

The Math and Movement Pilot Study

One class of first graders from the Northeast Elementary School, located in Ithaca, New York participated in a pilot study which taught skip counting and multiplication through movement and sensory activities. The pilot study commenced in March, 2008 and ended in June, 2008 with the first graders performing the *Multiplying Monkeys* for their parents and community members. Actuary and author, Suzanne Kuntz led the pilot study. The purpose of the pilot study was to test the idea that combining math and movement enhances learning and creates a love of math in each student.



Demographics of School

There are 430 students enrolled in Northeast Elementary School. Twenty-five percent qualify for free or reduced lunch. Fifteen percent are enrolled in the ESL program. One-third of the students are from Asian countries. One-sixth of the students are African-American, Latino or from Africa. Fifty percent of the students are Caucasian. The children's math ability varies from difficulty with one-to-one correspondence to readiness for learning math that exceeds grade level expectations.

Research

Math education in the United States needs improvement. According to Jeremy Kilpatrick, chair of the committee who headed a study on math learning for the National Research Council of National Academies (2001) and Regents Professor of Mathematics Education at UGA, "Too few students leave elementary school and middle school with adequate mathematical knowledge, skill, and confidence, for the nation to be satisfied with the condition of school mathematics. Simply developing speed in pencil-and-paper arithmetic may have been sufficient when their parents and grandparents were in school, but today's students need a deeper understanding of mathematics to thrive in an increasingly technical economy. Improvement requires a comprehensive and sustained effort among policy makers, administrators, teachers, university faculty, parents and others to enhance both instruction and achievement."

Research has proven that movement and physical exercise enhances learning. According to Carla Hannaford, PhD and author of the researched-based book, *Smart Moves, Why Learning is Not All in your Head*, Great River Books, 2005, "The more closely we consider the elaborate interplay of brain and body, the more clearly one compelling theme emerges: movement is essential to learning. .. Movement awakens and activates our mental capacities. Movement integrates and anchors new information and experience into our neural networks. ... Moving while learning increases learning. ... And in a close look at thirteen other studies on the exercise/brainpower link, exercise was found to stimulate the growth of developing brains and prevent the deterioration of older brains. "

Description of The Math and Movement Pilot Study

The Math and Movement two-year pilot study will involved the 22 students in Mrs. Steinacher's first grade classroom, during the time period of March through June, 2008. Suzanne Kuntz participated in activities with the children, during the school day, three times a week, for fifteen minute time periods and once a week for one hour. The location of the study was outdoors and in the classroom.

The pilot study tested the idea that combining math and movement enhances math enthusiasm, confidence in math and math ability. The area of mathematics involved in the study was primarily skip counting and multiplication. In addition, the children were casually be introduced to division, square numbers, square roots, fractions, decimals and percents.

It is widely accepted that teaching children the alphabet before learning to read facilitates the process of learning to read. This pilot study is based on the hypothesis that teaching a child to skip count, before learning mathematics is comparable to a child learning the ABC's before learning to read.

During this study, the children learned how to skip count using movement, physical activities and hands-on activities. Currently, the first grade curriculum includes teaching children to skip count by twos, fives and tens. The study expanded on the curriculum by teaching the children to skip count by all numbers up to and including ten, which they are not traditionally taught until the third grade. In this study, the first grade children were taught to multiply up to ten times ten. Traditionally multiplication is taught in the third grade.

Following are the activities included in the study.

In the gymnasium or outside:

1. The children reinforced one-to-one correspondence by counting their steps and jumps. One-to-one correspondence is the ability to link a number name with one and only one object. One-to one correspondence lays the foundation for arithmetic.
2. The children used "jumping cards" and skip-counting posters to recite the skip counting numbers while simultaneously doing jumping jacks, bunny hops, running in place, windmills, etc. Using the jumping cards and posters enables the children to skip-count numbers that they have not memorized. The study determined if engaging in these activities, over a period of time, and including movement, increases the retention level of skip-counting patterns of numbers.
3. Children were allowed some free choice. Each session involved one child choosing a movement activity for the class to do, while simultaneously skip-counting. Allowing free choice helps to keep the activities enjoyable.

