	32%	50%	22%

Figure 6. Percentage of students scoring more than 6 months below grade level, within 6 months of their grade level, and more than 6 months above grade level at Site B.

In addition to academic achievement testing, observations of student behaviors were monitored weekly for the first three weeks and then weekly for three weeks upon completion in order to assess the effects that goal setting and peer tutoring would have on behaviors during math instruction times. Summaries of the number of positive behaviors observed at each site at the start and end of the intervention are shown in the following figures.



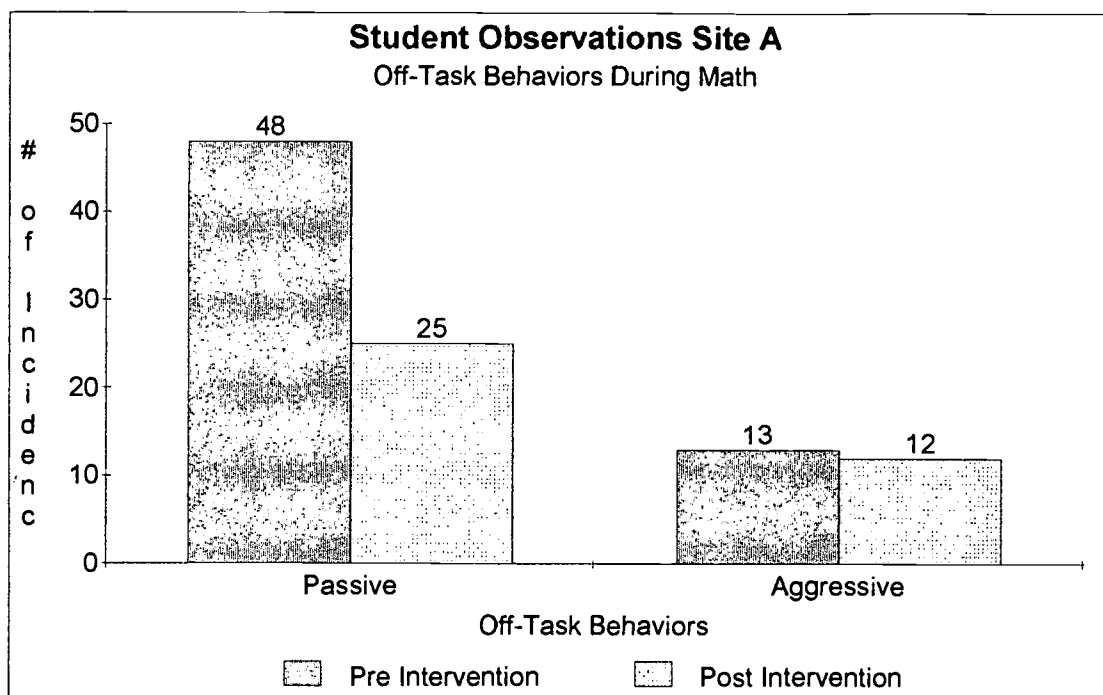
**Figure 7.** Number of positive behaviors observed at Site A during math instruction.



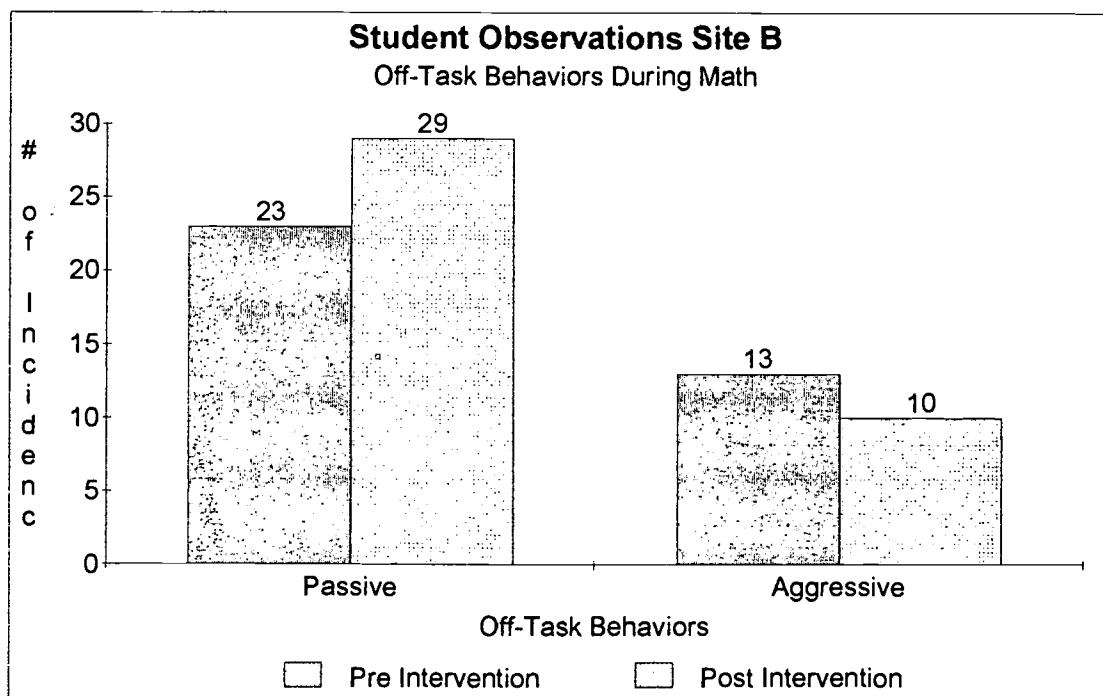
**Figure 8.** Number of positive behaviors observed at Site B during math instruction.

