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Math+Music Program : teacher perception of its effect on student growth

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MATH+MUSIC PROGRAM:
TEACHER PERCEPTION OF ITS EFFECT ON STUDENT GROWTH

A Thesis Presented to
The Faculty of the Department of Music and Dance
San Jose State University

In Partial Fulfillment
Of the Requirements for the Degree
Master of Arts

by
Mary Meeks Nguyen

May 2007

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ABSTRACT

MATH+MUSIC PROGRAM: TEACHER PERCEPTION OF ITS EFFECT ON STUDENT GROWTH

By Mary Meeks Nguyen

This thesis examines teacher perception of student growth effected through the MIND Institute's Math+Music program. Using a Lickert-scale questionnaire, teachers were asked to evaluate student growth in academic and personal areas. Questionnaire topics follow: math, language arts, arts, physical education, self-control, self-esteem, and self-regulation.

The literature review and this study's results revealed that music training enhances spatial temporal abilities, and arts training often leads to improved self-concepts. Strong parallels were drawn between language arts and music from the most basic skills such as decoding to the more advanced skills such as composing in a given genre. Though popular methods of music instruction utilize movement, participation in the program showed no effect on physical education.

Results of this study coincide with the literature in all areas except language arts. Questionnaire topics follow in decreasing strength of positive responses: math, self-regulation, self-esteem, arts, self-control, and language arts.

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Chapter 1

Introduction

Purpose of the Study

This study examines teacher perception of student growth effected through an academic Math+Music program. Using a Lickert-scale questionnaire teachers were asked to evaluate student growth in seven areas: math, language arts, arts, physical education, self-control, self-esteem, and self-regulation. The program selected for this study was the Music Intelligence Neural Development Institute's (MIND) spatial temporal (ST) Math+Music program. Although the ST Math+Music program was designed to elevate student understanding of math concepts (addressed later in this chapter), music training is an integral part of the program and this study investigates ancillary benefits from such instruction.

Statement of the Problem

The current tendency in public education today is to elevate standardized test scores above other indicators of student academic achievement. Teachers, principals, school districts, and now even parents often concern themselves primarily with this narrow assessment tool. In addition to academic areas, this study considers teacher perception of students' personal growth, in an effort to consider aspects of the "whole child."

Overview of Math+Music Program

The ST (spatial temporal) Math+Music program is an academic program that includes piano keyboard lessons and language-free computer games. The pilot program

began in 1998 at the 95th St. Elementary School in Los Angeles. Their purpose was “to explore how piano keyboard training, versus an appropriate control, in conjunction with STAR (spatial temporal animation reasoning), affected students’ performance in math.”¹ The study focused on children in the second grade. The program has since expanded and now serves children in grades K–5 in over one hundred elementary schools across the nation.

Components of the Program

The three components of the program are math, music, and STAR computer games. Classroom teachers teach the math portion, music specialists teach the music portion, and various school employees such as teacher aides, computer technicians, or classroom teachers, administer the STAR computer games. Math teachers and music specialists receive one day of curriculum training by the MIND Institute before introducing students to the program. No specific training is required for the STAR portion as the games are self-explanatory.²

Time varies by grade for some of the program’s activities. All grades receive district math curriculum for the number of minutes mandated by the district. For STAR games and music the class length and frequency are: K–2nd grade, STAR math games two days per week, forty-five minutes per day; music training two days per week, forty-five minutes per day; 3rd–4th grade, STAR math games two days per week, forty-five minutes per day, music training one day per week, forty-five minutes per day; 5th grade, STAR math games two days per week, forty-five minutes per day.

¹ Gordon L. Shaw, *Keeping Mozart in Mind*, Second ed. (Amsterdam: Elsevier, 2004), 194.

² *Ibid.*, 25.

Matthew Peterson of the MIND Institute developed the STAR games to be free of language. The use of language to convey concepts is used heavily in traditional classrooms, and is the main method used to teach math in the United States. The use of language or symbols of any kind requires students to use language-analytic reasoning. Though useful in many ways, it has a limited effectiveness for conveying certain math concepts. Spatial temporal reasoning is a different way of solving math problems and is currently under-utilized in classroom instruction today.³ Fractions, proportional math, and symmetry operations are among the topics addressed by the STAR games. Each game addresses a specific math standard required by the state. This simplifies the accountability process for teachers. Students fluent or struggling in any language, as well as deaf and mute students, benefit from mastering the games. Gaining mastery requires feedback. Therefore the STAR computer games are designed to give students immediate individual feedback. Immediate feedback allows students to master skills most efficiently.⁴ As a student learns the concept for each game, it is offered in increasingly difficult variations. If a student has great difficulty with a concept, the game remains basic until success is repeated; in this case the games are eventually offered in more difficult variations, but at a slower rate than for a student who quickly understands the concept.

The music portion of the program is taught using piano keyboards. Keyboards were the instruments of choice as pitches are fixed, unlike string instruments for example,

³ Ibid.

⁴ Albert Bandura, ed., *Social Foundations of Thought and Action: A Social Cognitive Theory* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1986).

and musical intervals can be seen in black and white. Each lesson presents a concept visually and auditorily, then the students can see, hear, and create a matching sound in response. For instance, the music specialist may model by playing piano pitches and singing their note names simultaneously. Students would imitate by singing note names back while playing those notes on the piano. From the beginning students are also taught how to read musical notation. This way of learning addresses multiple learning modalities simultaneously.

Utilization of the Program

Adherence to the program is inconsistent, and variance in delivery will likely produce differences in the degree to which students might gain understanding of math concepts. One variation follows. The responses on question eighteen of the 2005–2006 MIND Institute survey of the program indicated 77 of 120 adult participants in the ST Math+Music program always or usually attend music sessions with the music instructor; 24 respondents sometimes, seldom or never attend the music sessions; 19 respondents said it was not applicable. However, according to survey responses, the majority of participants follow the parameters of the program. Despite incongruous delivery the ST Math+Music program has an impressive record of success.

Success of the Program

A study conducted during the 2002–2003 academic year included over 6,000 2nd, 3rd, and 4th grade students: 4,173 from classrooms where the teacher volunteered to participate and 1,546 non-participating students from the same grades and schools. 3rd and 4th grade students who completed greater than 50% of the STAR games averaged

twenty-three percentiles above the control group on the California Achievement Test Form 6. 2nd grade students who completed greater than 50% of the STAR games averaged twenty percentile points above the control group on the same test.⁵

Clarification of Terms

Definitions of terms used for this thesis such as self-control, self-esteem, and self-regulation are found in the glossary on page forty-eight.

Relationship Between This Study and the Math+Music Program

The student growth survey created for this study explores whether and to what extent the ST Math+Music program effects students' personal and academic growth beyond math or music. The review of related literature is found in the Chapter Two. Design and application of the study are found in Chapter Three.

⁵ "Star Treatment Effect on Mathematics Performance Levels of 2nd, 3rd, and 4th Grade Students Measured Using the California Achievement Test Form 6 and the California Standards Test 2002/2003," (Costa Mesa, CA: M.I.N.D. Institute, 2003), 4.

Chapter 2

Review of Literature

Literature reviewed in this chapter includes literature addressing the way music relates to the four academic and three personal aspects addressed in the survey.

Literature related to the student growth questionnaire is divided into three sections: music and spatial temporal reasoning, academic growth, and personal growth (self-esteem, self-regulation, and self-control).

Music and Spatial Temporal Reasoning

In 1991 Leng and Shaw were the first to propose a causal link between music and spatial temporal reasoning.⁶ Leng graphed ST sequences of memory patterns on a model of the brain in order to study the symmetry they saw in neural patterns of higher brain function. Though no music was related to the brain functions examined, graphs of the memory patterns resembled recognizable musical form. Leng and Shaw decided to pursue their understanding of higher brain function through the study of music, as it seemed a logical means of understanding other higher creative cognitive processes. They found the neural language of the brain to be the same for various higher brain functions (such as playing a game of chess or composing music) and suggest “music training at an early age is ‘exercise’ for higher brain function.”⁷ The next phase of their research included a long-term study on the effect of music training for pre-school children’s spatial temporal abilities.

⁶ Xiaodan Leng and Gordon Shaw, "Toward a Neural Theory of Higher Brain Function Using Music as a Window," *Concepts in Neuroscience* 2, no. 2 (1991), 229.

⁷ Ibid., 255.

In 1993 Rauscher and Shaw built upon the Leng and Shaw studies that linked music and higher brain function. Rauscher and Shaw reasoned if musical training caused long-term spatial temporal enhancement, then listening to specific types of music may cause short-term spatial temporal enhancements.⁸ They tested thirty-six college students; each student was given three sets of standard IQ spatial reasoning tasks. Each task was preceded by ten minutes of silence, relaxation tape, or the first movement of Mozart's K.448. All students experienced all three listening conditions. Students did much better on the spatial tasks after listening to the Mozart than the other conditions; the spatial reasoning improvements lasted 10-15 minutes. Results were statistically significant.⁹ Due to media attention, this study became widely known as the "Mozart Effect."

In 1995 they completed a related study using 79 UC Irvine students over a five-day period. Students were divided into three groups, Mozart K.448, silence, and mixed listening. After each listening period students performed spatial tasks. The mixed listening group included two days of repetitive music: a Phillip Glass piece with a very repetitive melody, and a British dance piece with a repetitive rhythm. It was found that repetitive music does not enhance spatial temporal music, but the Mozart group did the best every day.¹⁰

⁸ Shaw, *Keeping Mozart in Mind*, 160.

⁹ Ibid.

¹⁰ Ibid., 164.

In 1997 Rauscher et al studied the relationship between music training and children's spatial-temporal reasoning.¹¹ The study included seventy-eight preschool students. The thirty-four children in group one received private piano keyboard lessons. The twenty students in group two received private computer lessons. The twenty-four students in group three were given no treatment. Four separate spatial reasoning tests were given as pre and post-tests. Only the piano keyboard group showed significant improvement on the spatial-temporal test. They suggest "music training, unlike listening, produces long-term modifications in underlying neural circuitry (perhaps right prefrontal and left temporal cortical areas as indicated in EEG coherence studies, Sarthein et al 1997) in regions not primarily concerned with music."¹² Rauscher et al predicted that music training would enhance proportional reasoning skills.¹³

In 1998 Graziano, Peterson, and Shaw built on the previous findings of Rauscher et al regarding piano training and enhanced spatial abilities. They predicted the enhanced spatial abilities from piano training might lead to better understanding of proportional math concepts.¹⁴ Peterson designed spatial-temporal math video game software to teach fractions and proportional math. Those ST Math games were used in their pilot study involving 237 second-grade students from two public schools in Los Angeles. Students were divided into three main groups. Group one received English training on the computer+ST games. Group two received piano keyboard training+ST

¹¹Frances H. Rauscher et al., "Music Training Causes Long-Term Enhancement of Preschool Children's Spatial-Temporal Reasoning," *Neurological Research* 2 (February 1997).

¹² Ibid.