4. The children learned dance moves that incorporate skip counting. Each number, three to nine has its own unique “dance move” to reinforce one-to-one correspondence and to help the children learn the skip counting pattern. Two, five and ten are not included because skip counting by two, five and ten is included in the regular first grade curriculum. For example, the dance move for learning to skip count by threes is as follows:
 - a. Cross right hand and right foot to left side of body. Snap fingers and whisper one.
 - b. Cross left hand and left foot to right side of body. Snap fingers and whisper two.
 - c. Clap and say three. (Say it loud)
 - d. Cross right hand and right foot to left side of body. Snap fingers and whisper four.
 - e. Cross left hand and left foot to right side of body. Snap fingers and whisper five.
 - f. Clap and say six (Say it loud.)
 - g. Continue to 30 following the same pattern.
5. The children pretended to be trees waving in the wind. The trees whisper-count one, whisper-count two and shout three. The children, with arms extended straight over their heads, wave to the left (whisper one), wave to the right (whisper two) and clap hands over their heads (shout three).
6. The children pretended to be elephants and rabbits trumpeting and hopping while simultaneously using the whisper/loud technique of counting.



In the classroom:

1. The above mentioned activities modified to accommodate a classroom’s limit for noise and space.
2. The children used a piece of paper divided into ten rectangles as a counting mats to display and count ten groups of stickers. When children are learning to skip count by threes, each child will place three stickers in each rectangle of the piece

of paper. The children counted the stickers by whispering one, whispering two, and then saying three out loud. This activity reinforced the idea that during skip counting, all items continue to be counted.

3. The children used stickers to make square numbers and triangular numbers. A story and a hundred number board was used to teach the children about fractions, decimals and percents. Beginning division was introduced in story form.



The Multiplying Monkeys Performance

In June, the children in Mrs. Steinacher's class demonstrated their incredible multiplication skill by performing for the parents and community members. The children wore monkey costumes. They performed their dance moves for 3's through 9's, skip counting acrobatics and then invited the audience to quiz them on any multiplication question.

The Math and Movement Research

The Math and Movement pilot study had the following four data points and one optional data point:

- 1) **Data Point 1:** Classroom teacher's appraisal of each individual student. The following four questions will be asked of each child before the beginning, and after the conclusion, of the study.
 - a) What is the child's level of interest or enthusiasm regarding math? The level will be measured on a scale of 1 to 3 where 1 represents below average, 2 represents average, and 3 represents above average.
 - b) What is the child's level of interest or enthusiasm regarding other school subjects? The level will be measured on a scale of 1 to 3 where 1 represents below average, 2 represents average, and 3 represents above average.
 - c) What is the child's level of confidence in math? The level will be measured on a scale of 1 to 3 where 1 represents below average, 2 represents average, and 3 represents above average.
 - d) What is the child's level of math ability? The level will be measured on a scale of 1 to 3 where 1 represents below grade level expectation, 2 represents meets grade level expectation, and 3 represents exceeds grade level expectation.

- 2) **Data Point 2:** Interview with each child. The interview will occur twice, before beginning and after the conclusion of the study. Each child will be asked open-ended questions such as, “how do you feel about math?” The exact wording of each child’s response will be transcribed. In addition, during the interview, each child will be asked to count 103 blocks, one at a time. The interviewer will document the child’s ability to count with one-to-one correspondence. The child will be asked to skip count by 2’s, 3’s, 4’s, 5’s, 6’s, 7’s, 8’s, 9’s, and 10’s. The child will also be asked to complete six addition problems and six multiplication problems. The child will be asked, “do you know what multiplication is?” If child answers in the positive, then the child will be asked, “who taught you about multiplication?”
- 3) **Data Point 3:** Writing answers to questions about math will be added to the child’s regular writing time. Each child will write answers to open-ended math questions such as, “what do you like about math?” “what do you not like about math?” and “how do you feel about math?”
- 4) **Data Point 4:** Pre-survey and post-survey of each child. In the pre-survey, each child will be asked to circle the math activities that he/she likes. A digital photograph will show the classroom math activities such as doing a page in the workbook, playing a math game, etc. In the post-survey, the child will be asked the same questions as the pre-survey and the new math and movement activities will be added to the survey. In addition, on each survey, the first question will be: “When it is time for math, I feel...,” the child will have the option of circling a happy face, sad face or no expression face.
- 5) **Data Point 5:** Optional parent survey.

A process evaluation will be completed at the end of the first year of the study, utilizing pre- and post- interviews with students and the classroom teacher; a survey, writing samples; and a parent survey. A product evaluation will be completed at the end of the second year by analyzing the students’ math grades for the year following the pilot program. Since the twenty-two participating students will disperse into three separate classrooms after the first grade, it will be possible to compare these students with control groups from the other first grade classrooms that did not use the Math and Movement program, and also to factor out the individual styles of the different second grade teachers.