There was growth in positive behaviors at both sites in all areas. At Site A, students showed the greatest growth in volunteering with over double what was observed during the initial intervention period. Students at this site showed little growth in active participation. Site B students showed the most dramatic growth in peer interactions with numbers almost doubling from what was observed during the onset of the intervention. The number of positive behaviors at Site B were more prominent than those of Site A. There was the least amount of growth in the area of completed assignments at this site.

Off-task behaviors were also monitored through the use of observation checklists. Off-task behaviors were broken down into two areas. Passive off-task behaviors consisted of any movement off a prescribed activity which could include looking around, staring into space, doodling, or any other observable movement that is off the task at hand. Aggressive off-task behaviors were any movements off a prescribed activity that may include distracting sounds, being out of place, physical contact or destruction with another person or another person's property, or any other observable movement that is off the task at hand. Summaries of the percentage of off-task behaviors observed at the conclusion of the intervention are shown in the following figures.



**Figure 9.** Percentage of off-task behaviors observed at site A during math instruction.



**Figure 10.** Percentage of off-task behaviors observed at site B during math instruction.



Overall, it was observed that there was a decline in off-task behavior. Although the figures above show an increase in passive behaviors at one site, there were actually 21 fewer off-task behaviors between the two sites. Site A actually had 23 fewer passive behaviors occur during instruction and one less aggressive behavior. Site B had five more passive behaviors observed during instruction and three fewer aggressive behaviors.

### Conclusions and Recommendations

Based on the presentations and analysis of the data on achievement, a large percentage of the students showed growth. It would appear that students selection of goals contributed to this outcome. The positive behaviors that were exhibited during math instruction had a marked increase. Since growth was most apparent through volunteering and active participation, it would seem that confidence was gained after working with peer tutors. Off-task behaviors were reduced considerably at one site. Although, students at the other site did not show such drastic differences in behavior, it must be considered that kindergartners have tremendous social growth at this grade level and some of these actions could be attributed to that fact.

This intervention is strongly recommended to improve motivation and increase student achievement in mathematics with slight changes to the intervention plan in order to enhance the manageability and possibly improve the outcomes. More time could be spent on peer tutor training with emphasis on modeling of teaching strategies and identification of skill mastery. It would be considerably more advantageous to use older children, as well, as peer tutors. Fourth graders required a large amount of teacher



guidance through the peer tutoring process. It would be beneficial to lengthen the amount of time for children to master skills. Checking for mastery and goal setting should occur every two weeks, rather than weekly. Students often had to repeat their goals that they had set for an additional week. Meeting weekly with every child is time consuming for teachers. These changes would serve to benefit children's learning and provide better management for teachers.