¹³ Ibid., 7.

¹⁴ Amy B. Graziano, Matthew Peterson, and Gordon L. Shaw, "Enhanced Learning of Proportional Math through Music Training and Spatial-Temporal Training," *Neurological Research* 21 (March 1999), 139.

games. Group three received no treatment. The assessment tool used was the California Achievement Test Form 6. The piano keyboard-ST group scored 36% higher than the English-ST group from the same school. Both the piano keyboard-ST group and the English-ST group scored 100% better than the no treatment group. Graziano, Peterson, and Shaw concluded that ST math games improved understanding of proportional math concepts in second grade students. The greatest improvements were seen in students who received piano keyboard training in addition to ST training.¹⁵

The 1998 pilot study became a more permanent fixture in some Los Angeles elementary schools. Two years later 1,283 2nd graders in twelve schools were using the program.¹⁶ Bodner et al developed an Advanced Math Concepts test to assess student understanding of proportional math, fractions, symmetry, graphs, and pre-algebra problems using simplified language or none at all. 2nd graders in the ST Math+Music program scored the same as 4th graders not in the program from the same school.¹⁷ Peterson upgraded the ST Math games used in the pilot study; they are now called Spatial Temporal Animation Reasoning, or STAR games. There are plans to expand the program to reach older students.

A 1998 article by Grandin, Shaw, and Peterson noted the benefits of utilizing spatial temporal thinking to design structures. Grandin's ability to visualize herself in a particular building before it is built has allowed her to anticipate, and therefore correct,

¹⁵ Ibid., 147.

¹⁶ Mark Bodner et al., "The Music-Math Connection," *Early Childhood Connections; journal of music- and movement-based learning* (Summer 2002), 13.

¹⁷ Ibid.

design flaws before they materialize, thus giving her an advantage over designers who rely mainly on language-analytic skills.¹⁸

In 1997 Gromko and Poorman studied the effect of music training on spatial task completion with a group of pre-school children.¹⁹ A total of thirty, three- to four-year-old children completed the study. There were fifteen children each in the treatment and control groups. The fifteen children in the music treatment group received thirty-minute music lessons on twenty Tuesday afternoons during one academic year. Lessons were designed to “involve the children’s motor systems in response to musical sound, to draw their attention to pitch and rhythmic aspects of songs, and to increase their memory for musical sound.”²⁰ Gromko and Poorman found spatial task ability gains with the treatment group and decreases in the control group.²¹

A 1985 study by Hassler, Birbaumer, and Feil addressed connections between musical talent and visual spatial ability.²² The results indicated a significant correlation between musical talent and spatial visualization and a positive but not significant correlation between musical talent and spatial orientation. Their three-year study included three groups of forty students from nine to fourteen years of age. Group one was comprised of children with musical training and the ability to improvise and/or compose. Group two was comprised of children with musical training without the ability

¹⁸ Temple Grandin, Ph.D. Gordon L. Shaw, and Matthew Peterson, "Spatial-Temporal Versus Language-Analytic Reasoning: The Role of Music Training," *Arts Education Policy Review* 99, no. 6 (1998), 6.

¹⁹ Joyce Eastlund Gromko and Allison Smith Poorman, "The Effect of Music Training on Preschoolers' Spatial-Temporal Task Performance," *Journal of Research in Music Education* 46, no. 2 (Summer 1998).

²⁰ *Ibid.*, 176.

²¹ *Ibid.*, 178.

²² M. Hassler, N. Birbaumer, and A. Feil, "Musical Talent and Visual-Spatial Abilities: A Longitudinal Study," *Psychology of Music* 13 (1985).

to improvise and/or compose. The control group three was comprised of non-musicians. Participants were tested and compared in a number of different capacities including brain hemisphere dominance, spatial orientation (ability to visualize a rigid configuration when it is moved into different positions), and spatial visualization (ability to keep in mind a configuration against distraction). They noted a change in ability at puberty in favor of boys, and that “creative musical ability was significantly related to spatial orientation in both boys and girls.”²³

Academic Growth

The academic studies are grouped by topic, starting with math followed by language arts, arts, and physical education, paralleling the four academic areas addressed in the student growth questionnaire. Some overlap occurs since many studies address multiple academic topics.

Gardiner et al compared student academic growth between students taking only traditional classes and students taking “test-arts” classes. The test-arts classes taught the arts with an emphasis on sequential skill development. Though the test-arts student received no different training in math than other students, by the end of the study, their most significant growth was seen in math. In the first year of a two-year study involving eight classrooms of public school first graders, Gardiner et al replaced traditional arts classes with “test-arts” classes for half of the students. Students in the other four classes received the district’s standard visual arts and musical training. The treatment groups were determined by scheduling availability. Though the test-arts group started the year

²³ Ibid., 99.

significantly behind the control group academically, they ended the year equivalent in reading and significantly ahead in math. Four times during the year, teachers completed a Lickert-scale survey noting student disposition in the classroom. The test-arts students began the year with significantly worse attitudes and behavior, but ended the year statistically equivalent with the control group. After the second year, a greater number of second year test-arts students scored at or above grade level in math than any other group. Their reading scores were equal to the control group. Gardiner et al drew two conclusions: learning arts skills stretches mental skills in ways that are useful to other learning areas; and once students realize they can learn challenging and desirable skills in the arts, their general attitude toward school can improve.²⁴

As mentioned previously, a Graziano, Peterson, and Shaw study involving 6,000 elementary students showed that students who received music training and mastered ST games in the MIND Institute's Math+Music program averaged twenty-three percentile gains in math over non-participating peers on the CAT 6 test.²⁵

In a 2001 review of literature, Stickland²⁶ cited Douglas and Willatt's 1994 study finding a significant correlation between rhythmic ability and reading ability in eight-year-old Scottish students. The test group of students developed auditory, visual, and motor skills through musical activities. After six months of instructions, the treatment group showed significant growth in their reading ability; the control group showed no

²⁴ Martin F. Gardiner et al., "Learning Improved by Arts Training," *Nature* 381, no. May 23, 1996 (1996), 284.

²⁵ "Star Treatment Effect on Mathematics Performance Levels of 2nd, 3rd, and 4th Grade Students Measured Using the California Achievement Test Form 6 and the California Standards Test 2002/2003," 4.

²⁶ Susan Strickland, "Music and the Brain in Childhood Development," *Childhood Education* 78, no. 2 (Winter 2001-2002), 102.

improvement in their reading ability. The authors believe there is a connection between learning music and reading ability, perhaps due to the “close proximity of rhythmic and reading representations in the brain.”²⁷

Overy also found arts training to enhance academic achievement. She cites a host of references that point to rhythmic timing as a root of dyslexic students’ reading difficulties.²⁸ Barwick, 1989, O’Conner and Hermelin, 1983, and McMahon, 1982 found correlations between general musical ability and verbal ability. Their research suggests that processing language and music may require similar mental processing skills. They suggest that dyslexic students’ difficulties with music and language may be rooted in abnormal temporal processing.

Overy studied whether music training made a difference in spelling ability and phonological skills of a class of first graders. About one third of the class tested as high risk for dyslexia; their pre-test scores were significantly lower than those of their peers. All students had music lessons from their classroom teacher who was being trained and overseen by “The Voices Foundation,” a charitable music foundation. At the end of the year all students showed growth, but the high-risk students displayed the greatest amount of growth. Overy suggested that if a music specialist taught curriculum designed for dyslexic students the results may be even better.²⁹

Overy also cited a 1993 study by Weber et al involving Swiss students in 50 elementary schools. Students took extra music courses in place of other academic

²⁷ Ibid.

²⁸ Katie Overy, "Dysexia, Temporal Processing and Music: The Potential of Music as an Early Learning Aid for Dyslexic Children," *Psychology of Music* 28 (2000).

²⁹ Ibid., 226.

classes. At the the end of three years, students with extra music lessons were at least equal to their peers in all areas of the curriculum; reading and language skills were found to be a little higher than their peers, even though they had fewer lessons in reading and language.³⁰

In 2002 Fisher and McDonald wrote *Developing Arts-Loving Readers*, a compilation of their own ideas and experiences. Though no scientific studies have been conducted on the effectiveness of their lesson ideas, they were implemented in San Diego County's City Heights Educational Pilot Schools. There the authors received feedback from teachers implementing their ideas in the classroom. Fisher and McDonald then presented their ideas at conferences for the California Reading Association and the California Music Educators' Association. The authors state the arts can be taught in schools as isolated subjects or in conjunction with other subject matter. In either case they would like to see arts for all children, not only for those gifted in the arts, because the arts "expand our capacities to perceive, understand, and appreciate life."³¹

Hansen, Bernstorf, and Stuber wrote *The Music and Literacy Connection*³² for reading teachers and music teachers working with pre-school through middle elementary grade students. The authors drew upon their own experiences and observations in addition to research studies. They detail ten parallels in auditory processes between language reading and music reading. The first of four pertaining to this study is auditory analysis; in language reading it involves identifying phonemes embedded in words; in

³⁰ Ibid., 222.

³¹ Nan McDonald and Douglas Fisher, *Developing Arts-Loving Readers: The Top 10 Questions Teachers Are Asking About Integrated Arts Education* (Lanham, Maryland: The Scarecrow Press, 2002).

³² Dee Hansen, Elaine Bernstorf, and Gayle M. Stuber, *The Music and Literacy Connection* (Lanham: Rowman & Littlefield Education, 2007).

music reading it involves identifying specific sounds embedded in a musical context. The second is auditory attention; in language reading it means paying attention to auditory signals such as speech for an extended time; in music reading it means paying attention to auditory signals such as vocal or instrumental music for an extended time. The third is auditory blending; in language reading it is to synthesize isolated phonemes into words; in music reading it is to determine the pattern or contour of the rhythm or melody. The fourth is auditory discrimination; in language reading it requires discrimination among words that are acoustically similar and among frequency, duration, or intensity; in music reading it requires discrimination among and within specific musical elements such as frequency (pitch), duration (beat, meter, rhythm, tempo), intensity (dynamics), timber, and tone color.³³

Hansen, Bernstorff, and Stuber then identified eleven parallels in visual processing between language and music. The first of four pertaining to this study is visual attention; in language it means paying attention to written language, for an extended time; in music it means paying attention to musical notation, for an extended period of time. The second is visual blending; in language it is synthesizing letters into words; in music it is determining patterns or contour from notation. The third is visual discrimination; in language it includes discriminating among graphemes that are visually similar; in music it includes discriminating specific musical elements by sight, such as pitch intervals, rhythms, or tempo markings. The fourth is visual continuation; in language it involves fusing letters into words and words into phrases or sentences; in music it involves

³³ McDonald and Fisher, *Developing Arts-Loving Readers: The Top 10 Questions Teachers Are Asking About Integrated Arts Education*, 5.

identifying phrases, melodic contour, and repetitive patterns. All of the aforementioned auditory and visual processes listed are fundamental skills students need in order to read well.³⁴ They close by addressing more advanced skills in language and music: recognizing and composing various genres. Students must have a solid understanding of the fundamental elements of language or music before they can recognize a genre. For composing in a given genre, understanding and imagination are required.