## References

- Abi-Nader, Jeanette. (1991). Creating a vision of the future: strategies for motivating minority students. Phi Delta Kappan, 72, 546-549.
- Alderman, M. Kay. (1990). Motivation for at-risk students. Educational Leadership, 48, 27-30.
- Bell, Jean., Bell, Max., Freedman, Dorothy., Goodsell, Nancy Guile., Hanvey, Nancy., Morrison, Kate. (1998). Everyday Mathematics. Chicago: Everyday Learning Corp.
- Bogan, Eileen. (1997). Three equations for an equitable math program. Educational Leadership, 54, 46-47.
- Casanovo, Ursula. (1990). The case for peer tutoring. Instructor, 99, 16-17.
- Corno, Lyn. (1992). Encouraging students to take responsibility for learning and performance. The Elementary School Journal, 93, 69-83.
- Ford, Martin E. (1995). Motivation and competence development in special and remedial education. Intervention in School and Clinic, 31, 70-83.
- Fulk, B.M. & Montgomery-Grymes, D.J. (1994). Strategies to improve student motivation. Intervention in School & Clinic, 30, 28-39.
- Harlem School District Demographic Report. (1993). Loves Park, IL: Information, etc.
- Hedelin, L. & Sjoberg, L. (1985). Can we help children enthusiastic about school?. In D. C. Berliner & U. Casanova, Putting research to work in your school (pp. 169-172). Arlington Heights, IL: IRI/Skylight Training and Publishing, Inc.
- Hoffer, Alan R., Johnson, Martin L., Leinwand, Steven J., Lodholz, Richard D., Musser, Gary L., Thoburn, Tina. (1991). Mathematics in action. New York: MacMillan/McGraw Hill School Publishing.
- Johns Hopkins University. (1996). A schoolwide restructuring program for students in grades pre-k to five: Success for all (Brochure). Baltimore, MD: Center for Social Organization of Schools.
- Lumsden, Linda S. (1994). Student motivation. Research Roundup, 10, 5-9.

MacIver, Douglas J. & Reuman, David A. (1994). Giving their best: Grading and recognition practices that motivate students to work hard. American Educator, 17, 24-31.

Main, Robert G. (1993). Integrating motivation into the instructional design process. Educational Technology, 33, 37-41.

Newby, Timothy J. (1991). Classroom motivation: Strategies of first-year teachers. Journal of Educational Psychology, 83, 195-200.

Oldfather, Penny. (1993). What students say about motivating experiences in a whole language classroom. The Reading Teacher, 46, 672-681.

Olson Park Elementary School. (1996). School report card. Machesney Park, IL: Harlem Unit District 122.

Ornstein, Allan C. (1995). Motivation and learning. The High School Journal, 30, 105-107.

Ornstein, Allan C. (1996). Motivation and learning: a psychological perspective. The High School Magazine, 3, 40-42.

Ornstein, Allan C. (1994). Yearning to learn. The Executive Educator, 16, 27-30.

Pardes, Joan Rudel. (1994). Motivate every learner. Instructor, 104, 99-100.

Perrone, Vito. (1994). How to engage students in learning. Educational Leadership, 51, 11-13.

Phelan, P., Davidson, A.L., & Cao, H.T. (1992). Speaking up: Students' perspectives on school. Phi Delta Kappan, 73, 695-704.

Serna, Loretta A. & Lau-Smith, Jo-Anne. (1995). Learning with purpose: Self-determination skills for students who are at risk for school and community failure. Intervention in School and Clinic, 30, 142-146.

Strong, Richard, Silver, Harvey F., & Robinson, Amy. (1995). What do students want (and what really motivates them)? Educational Leadership, 53, 8-12.

Swanson, David P. (1992). I can: an acronym for success. Teaching Exceptional Children, 24, 22-26.

## APPENDICES

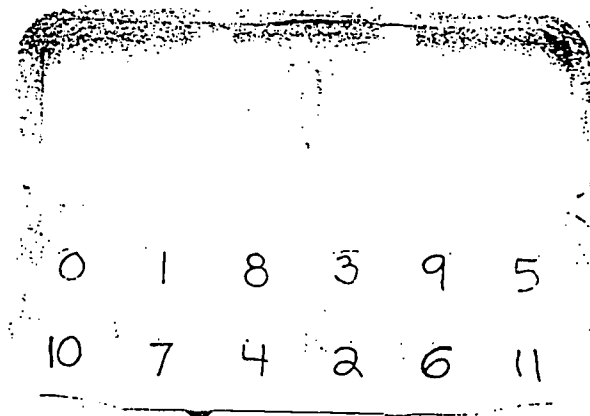
Appendix A  
Sample Math Lesson

## Egg-Carton Mathematics

**FOCUS:** Read and count numbers 0–11; develop fine motor skills. (This activity can be a baseline for ongoing assessment.)

**MATERIALS:** egg carton or muffin tin; beans

Label each cup of an egg carton or muffin tin with the numbers 0–11 in any order. A child places the correct amount of beans in each cup while his or her partner checks for accuracy.



- Partners
- Center

### Note

For suggestions on administering baseline assessment activities see *Towards a Balanced Assessment for K–3 Everyday Mathematics*, pp. 39, 71, and 72.

(Bell, et al., 1998)

## Appendix B Sample Math Lesson

### LESSON OBJECTIVES

Write money amounts from pictures and word names.

Name the coins and bills needed to equal a given amount.