Hansen, Bernstorff, and Stuber also present the case that children learn through play and cite well known child development theorists Jean Piaget, Lev Vygotsky and Daniel Elkonin, and Mildred Parten.³⁵ Hansen, Bernstorff, and Stuber state emotions play a key role in learning and that learning opportunities are optimal when a child feels safe and is relaxed, which is most often the case when children are at play.³⁶ The use of music in pre-school and primary grade classrooms focuses children's attention, allowing for incidental learning. Then during play-time (unstructured, undirected general play-time), children often sing or hum rhymes they know or have made up on their own.³⁷ Many children and adults still perceive music as play. Educators understand that students learn most readily if they are highly interested in the material and have an emotional connection with it. Learning through musical activities and musical play provides both.

In a 2000 article Smith wrote about the connections between songs and literacy instruction for pre-readers and beginning readers in elementary school classrooms. He

³⁴ Ibid., 10.

³⁵ Hansen, Bernstorff, and Stuber, *The Music and Literacy Connection*, 17.

³⁶ Ibid., 24.

³⁷ Ibid., 28.

addressed parallels between music and literacy instruction such as letter names and sounds, phonemic awareness, vocabulary, decoding, and writing.³⁸

In an article for *Comparative Literature*, Scher³⁹ addressed the multiple similarities between literature and music. Works from both disciplines may be divided into specific genres, and their stylistic tendencies parallel one another through the periods of Western history. Literature often inspires music. A poet may start with the words and add music. Word music may involve poetic imitation of musical sound. Both music and literature are temporal and auditory and often complement one another. Music can be written to convey a message that might be supplemented with words; literature often draws upon feelings that could be augmented by music.⁴⁰

Manins wrote for *Music Educator's Journal*⁴¹ about the integrated curriculum used in some New Zealand school districts. The curriculum draws upon children's natural curiosity as students learn how to "write" their own stories and allows language, drama, movement, art, and music to be used together. At first students would simply retell stories or slightly alter them but elements of the stories, art, and music etc. were their own inventions. The idea is not simply to provide musical experiences for children, but also give them a chance to interact with the music or sound source. Participating schools use music as a bridge to other areas such as history and language.⁴²

³⁸ John A. Smith, "Singing and Songwriting Support Early Literacy Instruction," *Reading Teacher* 53, no. 8 (2000).

³⁹ Steven Paul Scher, "Notes toward a Theory of Verbal Music," *Comparative Literature* 22, no. 2 (1970).

⁴⁰ Ibid.

⁴¹ Stuart Manins, "Bridge Building in Early -Childhood Music," *Music Educators Journal* 80, no. 5 (1994).

⁴² Ibid.

Schneider and Klotz tracked academic achievement in musicians and athletes in a three-year study. It involved 346 students in a large suburban/ rural school district in the Southwestern United States. The results showed that “musicians scored statistically higher than the athletes did and that over time, the gap widened.”⁴³ They compared musicians, athletes, and students who participated in neither music nor athletics. Student scores were based on the annual California Achievement Test. By 9th grade, musicians’ scores stabilized, while athlete and non-participant scores dropped. When the quality of the music programs were considered, students who participated in what Schneider and Klotz called “high quality music programs” scored significantly higher than athletes or non-participants.⁴⁴

Personal Growth

McPherson and Zimmerman wrote on the self-regulation of musical learning. Researchers are discovering how students acquire skills in order to control their own learning, and most believe that the ability to regulate one’s learning is obtained socially.⁴⁵ Family influence on childrens’ self-regulatory behavior continues well into adolescence, thus including all students in this study. McPherson and Zimmerman note four steps to acquiring self-regulation: observe a model, imitate the behavior, duplicate the behavior independently, and duplicate the behavior independently in a variety of personal and environmental conditions. McPherson and Zimmerman reference a 2001 study in which McPherson and Renwick followed the progress of 157 beginning band

⁴³Timothy W. Schneider and Jack Klotz, "The Impact of Music Education and Athletic Participation on Academic Achievement," in *Annual Meeting of the Mid-South Educational Research Association* (Bowling Green, KY: 2000), 24.

⁴⁴ Ibid.

⁴⁵ Bandura, ed., *Social Foundations of Thought and Action: A Social Cognitive Theory*.

students' practice, by studying home-video tapes of their individual practice time over a three-year period. In the first months of the study 80% of students needed reminders to practice; after nine months only 48% of students needed reminders. From that it seems a high percentage of students had progressed to the third step of self-regulation, duplicating the behavior independently. McPherson and Renwick suggest having students regularly evaluate the progress of other students as a way of developing their capacity to monitor their own progress. Another aspect of acquiring self-regulation is assuming responsibility of self. As students practiced their band instruments on a regular basis some began to assume practicing as their own responsibility, not their parents'.⁴⁶

Sosniak's 1987 study found that parents of the most successful music students consistently supported their efforts even during setbacks and times of discouragement. During those times, parents approached setbacks and discouragement as obstacles to overcome rather than failures, demonstrating the fourth step of acquiring self-regulation: duplicate the behavior independently in a variety of personal and environmental conditions. The personal condition may be one of disappointment, differing from the initial enthusiasm young instrumentalists often have when they first begin. Students who continue working toward their goals despite personal environments such as disappointment, discouragement, and dissatisfaction are obtaining self-regulation skills.⁴⁷

Self-regulation is also related to self-concept, which plays a significant role in a person's performance. How well a student believes he or she will perform is a greater

⁴⁶ Gary E. McPherson and Barry J. Zimmerman, "Self-Regulation of Music Learning," in *The New Handbook of Research on Music Teaching and Learning*, ed. Richard Colwell and Carol Richardson (Oxford: Oxford University Press, 2002), 332.

⁴⁷ Ibid.

determinant than their actual ability or skill.⁴⁸ Pintrich and Schunk's 1996 article supports this by noting students with higher expectations of themselves usually perform at a more advanced level than peers of equal skill with lower self-expectations. O'Neill and Sloboda concur in their 1997 article, though they use different terminology. They state equally skilled children may display an adaptive mastery-oriented approach to a task or a maladaptive helpless-oriented one. The mastery-oriented students would be the self-regulators, students who adjust themselves or their environment to master a given skill.⁴⁹

Catterall, Chapleau, and Iwanaga contributed one chapter to the 1999 book *Champions of Change: the Impact of the Arts on Learning*. Data on 25,000 students in a longitudinal study was included. The study examined the relationship between arts participation and student performance and attitudes. Catterall, Chapleau, and Iwanaga found "the arts have also shown links to student motivation and engagement in school, attitudes that contribute to academic achievement. Arts activities also can promote community—advancing shared purpose and team spirit required to perform in an ensemble musical group or dramatic production, or to design and paint an urban mural. With community surely comes empathy and general attachment to the larger values of the school and the adult society which high school students will soon join."⁵⁰

McPherson and Zimmerman reference Hallam's 1997 article that found more capable musicians were able to identify their strengths and weakness, and thus select appropriate strategies to address a given task. Often the musicians would simplify the

⁴⁸ Bandura, ed., *Social Foundations of Thought and Action: A Social Cognitive Theory*.

⁴⁹ McPherson and Zimmerman, "Self-Regulation of Music Learning."

⁵⁰ James S. Catterall, Richard Chapleau, and John Iwanaga, "General Involvement and Intensive Involvement in Music and Theater Arts," in *Champions of Change: The Impact of the Arts on Learning*, ed. Edward Fiske (Washington, DC: The Arts Education Partnership, 1999), 4.

task into smaller bits: short term and long-term goals. This provided guidance for their practice time, and allowed for interim self-assessments. Self-regulating students quickly notice when they are having difficulty acquiring a new skill or grasping a new concept because they self-monitor. Self-regulators tend to be proactive. They have adopted goals for themselves and will adjust their environment or their thought processes in order to reach them. Zimmerman believes “the ability to change or adapt one’s behavior based on performance feedback is central to self-regulation.”⁵¹

Summary

Most literature available on both music and other academic subject areas presents music in a subordinate role, suggesting music’s primary value in school settings is raising performance levels in other subject areas such as language arts, history, or math. Among academic subjects more has been written on language arts’ similarities and parallels with music than any other subject. Studies on spatial temporal reasoning show enhancement by music training. However some researchers such as Hassler, Birbaumer, and Feil question the long-term effects of music training due to a leveling that occurred once their subjects entered adolescent years. There is a consensus in the literature that improvements in attitude and behavior are by-products of music training or arts training. McPherson, Zimmerman, and others noted that students with instrumental music training had elevated levels of problem solving skills.

Gardiner et al found that students in the arts classes significantly improved their attitudes toward school over students without the arts classes. They attributed the

⁵¹ McPherson and Zimmerman, "Self-Regulation of Music Learning," 336.

positive change in demeanor to student realization of their ability to learn difficult skills such as those in the arts. Catterall, Chapleau, and Iwanaga went a step further and said arts involvement elevated student attitudes toward school and fostered a sense of community among participants. The Math+Music program has also been associated with positive academic and personal growth for its students. Following is anecdotal evidence of teacher perception from program participants.

In September 2002, Marti Baker, Principal of Madison Elementary said, “the students love learning the new math concepts, and the success they are experiencing gives them the confidence to take risks and be successful in other academic areas, as well.” In November of 2003, Janis Kleinberg, a math coach at Burnett Elementary, Long Beach said, “our kids love the program so much that they come for classes before school and stay for classes after school for their piano and computer instruction. It’s magical.” Another teacher at the same school shared about unexpected success of a severely dyslexic little boy, “...in the computer lab ... and in the piano keyboarding class he kept up almost as well as the other children. I asked him ‘how are you doing this?’ He replied, ‘I know I can’t read it, but I can hear it.’ No one would have ever known he wasn’t reading the music. What a marvelous gift for special education children to be able to meet their minds at a different place.”⁵²

⁵² Testimonials provided by Tina Earl, MIND Institute Director of Customer Support.

Chapter 3

Design and Application of Study

The objective of this study was to determine teacher perception of student growth after participating in the MIND Institute's ST Math+Music program. Student growth is measured in seven areas: four academic and three personal. Academic growth is assessed by evaluating achievement in math, language arts, arts, and physical education. Personal growth is assessed by evaluating changes in self-esteem, self-control, and self-regulation.

Initial Steps in Research Development

The initial steps in the research were to define the research administration processes and to identify the pool of participants. Questionnaire research, otherwise known as survey research, emerged as the most viable type of research for this study because it is often used to evaluate programs, services, opinions, and attitudes.⁵³ The effect of the Math+Music program on student growth is measured by the opinions and attitudes of the adults.