## 1 PREPARE

**Warm-Up** To prepare students to count money, have them skip-count around the room by 5s and then by 10s up to 100.

## 2 TEACH

**Modeling** Give students play money. Have them work in pairs.

■ **How many different ways can you make 62 cents out of 2 pennies, 4 nickels, 4 dimes, 2 quarters, and 1 half dollar?** [There are 7 ways. Possible answer: 1 quarter, 2 dimes, 3 nickels, 2 pennies]

### PUPIL'S EDITION pp. 26–27

**A** You may wish to have students use play money as they work through the example. Point out that when counting money, it is best to count the coins from greatest value to least value. Demonstrate how much more difficult it is to count from least value to greatest.

■ **In what order should you count 5 nickels, 2 quarters, 6 pennies, and 4 dimes?** [quarters, dimes, nickels, pennies]

**B** Tell students that when counting money, they should always count first the bills and then the coins in order from the greatest to the least value.

■ **In what order should you count 2 quarters, 3 dimes, and 5 dollar bills?** [dollar bills, quarters, dimes]

### Check for Understanding

■ **What bills and coins could you use to buy orange juice that costs \$2.73?**  
Possible answer: 2 one-dollar bills, 2 quarters, 2 dimes, and 3 pennies]

## 3 PRACTICE/APPLY

**GUIDED PRACTICE ■ TRY OUT** For reteaching, use Common Error and Remediation or Alternative Strategy.

**PRACTICE** ex. 6–15: Provide play money to students who are having difficulty with ex. 6–15.

**Critical Thinking** ex. 15: Have volunteers use play money to demonstrate their method for finding the fewest number of coins and bills.

### CLOSE

Guide students to summarize the lesson:

■ **What are the least number of bills and coins needed to make \$1.55?** [1 one-dollar bill, 1 half-dollar, 1 nickel]

## Common Error and Remediation

**TRY OUT** Some students may miscount the value of coins or bills pictured or described. These students may incorrectly answer:

ex. 4: \$1.40    ex. 5: \$4.06

Have these students use play money and a chart like the one pictured below. Demonstrate with ex. 4:

\$5.00	\$1.00	50¢	25¢	10¢	5¢	1¢
	□		○	○ ○	○ ○ ○	

(Hoffer, et al., 1991)

Appendix C  
Goal Sheet

## Kindergarten Profile of Progress

Student Name: \_\_\_\_\_

Concepts/Skills & Student Goals		Peer Tutor Comments:
Rote counting to _____.		
Rational counting to _____.		
Recognizes numbers from _____.		
Identifies and forms groups of _____.		
Recognizes geometric shapes: circle, square, triangle, and rectangle. (Circle ones that are goals)		
Understands concept of first and last. (Circle ones that are goals)		
Recognizes coins: penny, nickel, and dime. (Circle ones that are goals)		
Sorts objects; shares strategies. (List in comment column how objects are sorted)		
Compares sizes by color, size, shape, and thickness. (Circle ones that are goals)		
Makes and describes a _____ - part patterns.	55	

Appendix D  
Goal Sheet

## Kindergarten Profile of Progress

Student Name: \_\_\_\_\_

Concepts/Skills & Student Goals		Peer Tutor Comments:
Counts backwards from _____.		
Counts by two's starting at _____.		
Writes numbers _____.		
Can duplicate a pattern.		
Counts by 5's starting at _____.		
Counts by 10's starting at _____.		
States the days of the week.		
States the months of the year.		
Computes simple addition number stories.		
Computes simple subtraction number stories.		



Appendix E  
Goal Sheet

## Third Grade Profile of Progress for Chapter 1

Student Name: \_\_\_\_\_

Concepts/Skills:	Peer Tutor Comments:
Counting change to _____.	
Making change from _____.	
Rounding to the nearest 10.	
Rounding to the nearest 100.	
Measuring length in centimeters and inches. (Circle the ones that are known)	
Estimation of length (which units of measure are best to use)	
Subtracting 3-digit numbers with regrouping: once, twice, with zero. (Circle the ones that are known).	
Telling time to the hour, half hour, quarter hour, minutes, and elapsed time. (Circle ones that are known)	

Appendix F  
Goal Sheet

## Third Grade Profile of Progress for Chapter 2

Student Name: \_\_\_\_\_

Concepts/Skills & Student Goals	Goal to Work on	Peer Tutor Comments:
Addition fact to Section _____.		
Adding more than 2 digits: <b>3 digits</b> or <b>4 digits</b> . (Circle ones that are goals)		
<b>Estimating</b> and <b>measuring</b> length using metric units. (Circle ones that are goals)		
<b>Interpreting</b> and <b>displaying</b> data on bar graphs. (Circle ones that are goals)		
Solving word problems: <b>choosing the correct operation, setting up the problem, identifying extra information.</b> (Circle ones that are goals)		