The choice between administering an independent survey or participating in an existing survey was difficult. Administering an independent survey meant its design and participant pools were selected solely by the author. Along with that freedom, however, would come the task of identifying a large enough pool of willing subjects, and the possibility of a low return rate of the survey. An existing survey would supply participants but with compromised freedom of study design. The author chose to add the

⁵³Mildred L. Patten, *Questionnaire Research: A Practical Guide*, Second Edition ed. (Los Angeles: Pryczak Publishing, 2001).

student growth questions to an existing annual survey for the purpose of accessing a large pool of participants.

Design of Questionnaire

Question Development

After discussing the proposed research with the MIND Institute, space on their annual program assessment survey was requested and received. The original scope of the study changed as the wording of the student growth questions were modified to blend with the MIND Institute's survey questions. These modifications did not change the essence of the questions. However, what began as an experimental study with treatment and control groups became a descriptive study measuring teacher perception of past and present students. The student growth questions were developed with input from the MIND Institute's Director of Customer Support, the San Jose State University Department of Music and Dance graduate advisor, the Music Department Chair of Del Mar High School, San Jose, CA, and six graduate students from San Jose State University's Department of Music and Dance.

Topic Selection

The topics selected for the survey were self-control, self-esteem, self-regulation, math achievement, language arts achievement, arts achievement, and physical education achievement. The self topics were selected to address students' personal growth. Math and arts were selected because they include academic subjects actively taught in the Math+Music program. Language arts was selected because literature suggests parallels between language study and music study, though the program does not actively teach it.

Physical education was selected because there was no obvious connection to the program, though music is often associated with movement.

Definition Selection

The definitions of terms were drawn from the *Encyclopedia of Psychology*, *The Greenwood Dictionary of Education*, and *Social Foundations of Thought and Action*. Sources were selected based on how succinctly their definitions were written, their date of publication, and their degree of respectability. Concise definitions are necessary in survey research; recent publications are imperative due to the fluid nature of word usage in the social sciences; source respectability is required in academic research. The three definitions provided were: **self-control**⁵⁴ when frustrated, can display the appropriate reaction or engage in problem-solving techniques; **self-esteem**⁵⁵ the confidence a person has in himself; how a person perceives and is satisfied with himself; **self-regulated behavior**⁵⁶ the process whereby students activate and sustain cognitions, behaviors, and affects that are systematically oriented toward attainment of the goals. Definitions of terms were presented before the questions so respondents had a uniform understanding of the questions.

Lickert-Scale Answers Selected

The student growth questions were created in a Lickert-scale format. Respondents indicated the extent to which they agreed or disagreed with each given statement. Answer choices for personal growth, or “self,” questions were: strongly agree,

⁵⁴ "The Greenwood Dictionary of Education."

⁵⁵ Ibid.

⁵⁶ Bandura, *Self-Efficacy: The Exercise of Control*.

agree, neutral, disagree, and strongly disagree. All four academic questions offered not applicable as a choice in addition to the aforementioned. This was necessary because few teachers instruct students in every academic area. For example, the classroom teacher may or may not instruct the students in the arts, therefore they may or may not be aware of student achievement in the arts.

All questions were similarly structured, comparing teacher perceptions of current ST Math+Music students with perceptions of students they taught prior to ST Math+Music. The survey questions follow:

1. My current ST Math+Music students have more self-control than students I taught prior to ST Math+Music.
2. My current ST Math+Music students have more self-esteem than students I taught prior to ST Math+Music.
3. My current ST Math+Music students self-regulate learning more than students I taught prior to ST Math+Music.
4. My current ST Math+Music students display higher achievement in math than students I taught prior to ST Math+Music.
5. My current ST Math+Music students display higher achievement in language arts than students I taught prior to ST Math+Music.
6. My current ST Math+Music students display higher achievement in the arts than students I taught prior to ST Math+Music.
7. My current ST Math+Music students display higher achievement in physical education than students I taught prior to ST Math+Music.

Administration of Survey

The student growth survey questions were included as the final portion of the MIND Institute's annual survey for the 2005–2006 academic year. At the close of each year, the MIND Institute's Customer Support department administers an assessment

survey addressing such topics as program funding, teacher support, program continuation, and computer access. The survey was made available on June 16, 2006 to all adult participants in the program. The internet survey was administered and results collected by the MIND Institute. Raw data was then forwarded to the author. This year approximately 1,000 teachers from 100 K–5 California schools took part in the program, the majority of whom are located in and around Los Angeles and Fresno.⁵⁷ 128 adult participants responded. Questions for the student growth survey begin with question 28 of the MIND Institute's survey; the entire survey and results are included as appendices. Data about and from student growth survey respondents is presented in the following chapter.

⁵⁷ Christina Earl, Director of Customer Support, Mind Institute, Telephone conversation, August 9, 2006.

Chapter 4

Characteristics of Respondents and Survey Results

The data for this study was obtained from a survey administered by the MIND Institute and offered to all California teachers and technicians who participated in their ST Math+Music program 2005–2006. The survey was distributed online, June 16, 2006. The results were compiled in July 2006.

Characteristics of Respondents

Of the approximately 1,000 teachers and technicians administering the MIND Institute’s ST Math+Music program, 128 completed the survey. Teachers and technicians were offered the same survey, though the results came back as two separate categories: teachers and technicians. The composition of the 117 respondents in the “teacher” summary was as follows: 112 were classroom teachers, 1 ST math software instructor, 2 music instructors, and 2 “other.” The composition of the 17 respondents in the “technician” summary was as follows: 10 were lab technicians, 1 classroom teacher, 2 ST math software instructors, and 8 “other.”

Although it would be informative to distinguish between the perceptions various kinds of instructors (classroom teacher vs. technician), it is beyond the scope of this study, and the pool in some categories is too small to produce reliable results. For these reasons results from all 128 respondents will be considered together.

Results

Results are shown in two different ways: untreated and treated. Results are displayed in table 1. There are eight columns; column headings left to right are survey

question topic, strongly agree, agree, neutral, disagree, strongly disagree, n/a (not applicable), and total responses. The survey question topics from top to bottom are more self-control, more self-esteem, more self-regulation, higher math achievement, higher language arts achievement, higher arts achievement, and higher physical education achievement. Contents of individual cells are included in the following paragraphs, organized by survey question topic. The number of respondents varied with each question.

Table 1. Survey Results on Student Growth

Topic	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Number of Responses
More Self-control	8	41	50	17	4	0	120
More Self-esteem	14	42	48	13	1	0	118
More Self-regulation	15	40	50	9	2	0	116
Higher Math Achievement	34	54	16	4	0	10	118
Higher Language Arts Achievement	2	27	59	10	5	15	118
Higher Arts Achievement	9	37	44	6	5	17	118
Higher Physical Education Achievement	2	6	58	17	6	28	117

The first question addresses whether ST Math+Music students have more self-control. Of 120 responses, 8 strongly agreed, 41 agreed, 50 were neutral, 17 disagreed, and 4 strongly disagreed.

The second question addresses whether ST Math+Music students have more self-esteem. Of 118 responses, 14 strongly agreed, 42 agreed, 48 were neutral, 13 disagreed, and 1 strongly disagreed.

The third question addresses whether ST Math+Music students self-regulate their learning more. Of 116 responses, 15 strongly agreed, 40 agreed, 50 were neutral, 9 disagreed, and 2 strongly disagreed.

The fourth question addresses whether ST Math+Music students displayed higher achievement in math. Of 118 responses, 34 strongly agreed, 54 agreed, 16 were neutral, 4 disagreed, 0 strongly disagreed, and 10 were not applicable.

The fifth question addresses whether ST Math+Music students displayed higher achievement in language arts. Of 118 responses, 2 strongly agreed, 27 agreed, 59 were neutral, 10 disagreed, 5 strongly disagreed, and 15 were not applicable.

The sixth question addresses whether ST Math+Music students displayed higher achievement in arts. Of 118 responses, 9 strongly agreed, 37 agreed, 44 were neutral, 6 disagreed, 5 strongly disagreed, and 17 were not applicable.

The final question addresses whether ST Math+Music students displayed higher achievement in Physical Education. Of 117 responses, 2 strongly agreed, 6 agreed, 58 were neutral, 17 disagreed, 6 strongly disagreed, and 28 were not applicable.

Treatment of Data

Treated results are displayed in percentage form in table 2. There are eight columns; column headings left to right are Survey Question Topic, Percentage Strongly Agree, Percentage Agree, Percentage Neutral, Percentage Disagree, Percentage Strongly

Disagree, Percentage N/A (not applicable), and total responses. The survey question topics from top to bottom are More Self-control, More Self-esteem, More Self-regulation, Higher Math Achievement, Higher Language Arts Achievement, Higher Arts Achievement, and Higher Physical Education Achievement. Contents of individual cells are included in the following paragraphs, organized by survey question topic. The number of respondents varied with each question. Percentages are rounded to the nearest tenth of a percent, therefore totals may not equal 100% precisely.

Table 2. Percentage Results on Student Growth

Student Growth Survey Topic	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	% N/A	Number of Responses
More Self-control	6.6	34	41.6	14	3.3	0	120
More Self-esteem	11.9	35.6	40.7	11	0.8	0	118
More Self-regulation	12.9	34.5	43	7.7	1.7	0	116
Higher Math Achievement	28.8	45.7	13.5	3.3	0	8.5	118
Higher Language Arts Achievement	1.7	22.9	50	8.5	4.2	12.7	118
Higher Arts Achievement	7.6	31.3	37.2	5	4.2	14.4	118
Higher Physical Education Achievement	1.7	5.1	50	14.6	5.1	23.9	117

The first question addresses whether ST Math+Music students have more self-control. Of the total responses, 6.6% strongly agreed, 34% agreed, 41.6% were neutral, 14% disagreed, and 3.3% strongly disagreed.

The second question addresses whether ST Math+Music students have more self-esteem. Of the total responses, 11.9% strongly agreed, 35.6% agreed, 40.7% were neutral, 11% disagreed, and 0.8% strongly disagreed.

The third question addresses whether ST Math+Music students self-regulate their learning more. Of the total responses, 12.9% strongly agreed, 34.5% agreed, 43% were neutral, 7.7% disagreed, and 1.7% strongly disagreed.

The fourth question addresses whether ST Math+Music students displayed higher achievement in math. Of the total responses, 28.8% strongly agreed, 45.7% agreed, 14.8% were neutral, 3.3% disagreed, 0% strongly disagreed, and 8.5% were not applicable.

The fifth question addresses whether ST Math+Music students displayed higher achievement in language arts. Of the total responses, 1.7% strongly agreed, 22.9% agreed, 50% were neutral, 8.5% disagreed, 4.2% strongly disagreed, and 12.7% were not applicable.

The sixth question addresses whether ST Math+Music students displayed higher achievement in arts. Of the total responses, 7.6% strongly agreed, 31.3% agreed, 37.2% were neutral, 5% disagreed, 4.2% strongly disagreed, and 14.4% were not applicable.

The final question addresses whether ST Math+Music students displayed higher achievement in Physical Education. Of the total responses, 1.7% strongly agreed, 5.1% agreed, 50% were neutral, 14.5% disagreed, 5.1% strongly disagreed, and 23.9% were not applicable.

Only applicable responses are included in the following charts.⁵⁸ Figure 1. displays teacher perception of more self-control. Combining “agree” with “strongly agree” and “disagree” with “strongly disagree” creates a summary of self-control responses. 40.6% agree or strongly agree; 44.6% are neutral; 17.3% disagree or strongly disagree.

Figure 1. Teacher Perception of More Self-control

⁵⁸ Complete student growth survey responses are included as appendices. The student growth survey is the final portion of the MIND Institute’s survey.

Figure 2. displays teacher perception of more self-esteem. Combining “agree” with “strongly agree” and “disagree” with “strongly disagree” creates a summary of self-esteem responses. 47.5% agree or strongly agree; 40.7% are neutral; 11.8% disagree or strongly disagree.

Figure 2. Teacher Perception of More Self-esteem

Figure 3. displays teacher perceptions of more self-regulation. Combining “agree” with “strongly agree” and “disagree” with “strongly disagree” creates a summary of self-esteem responses. 47.7% agree or strongly agree; 43% are neutral; 9.4% disagree or strongly disagree.

Figure 3. Teacher Perception of More Self-regulation

Figure 4. displays teacher perception of higher math achievement. Combining “agree” with “strongly agree” and “disagree” with “strongly disagree” creates a summary of Math Achievement responses. 81.5% agree or strongly agree; 14.8% are neutral; 3.7% disagree or strongly disagree.

Figure 4. Teacher Perception of Higher Math Achievement

Figure 5 displays teacher perception of higher language arts achievement. Combining “agree” with “strongly agree” and “disagree” with “strongly disagree” creates a summary of Language Arts responses. 28.1% agree or strongly agree; 57.3% are neutral; 14.5% disagree or strongly disagree.

Figure 5. Teacher Perception of Higher Language Arts Achievement

Figure 6 displays teacher perception of higher arts achievement. Combining “agree” with “strongly agree” and “disagree” with “strongly disagree” creates a summary of Arts responses. 45.5% agree or strongly agree; 43.6% are neutral; 10.9% disagree or strongly disagree.

Figure 6. Teacher Perception of Higher Arts Achievement

Figure 7 displays teacher perception of higher physical education achievement. Combining “agree” with “strongly agree” and “disagree” with “strongly disagree” creates a summary of physical education responses. 8.9% agree or strongly agree; 65% are neutral; 25.7% disagree or strongly disagree.

Figure 7. Teacher Perception of Higher Physical Education Achievement

The final data treatment displays number of positive responses to number of negative responses in ratios. The percentage of neutral responses is also considered. Positive responses include agree and strongly agree. Negative responses include disagree and strongly disagree.

Math had the strongest positive response with a positive to negative ratio of 22:1 and only 15% neutral responses. Second strongest was self-regulation with a positive to negative ratio of 5:1 and 43% neutral responses. Self-esteem was third with a positive to negative ratio of 13:1 (equivalent to 4.3:1) and 41% neutral responses. Arts came in

fourth with a positive to negative ratio of 4:1 and 44% neutral responses. Self-control was fifth with a positive to negative ratio of 7:3 (equivalent to 2.3:1) and 42% neutral responses. Language arts came in sixth with a positive to negative ratio of 2:1 and 50% neutral responses. Physical education was last with a positive to negative ratio of 1:3 and 50% neutral responses.

Responses to six of the seven survey topics reflect the literature; math, self-regulation, self-esteem, arts, and self-control had positive responses; physical education, which has no obvious connection to the Math+Music program, had a negative response. The language arts results were unexpected. Though it had an overall positive to negative ratio, it was weak because exactly half of the responses were neutral. Discussion and conclusions are in the following chapter.

Chapter 5

Discussion and Conclusions

The strongest response was a positive one for mathematics achievement. This finding supports standardized testing data tracked by the MIND Institute each year and is a logical outcome as the Math+Music program was designed to improve student understanding of math concepts. Self-regulation, self-esteem, and arts had positive responses, self-control and language arts were slightly positive, and physical education was negative. Math had the most convincing positive response with a positive to negative ratio of 22:1, 15% neutral. Self-regulation was second with 5:1, 43% neutral. Self-esteem was third with 13:3 (equivalent to 4.3:1), 41% neutral. The arts came in fourth with 4:1, 44% neutral. The remaining three categories self-control, language arts, and physical education had equivalent or fewer positive responses than neutral responses. This indicates teacher perception of the program's effect on those four areas was minimal.

Factors Influencing Teacher Perception

Any number of factors may influence answers in a teacher perception survey. Teachers were asked to compare current to former students. A first year teacher taking the survey would not have previous students with whom to compare current students. Teachers whose student computers were reliable may have a more positive view of the program than those whose computers were not reliable. Teachers working within a school that implemented the program as recommended may have a more positive view of the program than schools that did not. When comparing current to prior students, we

must consider the fact they are different students. The current students may be naturally less capable than prior students. Though the current students' math achievement may have improved significantly due to ST Math+Music training, it may have only reached levels comparable to achievement levels of the naturally more capable prior students. We must also consider memories are not always precise representations of what really happened.⁵⁹

Wording of Questions

Wording of questions may have altered the results. Even though the Lickert type questionnaire is commonplace, it is possible that some participants perceived the answers to mean different things. For example, one respondent's understanding of neutral may be the same as another respondent's understanding of not applicable. Others may have chosen disagree because they thought the question was irrelevant.

Also, no specific definition of "arts" was provided in the survey, so one teacher may have answered the question based on visual arts alone, whereas another may have answered the question based on all performing arts; yet another may not provide arts of any kind to her students and thus answered "disagree." Music teachers, however, know their subject is labeled as an "art," so they would be more likely to strongly agree or agree that students participating in the ST Math+Music program improved in the arts. This year only two of one hundred twenty eight respondents identified themselves as music teachers. If more teachers who identified themselves as music teachers completed

⁵⁹ Joseph LeDoux, *The Emotional Brain* (New York: Simon & Schuster, 1996), 210-11.

the survey, the results would have been significantly stronger in the “strongly agree” and “agree” categories for growth in arts.

Timing of Survey

Another factor that might have skewed results is the low response rate. The survey was offered beginning June 16, 2006, within days of summer vacation for many teachers. Such a release date may have reduced the number of respondents since their end of semester and end of year duties may have been more pressing than an optional survey.

Imbalance of Respondent Types

An imbalance of respondent types may have impacted the outcome. The program involves three main parts, classroom math time, computer time for ST games, and music time. Ideally, similar percentages of math teachers, music teachers, and lab technicians would respond, offering a balanced perspective of the program. For example, if 10% of the math teachers, 10% of the music teachers, and 10% of the lab technicians responded, then there would be balanced perspective. This was not the case. Survey responses reflect mainly the perceptions of the classroom teachers. On the other hand, classroom teachers tend to spend more time with students than music specialists or lab technicians, so it is possible their feedback would be the most accurate.

Literature Considerations

Teachers agreed that the MIND Institute’s ST Math+Music program effected student growth in self-regulation and self-esteem. There were enough noticeable changes in participating students’ demeanor and behavior to show a trend toward personal growth.

When students have improved self-esteem and self-regulation, they contribute positively to the overall learning environment. The positive response regarding self-regulation was not a surprise since students experience its persistent nature when they play the ST games; the games give individual students immediate feedback on their decisions, and modify the difficulty of subsequent problems based on that student's comprehension that day. When a student plays the ST games, they are given several different opportunities to conquer a given challenge. In essence, the ST games model self-regulation for the students. Students with greater self-regulating skills require less teacher guidance, since they are learning to utilize resources on their own. Students with greater self-esteem are more likely to take risks by attempting new skills. That allows teachers to focus a greater percentage of their energy on teaching than on monitoring student behavior. As teachers are able to focus more class time on teaching, more student learning is likely to occur.

Language Arts

A surprisingly low 28% of respondents agreed or strongly agreed students grew in language arts achievement. Given the large body of writing suggesting links between music and literature, a much more positive response might have been expected. There is a large discrepancy between articles, books, and research written on language arts and music and teacher perceptions of the link between them. Perhaps, since there was not a specific language arts component in the program teachers had no expectation for change in language arts, or perhaps any links between the two must be articulated to the students for links to be made. However, 28% of respondents agreed or strongly agreed while 15% of respondents disagreed or strongly disagreed, so there was still a positive sentiment

about a link to achievement in language arts. Perhaps the language and music connections must be expressed to the teachers before connections would be more recognizable.

Physical Education

Though popular methods of music instruction such as Orff and Kodaly utilize movement as an integral part of their lessons, movement associated with music may be different than movement associated with physical education. Students in the math+music program mostly employ small movements such as hand clapping and do not use their whole body. In addition, physical education is not required of students by the state of California, so respondents did not likely have a standard upon which to base their answers. Though movement tends to play a supporting role in learning by engaging an additional learning modality. It would be enlightening to know what, if any, connections there are between physical education achievement and self-esteem.

Responses from one of the MIND Institute's questions were filtered with responses to self-esteem. Their question was as follows: during computer sessions I assist students always, usually, sometimes, seldom, or never. Responses to frequency of teacher participation and student self-esteem were compared. The analysis showed no correlation.

It would be instructive to know what happened that only two music teachers responded to the survey. Because the surveys were anonymous, there was no way to know whether the teachers were full time employees or part-time music specialists, which may or may not determine their accessibility to the MIND Institute's survey.

Conclusions

The presence of two “self growth” categories in two of the top three areas with responses indicating positive growth is telling. We do not know whether the relationship between higher achievement in math and strengthened self areas is causal or whether it is related to engagement and skills from the STAR games and music training. It is possible, however, that students may participate more in all subject areas as their self-esteem and self-regulating behavior grow. Bandura stated, “among the types of thoughts that affect actions none is more central or pervasive than people’s judgements of their capabilities to deal effectively with different realities.”⁶⁰ Students with strengthened self-perceptions and skills will have positive effects on all other academic and personal areas.

Gardiner found arts training significantly improved students’ math achievement and attitude toward school. Douglas and Willatt found music training, with an emphasis on rhythm, significantly improved students’ reading ability. McPherson and Renwick found that band students who practiced regularly began to assume more responsibility for their behavior; students learned to adjust themselves or their environment in order to master a given skill. Students with arts training often experience a bond that comes from working towards a common goal such as painting a mural or performing in an ensemble, which are life skills every student would benefit from acquiring. We do know that people with strong beliefs in their abilities tend to utilize skills more effectively; on the other hand, a highly skilled individual will likely hesitate when they nurture self-doubt.⁶¹ The

⁶⁰ Bandura, ed., *Social Foundations of Thought and Action: A Social Cognitive Theory*, 21.

⁶¹ ———, *Self-Efficacy: The Exercise of Control*, 35.

academic achievement students gain from arts training seems to pale in comparison to the richness of life one may experience due to a healthy sense of one's self.