Appendix G  
Goal Sheet

### Third Grade Profile of Progress for Chapter 3

Student Name: \_\_\_\_\_

Concepts/Skills & Student Goals	Goal to Work on	Peer Tutor Comments:
Addition facts to Section _____.		
Estimating sums: <b>2-digit numbers, 3-digit numbers, 4-digit numbers.</b> (Circle ones that are goals)		
Adding 3-digit numbers without renaming.		
Adding 2-digit numbers with renaming.		
Adding 3-digit numbers with renaming.		
Adding 3-digit money amounts with renaming.		
Finding the perimeter of a figure in metric units.		
Solving word problems: <b>choosing the correct operation, setting up the problem, identifying extra information, checking reasonableness of the answer, drawing a picture.</b> (Circle ones that are goals)		

Appendix H  
Goal Sheet

### Third Grade Profile of Progress for Chapter 4

Student Name: \_\_\_\_\_

Concepts/Skills & Student Goals	Goal to Work on	Peer Tutor Comments:
Addition facts to Section _____. Subtraction facts to Section _____.		
Estimating differences: <b>2-digit numbers, 3-digit numbers, 4-digit numbers.</b> (Circle ones that are goals)		
Subtracting 3-digit numbers without regrouping.		
Subtracting 2-digit numbers with regrouping.		
Subtracting 3-digit numbers with regrouping.		
Subtracting 3-digit money amounts with regrouping.		
Subtracting 3-digit numbers with zero and regrouping.		
Solving word problems: <b>choosing the correct operation, setting up the problem, identifying extra information, checking reasonableness of the answer, drawing a picture, two-step solutions, estimating answers.</b> (Circle ones that are goals)		

Appendix I  
Goal Sheet

### Third Grade Profile of Progress for Chapter 5

Student Name: \_\_\_\_\_

Concepts/Skills & Student Goals	Goal to Work on	Peer Tutor Comments:
Addition facts to Section _____. Subtraction facts to Section _____.		
Estimate time.		
Tell time to the <b>hour, half hour, quarter hour, and minute.</b> (Circle ones that are goals)		
Write time.		
Find elapsed time.		
<b>Estimate and measure capacity and mass</b> in metric units. (Circle ones that are goals)		
<b>Estimate and measure</b> temperature in C.		
<b>Solving word problems: choosing the correct operation, setting up the problem, identifying extra information, checking reasonableness of the answer, drawing a picture, two-step solutions, estimating answers, finding needed information, conducting an experiment.</b> (Circle ones that are goals)	61	

Appendix J  
Definitions of Behaviors

## Student Observation Definitions

### **Off-Task Behaviors:**

Passive: Any movement off a prescribed activity which includes: looking around, staring into space, doodling, or any other observable movement that is off the task at hand is included

Aggressive: Any movement off a prescribed activity which includes: distracting sounds, out of place, physical contact or destruction with another person or another person's property, or any other observable movement that is off the task at hand is included.

### **Positive Behaviors:**




Volunteering: Deliberately volunteering to answer questions verbally participate in class including raising a hand to answer or speaking out to answer even without permission.

Active Participation: Deliberately volunteering to model and take part in prescribed activities and also includes manipulation of materials to aid in completing tasks.

Peer Interaction: Actively engaged in appropriate conversations with peers which enables students to complete tasks.

Completed Assignments: Assignments are completed in a timely manner and reflect the prescribed teaching objectives.

Appendix K  
Completed Goal Sheet

Concepts/Skills & Student Goals		Peer Tutor Comments:
Rote counting to <u>60</u> .		
Rational counting to _____.		
Recognizes numbers from _____.		
Identifies and forms groups of _____.		
Recognizes geometric shapes: circle, square, triangle, and rectangle. (Circle ones that are goals)		
Understands concept of first and last. (Circle ones that are goals)		
Recognizes coins: penny, nickel, and dime. (Circle ones that are goals)		
Sorts objects; shares strategies. (List in comment column how objects are sorted) <u>Size &amp; thickness</u>		
Compares sizes by color, size, shape, and thickness. (Circle ones that are goals)		
Makes and describes a <u>2</u> -part patterns.		<u>understands but she needs some help</u>

Appendix L  
Observation Checklist

## Student Observation Checklist

Student Name:

Observed Behaviors:	Tally Marks:
Volunteering	
Active Participation	
Completed Assignments	
Peer Interaction	

## Student Observation Checklist

Student Name:

Observed Off-task Behaviors:	Tally Marks:
Passive	
Aggressive	





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