Further Research

Research regarding student achievement might best be based on actual student assessments, not teacher perceptions; trends and tendencies may be best reflected in teacher perceptions, not precise increments of improvements seen in test scores. Similar studies on the MIND Institute's math+music program effect on student's personal growth would be helpful to confirm results of this study.

Glossary

achievement: The attainment of knowledge, competencies and higher level status, as may be reflected in grades, degrees, and other forms of certification or public acknowledgement.⁶²

language analytic: A way of reasoning that involves symbols or language to solve an equation to obtain a quantitative result.⁶³

MIND: Music Intelligence Neural Development Institute, a non-profit spun out of the University of California at Irvine in 1998. It is “a community based, nonprofit, interdisciplinary, basic scientific research institute devoted to using music as a window to understanding higher brain function, with the primary goal of enhancing children’s reasoning and creativity.”⁶⁴

STAR: Spatial temporal animation reasoning software games developed by Matthew Peterson to teach math concepts.⁶⁵

spatial temporal (ST): Thinking using pictures that evolve in space and time, especially important in math and science.⁶⁶

spatial orientation: The ability to visualize a rigid configuration when it is moved into different positions.

spatial visualization: The ability to keep in mind a configuration against distraction.⁶⁷

⁶² "The Greenwood Dictionary of Education," 4.

⁶³ Ph.D. Gordon L. Shaw, *Keeping Mozart in Mind*, Second ed. (Amsterdam: Elsevier, 2004), 19.

⁶⁴ Ibid.

⁶⁵ Ibid., 366.

⁶⁶ Ibid.

⁶⁷ Hassler, Birbaumer, and Feil, "Musical Talent and Visual-Spatial Abilities: A Longitudinal Study," 100.

self-control: When frustrated, can display the appropriate reaction or engage in problem-solving techniques.⁶⁸

self-esteem: The confidence a person has in himself; how a person perceives and is satisfied with himself.⁶⁹

self-regulated learning: The process whereby students activate and sustain cognitions, behaviors, and affects that are systematically oriented toward attainment of the goals.⁷⁰

technician: An adult who administers the STAR computer games, including teacher's aids or other uncertified school employees.⁷¹

⁶⁸ "The Greenwood Dictionary of Education.", 318.

⁶⁹ Ibid., 319.

⁷⁰ Bandura, *Self-Efficacy: The Exercise of Control*.

⁷¹ Earl, Director of Customer Support, Mind Institute.

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Appendix A

Letter of Permission to Publish Survey by Survey Monkey

Date: Mon, 2 Oct 2006 12:24:34 -0700 (PDT)
To:
From: "SurveyMonkey Support" <surveymonkey@mailca.custhelp.com>
Subject: request permission to use in a thesis [Incident: 061002-000121]

Recently you requested personal assistance from our on-line support center. Below is a summary of your request and our response.

If this issue is not resolved to your satisfaction, you may update it within the next 7 days.

Thank you for allowing us to be of service to you.

To update this question, please click here.

Note: Please do not reply via email. Click the link above to reply.

Subject

request permission to use in a thesis

Discussion Thread

Response (Grant Pauls)

10/02/2006 12:24 PM

Mary

Yes you can print out your survey and use it where ever you want.

Customer (Mary Nguyen)

10/02/2006 11:39 AM

Dear Survey Monkey,

I am a masters' student at San Jose State University. I request permission to use a printout of the original survey and survey results as an appendix to my thesis. The survey was initiated and completed this summer by the MIND Institute of Costa Mesa, CA. They included 7 of my questions on their survey.

Thank you for considering my request. Mary Nguyen

Auto-Response

10/02/2006 11:39 AM

We are currently reviewing your question and will get back to you shortly.

Thanks,
Grant

Appendix B

Letter of Permission to Publish MIND Institute 2006 Survey

Date: Thu, 05 Apr 2007 12:56:24 -0700
Subject: Re: permission please
From: "Tina Earl" <tearl@mindinstitute.net>
To: "Mary Nguyen"

Hi Mary,

MIND Institute grants permission for you to publish the results from our survey.

We look forward to seeing your thesis!!

-Tina

Tina Earl
Director of Customer Support
MIND Institute
Office: 888.751.5443, x 228
Mobile: 626.272.7523

"If you are planning for a year, sow rice. If you are planning for a decade, plant trees. If you are planning for a lifetime, educate a person."

-Chinese Proverb

Appendix C

MIND Institute 2006 Survey: Complete Survey
Offered to All Math+Music Participants as Provided by the MIND Institute

Friday, June 16, 2006

Design Survey

Show All Pages and Questions

<< Back

Preview >>

To change the look of your survey, select a choice below. Click 'Add' to create your own custom theme.

Theme: Blue Ice Add

MIND Institute Teacher Survey 2005-06

Edit Title

Edit Numbering

Add Logo

Add Page

1. Old Questions 1

Edit Page

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Add Logic

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 1. What is your role?

- ☐ Classroom Teacher
- ☐ Lab Tech
- ☐ Math Coach
- ☐ ST Math Software Instructor
- ☐ Music Instructor
- ☐ Other (please specify) _____

Add Question

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2. How many minutes per week of math instruction does your school / district require?

Add Question

Add Page

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3. How many minutes outside of the MIND program do you teach math per week?

Add Question

Add Page

Edit	Delete	Copy/Move	Add Logic
<p>4. Do you count ST Math computer session minutes as math minutes?</p> <p>☐ Yes</p> <p>☐ No</p> <p>☐ Partial</p> <p>☐ Don't know</p>			
Add Question		Add Page	

Edit	Delete	Copy/Move	Add Logic
<p>5. Do you count ST Math computer session minutes as technology minutes?</p> <p>☐ Yes</p> <p>☐ No</p> <p>☐ Partial</p> <p>☐ Don't know</p>			
Add Question		Add Page	

Edit	Delete	Copy/Move	Add Logic
<p>6. I lead the computer sessions:</p> <p>☐ For myself only</p> <p>☐ For 1 - 5 different teachers</p> <p>☐ For 6 - 10 different teachers</p> <p>☐ for 10+ different teachers</p> <p>☐ I don't teach my own or any classes</p>			
Add Question		Add Page	

Edit	Delete	Copy/Move	Add Logic
<p>7. During computer sessions, I assist students:</p> <p>☐ Always</p> <p>☐ Usually</p> <p>☐ Sometimes</p> <p>☐ Seldom</p> <p>☐ Never</p>			
Add Question		Add Page	

2. Untitled Page	Edit Page	Delete Page	Copy/Move	Add Logic
Add Question		Add Page		

Edit	Delete	Copy/Move
<p>8. Please rank the Importance from 1 through 5 (1=most / 5=least) of these topics for the ST Math Teacher's Manual:</p>		

	1	2	3	4	5
Installation Instructions (to install software)	☐	☐	☐	☐	☐
Scope and Sequence (table showing game descriptions, game order and standards coverage)	☐	☐	☐	☐	☐
Start-Up Guide (step-by-step instructions to implement the program)	☐	☐	☐	☐	☐
Tour of ST Math (walk through of the program and the spatial temporal approach)	☐	☐	☐	☐	☐

Add Question

Add Page

Edit Delete Copy/Move

9. Please specify any additional topic you would like to be included in the Teacher's Manual:

Add Question

Add Page

Edit Delete Copy/Move

10. How Important would it be to you to have access to these topics on the web? (1=most / 5=least)

	1	2	3	4	5
Installation Instructions (to install the software)	☐	☐	☐	☐	☐
Instructions for each game	☐	☐	☐	☐	☐
Product Descriptions	☐	☐	☐	☐	☐
Research - Articles	☐	☐	☐	☐	☐
Research - Test Results	☐	☐	☐	☐	☐
Scope and Sequence (table of game order and standards coverage)	☐	☐	☐	☐	☐
Start-Up Guide (step-by-step instructions to implement the software component)	☐	☐	☐	☐	☐
Tips and Hints for games	☐	☐	☐	☐	☐
Tour of ST Math (Walk	☐	☐	☐	☐	☐

through of the program and
the spatial temporal approach)

Add Question Add Page

Edit Delete Copy/Move

11. Please specify any additional topic you would like to have access to on the web:

Add Question Add Page

Edit Delete Copy/Move

12. Please indicate the usefulness of the following items from 1 through 5
(1=most / 5=least):

	1	2	3	4	5	Don't Know
ST Math Progress Chart (to display class / student progress)	☐	☐	☐	☐	☐	☐
JiJi's Hints & Tips Poster (implementation instructions poster for the computer lab)	☐	☐	☐	☐	☐	☐

Add Question Add Page

3. Untitled Page

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Add Question Add Page

Edit Delete Copy/Move Add Logic

13. I access my online class report:

- ☐ Before every computer session
- ☐ About once per week
- ☐ Once or twice per month
- ☐ Rarely
- ☐ Never

Add Question Add Page

Edit Delete Copy/Move Add Logic

14. ST Math+Music allows me to cover textbook math concepts and lessons more quickly in the classroom.

- ☐ Strongly Agree
- ☐ Agree

- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 15. ST Math+Music has increased the interest or enthusiasm of my students for mathematics.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 16. ST Math+Music has improved my students' performance on math tests.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 17. Do you count ST Math+Music music training minutes as arts minutes?

- ☐ Yes
- ☐ No
- ☐ Partial
- ☐ Not Applicable

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 18. I attend MIND music sessions with my students:

- ☐ Always
- ☐ Usually
- ☐ Sometimes
- ☐ Seldom
- ☐ Never
- ☐ Not Applicable

[Add Question](#) [Add Page](#)

[Edit](#) [Delete](#) [Copy/Move](#) [Add Logic](#)

* 19. I assist the music instructor:

- ☐ Always
- ☐ Usually
- ☐ Sometimes
- ☐ Seldom
- ☐ Never
- ☐ Do not attend music
- ☐ Not Applicable

[Add Question](#) [Add Page](#)

4. Old Questions 7

[Edit Page](#) [Delete Page](#) [Copy/Move](#) [Add Logic](#)

[Add Question](#) [Add Page](#)

[Edit](#) [Delete](#) [Copy/Move](#) [Add Logic](#)

* 20. Who is your school's MIND school support contact person?

- ☐ Tina Earl
- ☐ Laura Hanson
- ☐ Cynthia Watson
- ☐ Eric Sbar
- ☐ Andrew Sutton
- ☐ Don't know

[Add Question](#) [Add Page](#)

[Edit](#) [Delete](#) [Copy/Move](#) [Add Logic](#)

* 21. Please rate your MIND support person's effectiveness.

- ☐ Highly effective
- ☐ Somewhat effective
- ☐ Minimally effective
- ☐ Not effective
- ☐ No answer
- ☐ I have responded above, but would like to make additional comments.

[Add Question](#) [Add Page](#)

[Edit](#) [Delete](#) [Copy/Move](#) [Add Logic](#)

* 22. How often have you been in contact with ANY support person from MIND this

school year?

- ☐ Many times
- ☐ A few times
- ☐ Once
- ☐ Never

Add Question

Add Page

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* 23. Please rate the level of overall support which MIND provides you and your school.

- ☐ Excellent
- ☐ Good
- ☐ Adequate
- ☐ Needs Improvement
- ☐ Poor

Add Question

Add Page

5. Old Questions 9

Edit Page

Delete Page

Copy/Move

Add Logic

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 24. Did you attend the 2005 MIND Users Conference?

- ☐ Yes
- ☐ No

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 25. Would you consider attending an on-line MIND Teacher Briefing using your computer?

- ☐ Yes
- ☐ No
- ☐ Not sure

Add Question

Add Page

Edit Delete Copy/Move Add Logic

* 26. Would you consider accessing information about the ST Math+Music program via the web?

- ☐ Yes
- ☐ No
- ☐ Not sure

[Add Question](#) [Add Page](#)

[Edit](#) [Delete](#) [Copy/Move](#)

27. Please expand any answer, or provide comments on the ST Math+Music program. Thank you.

[Add Question](#) [Add Page](#)

6. Self-control [Edit Page](#) [Delete Page](#) [Copy/Move](#) [Add Logic](#)

Note: Some of the questions in this survey were created by Mary Nguyen who will include the findings in her research at San Jose State University. Your voluntary participation in this section is appreciated.

Definition of self-control: when frustrated, can display the appropriate reaction or engage in problem-solving techniques.

Definition of self-esteem: the confidence a person has in himself; how a person perceives and is satisfied with himself.

Definition of self-regulated learning: "the process whereby students activate and sustain cognitions, behaviors, and affects that are systematically oriented toward attainment of the goals."

[Add Question](#) [Add Page](#)

[Edit](#) [Delete](#) [Copy/Move](#) [Add Logic](#)

28. My current ST Math+Music students have more self-control than students I taught prior to ST Math+Music.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

[Add Question](#) [Add Page](#)

[Edit](#) [Delete](#) [Copy/Move](#) [Add Logic](#)

29. My current ST Math+Music students have more self-esteem than students I taught prior to ST Math+Music.

- ☐ Strongly Agree

- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

Add Question

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30. My current ST Math+Music students self regulate their learning more than students I taught prior to ST Math+Music.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

Add Question

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31. My current ST Math+Music students display higher achievement in the following disciplines than students I taught prior to ST Math+Music.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Math	☐	☐	☐	☐	☐	☐
Language Arts	☐	☐	☐	☐	☐	☐
Arts	☐	☐	☐	☐	☐	☐
Physical Education	☐	☐	☐	☐	☐	☐

Add Question

Add Page

<< Back

Preview

Appendix D

MIND Institute 2006 Survey Teacher Results: Summary as Provided by the MIND Institute

Results Summary

[Export](#)
[View Detail >>](#)

Filter Results

To analyze a subset of your data, you can create one or more filters.

[Add Filter...](#)

Total: 117

Visible: 117

1. Old Questions 1

1. What is your role?

	Response Percent	Response Total
Classroom Teacher	95.7%	112
Lab Tech	0%	0
Math Coach	0%	0
ST Math Software Instructor	0.9%	1
Music Instructor	1.7%	2
View Other (please specify)	1.7%	2
Total Respondents		117
(skipped this question)		0

2. How many minutes per week of math instruction does your school / district require?

[View](#) **Total Respondents** **112**
(skipped this question) 5

3. How many minutes outside of the MIND program do you teach math per week?

[View](#) **Total Respondents** **114**
(skipped this question) 3

4. Do you count ST Math computer session minutes as math minutes?

	Response Percent	Response Total
Yes	31.6%	37
No	41%	48
Partial	23.9%	28
Don't know	3.4%	4

Total Respondents **117**
 (skipped this question) **0**

5. Do you count ST Math computer session minutes as technology minutes?

	Response Percent	Response Total
Yes	45.3%	53
No	26.5%	31
Partial	17.9%	21
Don't know	10.3%	12
Total Respondents	117	
(skipped this question)	0	

6. I lead the computer sessions:

	Response Percent	Response Total
For myself only	71.8%	84
For 1 - 5 different teachers	8.5%	10
For 6 - 10 different teachers	1.7%	2
for 10+ different teachers	0.9%	1
I don't teach my own or any classes	17.1%	20
Total Respondents	117	
(skipped this question)	0	

7. During computer sessions, I assist students:

	Response Percent	Response Total
Always	42.7%	50
Usually	26.5%	31
Sometimes	23.1%	27
Seldom	5.1%	6
Never	2.6%	3
Total Respondents	117	
(skipped this question)	0	

2. Untitled Page

8. Please rank the importance from 1 through 5 (1=most / 5=least) of these topics for the ST Math Teacher's Manual:

	1	2	3	4	5	Response Average
Installation Instructions (to install software)	20% (21)	17% (18)	31% (33)	11% (12)	20% (21)	2.94
Scope and Sequence (table showing game descriptions, game order and standards coverage)	49% (51)	26% (27)	15% (16)	6% (6)	5% (5)	1.92
Start-Up Guide (step-by-step instructions to implement the program)	44% (46)	28% (29)	11% (12)	9% (9)	9% (9)	2.10
Tour of ST Math (walk through of the program and the spatial temporal approach)	37% (39)	22% (23)	27% (28)	9% (9)	6% (6)	2.24
Total Respondents						105
(skipped this question)						12

9. Please specify any additional topic you would like to be included in the Teacher's Manual:

View	Total Respondents	29
(skipped this question)		88

10. How important would it be to you to have access to these topics on the web? (1=most / 5=least)

	1	2	3	4	5	Response Average
Installation Instructions (to install the software)	15% (16)	12% (13)	35% (37)	12% (13)	25% (26)	3.19
Instructions for each game	47% (49)	22% (23)	14% (15)	6% (6)	11% (12)	2.13
Product Descriptions	10% (10)	14% (15)	40% (42)	18% (19)	18% (19)	3.21
Research - Articles	11% (12)	21% (22)	39% (41)	11% (12)	17% (18)	3.02
Research - Test Results	34% (36)	17% (18)	25% (26)	9% (9)	15% (16)	2.53
Scope and Sequence (table of game order and standards coverage)	46% (48)	24% (25)	18% (19)	7% (7)	6% (6)	2.03
Start-Up Guide (step-by-step instructions to implement the software component)	26% (27)	17% (18)	30% (31)	11% (12)	16% (17)	2.75
Tips and Hints for games	58% (61)	21% (22)	7% (7)	5% (5)	10% (10)	1.87
Tour of ST Math (Walk through of the program and the spatial temporal approach)	33% (35)	21% (22)	30% (31)	7% (7)	10% (10)	2.38
Total Respondents						105
(skipped this question)						12

11. Please specify any additional topic you would like to have access to on the web:

View **Total Respondents** **11**
 (skipped this question) **106**

12. Please indicate the usefulness of the following items from 1 through 5 (1=most / 5=least):

	1	2	3	4	5	Don't Know	Response Average
ST Math Progress Chart (to display class / student progress)	62% (65)	14% (15)	8% (8)	4% (4)	9% (9)	4% (4)	1.94
Jiji's Hints & Tips Poster (Implementation Instructions poster for the computer lab)	33% (35)	15% (16)	15% (16)	9% (9)	7% (7)	21% (22)	3.03
	Total Respondents						105
	(skipped this question)						12

3. Untitled Page

13. I access my online class report:

	Response Percent	Response Total
Before every computer session	17.5%	18
About once per week	31.1%	32
Once or twice per month	24.3%	25
Rarely	21.4%	22
Never	5.8%	6
	Total Respondents	103
	(skipped this question)	14

14. ST Math+Music allows me to cover textbook math concepts and lessons more quickly in the classroom.

	Response Percent	Response Total
Strongly Agree	21.4%	22
Agree	41.7%	43
Neutral	29.1%	30
Disagree	7.8%	8
Strongly Disagree	0%	0
	Total Respondents	103
	(skipped this question)	14

15. ST Math+Music has increased the interest or enthusiasm of my students for mathematics.

	Response Percent	Response Total
Strongly Agree	47.6%	49
Agree	36.9%	38
Neutral	14.6%	15
Disagree	1%	1
Strongly Disagree	0%	0
Total Respondents	103	
(skipped this question)		14

16. ST Math+Music has improved my students' performance on math tests.

	Response Percent	Response Total
Strongly Agree	28.2%	29
Agree	36.9%	38
Neutral	33%	34
Disagree	1.9%	2
Strongly Disagree	0%	0
Total Respondents	103	
(skipped this question)		14

17. Do you count ST Math+Music music training minutes as arts minutes?

	Response Percent	Response Total
Yes	42.7%	44
No	35.9%	37
Partial	11.7%	12
Not Applicable	9.7%	10
Total Respondents	103	
(skipped this question)		14

18. I attend MIND music sessions with my students:

	Response Percent	Response Total
Always	62.1%	64
Usually	7.8%	8

Sometimes		3.9%	4
Seldom		5.8%	6
Never		8.7%	9
Not Applicable		11.7%	12
Total Respondents			103
(skipped this question)			14

19. I assist the music instructor:

		Response Percent	Response Total
Always		26.2%	27
Usually		16.5%	17
Sometimes		16.5%	17
Seldom		8.7%	9
Never		4.9%	5
Do not attend music		5.8%	6
Not Applicable		21.4%	22
Total Respondents			103
(skipped this question)			14

4. Old Questions 7

20. Who is your school's MIND school support contact person?

		Response Percent	Response Total
Tina Earl		41.7%	43
Laura Hanson		17.5%	18
Cynthia Watson		10.7%	11
Eric Sbar		9.7%	10
Andrew Sutton		0%	0
Don't know		20.4%	21
Total Respondents			103
(skipped this question)			14

21. Please rate your MIND support person's effectiveness.

		Response Percent	Response Total
Highly effective		46.6%	48
Somewhat effective		20.4%	21
Minimally effective		0%	0
Not effective		0%	0
No answer		19.4%	20
View I have responded above, but would like to make additional comments.		13.6%	14
Total Respondents			103
(skipped this question)			14

22. How often have you been in contact with ANY support person from MIND this school year?

		Response Percent	Response Total
Many times		13.6%	14
A few times		48.5%	50
Once		25.2%	26
Never		12.6%	13
Total Respondents			103
(skipped this question)			14

23. Please rate the level of overall support which MIND provides you and your school.

		Response Percent	Response Total
Excellent		42.7%	44
Good		37.9%	39
Adequate		18.4%	19
Needs Improvement		1%	1
Poor		0%	0
Total Respondents			103
(skipped this question)			14

5. Old Questions 9

24. Were you made aware of the 2005 - 06 MIND Teacher Briefings in your area?

Response Response

	Percent	Total
Yes	93.2%	96
No	6.8%	7
Total Respondents		103
(skipped this question)		14

25. Did you attend a 2005 - 06 MIND Teacher Briefing?

	Response Percent	Response Total
Yes	34%	35
No	66%	68
Total Respondents		103
(skipped this question)		14

26. Did you attend the 2005 MIND Users Conference?

	Response Percent	Response Total
Yes	9.7%	10
No	90.3%	93
Total Respondents		103
(skipped this question)		14

27. Would you consider attending an on-line MIND Teacher Briefing using your computer?

	Response Percent	Response Total
Yes	62.1%	64
No	8.7%	9
Not sure	29.1%	30
Total Respondents		103
(skipped this question)		14

28. Would you consider accessing information about the ST Math+Music program via the web?

	Response Percent	Response Total
Yes	76.7%	79
No	5.8%	6

Not sure		17.5%	18
		Total Respondents	103
		(skipped this question)	14

29. Please expand any answer, or provide comments on the ST Math+Music program.
Thank you.

View	Total Respondents	24
		(skipped this question) 93

6. Self-control

30. My current ST Math+Music students have more self-control than students I taught prior to ST Math+Music.

	Response Percent	Response Total
Strongly Agree	6.8%	7
Agree	32%	33
Neutral	41.7%	43
Disagree	15.5%	16
Strongly Disagree	3.9%	4
Total Respondents		103
(skipped this question)		14

31. My current ST Math+Music students have more self-esteem than students I taught prior to ST Math+Music.

	Response Percent	Response Total
Strongly Agree	9.8%	10
Agree	36.3%	37
Neutral	40.2%	41
Disagree	12.7%	13
Strongly Disagree	1%	1
Total Respondents		102
(skipped this question)		15

32. My current ST Math+Music students self regulate their learning more than students I taught prior to ST Math+Music.

Response Percent	Response Total
------------------	----------------

Strongly Agree		12%	12
Agree		35%	35
Neutral		42%	42
Disagree		9%	9
Strongly Disagree		2%	2
Total Respondents			100
(skipped this question)			17

33. My current ST Math+Music students display higher achievement in the following disciplines than students I taught prior to ST Math+Music.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable	Response Average
Math	29% (29)	50% (50)	15% (15)	4% (4)	0% (0)	3% (3)	1.94
Language Arts	1% (1)	25% (25)	53% (54)	9% (9)	5% (5)	7% (7)	2.91
Arts	8% (8)	34% (34)	39% (39)	6% (6)	5% (5)	9% (9)	2.63
Physical Education	1% (1)	6% (6)	52% (52)	16% (16)	6% (6)	19% (19)	3.25
Total Respondents							101
(skipped this question)							16

Appendix E

MIND Institute 2006 Survey Technician Results: Summary as Provided by the MIND Institute

Results Summary

[Export...](#)
[View Detail >>](#)

Filter Results

To analyze a subset of your data, you can create one or more filters.

[Add Filter...](#)

Total: 21

Visible: 21

1. Old Questions 1

1. What is your role?

	Response Percent	Response Total
Classroom Teacher	4.8%	1
Lab Tech	47.6%	10
Math Coach	0%	0
ST Math Software Instructor	9.5%	2
Music Instructor	0%	0
View Other (please specify)	38.1%	8
Total Respondents		21
(skipped this question)		0

2. How many minutes per week of math instruction does your school / district require?

[View](#) **Total Respondents** 17
(skipped this question) 4

3. How many minutes outside of the MIND program do you teach math per week?

[View](#) **Total Respondents** 17
(skipped this question) 4

4. Do you count ST Math computer session minutes as math minutes?

	Response Percent	Response Total
Yes	28.6%	6
No	28.6%	6
Partial	14.3%	3
Don't know	28.6%	6

Total Respondents **21**
 (skipped this question) 0

5. Do you count ST Math computer session minutes as technology minutes?

	Response Percent	Response Total
Yes	38.1%	8
No	23.8%	5
Partial	9.5%	2
Don't know	28.6%	6
Total Respondents	21	
(skipped this question)	0	

6. I lead the computer sessions:

	Response Percent	Response Total
For myself only	4.8%	1
For 1 - 5 different teachers	0%	0
For 6 - 10 different teachers	42.9%	9
for 10+ different teachers	23.8%	5
I don't teach my own or any classes	28.6%	6
Total Respondents	21	
(skipped this question)	0	

7. During computer sessions, I assist students:

	Response Percent	Response Total
Always	33.3%	7
Usually	47.6%	10
Sometimes	14.3%	3
Seldom	4.8%	1
Never	0%	0
Total Respondents	21	
(skipped this question)	0	

2. Untitled Page

8. Please rank the importance from 1 through 5 (1=most / 5=least) of these topics for the ST Math Teacher's Manual:

	1	2	3	4	5	Response Average
Installation Instructions (to install software)	39% (7)	11% (2)	28% (5)	11% (2)	11% (2)	2.44
Scope and Sequence (table showing game descriptions, game order and standards coverage)	17% (3)	39% (7)	28% (5)	11% (2)	6% (1)	2.50
Start-Up Guide (step-by-step instructions to implement the program)	28% (5)	39% (7)	22% (4)	6% (1)	6% (1)	2.22
Tour of ST Math (walk through of the program and the spatial temporal approach)	22% (4)	33% (6)	28% (5)	11% (2)	6% (1)	2.44
Total Respondents						18
(skipped this question)						3

9. Please specify any additional topic you would like to be included in the Teacher's Manual:

View	Total Respondents	6
(skipped this question)		15

10. How important would it be to you to have accesss to these topics on the web? (1=most / 5=least)

	1	2	3	4	5	Response Average
Installation Instructions (to install the software)	22% (4)	0% (0)	44% (8)	17% (3)	17% (3)	3.06
Instructions for each game	56% (10)	22% (4)	11% (2)	6% (1)	6% (1)	1.83
Product Descriptions	11% (2)	22% (4)	56% (10)	6% (1)	6% (1)	2.72
Research - Articles	11% (2)	22% (4)	33% (6)	17% (3)	17% (3)	3.06
Research - Test Results	22% (4)	11% (2)	44% (8)	11% (2)	11% (2)	2.78
Scope and Sequence (table of game order and standards coverage)	39% (7)	22% (4)	28% (5)	6% (1)	6% (1)	2.17
Start-Up Guide (step-by-step instructions to implement the software component)	28% (5)	28% (5)	22% (4)	11% (2)	11% (2)	2.50
Tips and Hints for games	67% (12)	6% (1)	17% (3)	6% (1)	6% (1)	1.78
Tour of ST Math (Walk through of the program and the spatial temporal approach)	39% (7)	22% (4)	22% (4)	17% (3)	0% (0)	2.17
Total Respondents						18
(skipped this question)						3

11. Please specify any additional topic you would like to have access to on the web:

[View](#) **Total Respondents** **2**
(skipped this question) **19**

12. Please indicate the usefulness of the following items from 1 through 5 (1=most / 5=least):

	1	2	3	4	5	Don't Know	Response Average
ST Math Progress Chart (to display class / student progress)	50% (9)	6% (1)	22% (4)	11% (2)	0% (0)	11% (2)	2.39
Jiji's Hints & Tips Poster (implementation instructions poster for the computer lab)	28% (5)	17% (3)	28% (5)	11% (2)	11% (2)	6% (1)	2.78
Total Respondents							18
(skipped this question)							3

3. Untitled Page

13. I access my online class report:

	Response Percent	Response Total
Before every computer session	17.6%	3
About once per week	41.2%	7
Once or twice per month	17.6%	3
Rarely	11.8%	2
Never	11.8%	2
Total Respondents		17
(skipped this question)		4

14. ST Math+Music allows me to cover textbook math concepts and lessons more quickly in the classroom.

	Response Percent	Response Total
Strongly Agree	17.6%	3
Agree	29.4%	5
Neutral	52.9%	9
Disagree	0%	0
Strongly Disagree	0%	0
Total Respondents		17
(skipped this question)		4

15. ST Math+Music has increased the interest or enthusiasm of my students for mathematics.

	Response Percent	Response Total
Strongly Agree	52.9%	9
Agree	47.1%	8
Neutral	0%	0
Disagree	0%	0
Strongly Disagree	0%	0
Total Respondents		17
(skipped this question)		4

16. ST Math+Music has improved my students' performance on math tests.

	Response Percent	Response Total
Strongly Agree	29.4%	5
Agree	52.9%	9
Neutral	17.6%	3
Disagree	0%	0
Strongly Disagree	0%	0
Total Respondents		17
(skipped this question)		4

17. Do you count ST Math+Music music training minutes as arts minutes?

	Response Percent	Response Total
Yes	23.5%	4
No	29.4%	5
Partial	5.9%	1
Not Applicable	41.2%	7
Total Respondents		17
(skipped this question)		4

18. I attend MIND music sessions with my students:

	Response Percent	Response Total
Always	23.5%	4
Usually	5.9%	1

Sometimes		5.9%	1
Seldom		5.9%	1
Never		17.6%	3
Not Applicable		41.2%	7
Total Respondents			17
(skipped this question)			4

19. I assist the music instructor:

		Response Percent	Response Total
Always		11.8%	2
Usually		0%	0
Sometimes		5.9%	1
Seldom		5.9%	1
Never		17.6%	3
Do not attend music		17.6%	3
Not Applicable		41.2%	7
Total Respondents			17
(skipped this question)			4

4. Old Questions 7

20. Who is your school's MIND school support contact person?

		Response Percent	Response Total
Tina Earl		41.2%	7
Laura Hanson		35.3%	6
Cynthia Watson		5.9%	1
Eric Sbar		17.6%	3
Andrew Sutton		0%	0
Don't know		0%	0
Total Respondents			17
(skipped this question)			4

21. Please rate your MIND support person's effectiveness.

		Response Percent	Response Total
Highly effective		47.1%	8
Somewhat effective		11.8%	2
Minimally effective		5.9%	1
Not effective		0%	0
No answer		0%	0
View I have responded above, but would like to make additional comments.		35.3%	6
Total Respondents			17
(skipped this question)			4

22. How often have you been in contact with ANY support person from MIND this school year?

		Response Percent	Response Total
Many times		64.7%	11
A few times		35.3%	6
Once		0%	0
Never		0%	0
Total Respondents			17
(skipped this question)			4

23. Please rate the level of overall support which MIND provides you and your school.

		Response Percent	Response Total
Excellent		76.5%	13
Good		23.5%	4
Adequate		0%	0
Needs Improvement		0%	0
Poor		0%	0
Total Respondents			17
(skipped this question)			4

5. Old Questions 9

24. Were you made aware of the 2005 - 06 MIND Teacher Briefings in your area?

Response Response

	Percent	Total
Yes	94.1%	16
No	5.9%	1
Total Respondents		17
(skipped this question)		4

25. Did you attend a 2005 - 06 MIND Teacher Briefing?

	Response Percent	Response Total
Yes	47.1%	8
No	52.9%	9
Total Respondents		17
(skipped this question)		4

26. Did you attend the 2005 MIND Users Conference?

	Response Percent	Response Total
Yes	17.6%	3
No	82.4%	14
Total Respondents		17
(skipped this question)		4

27. Would you consider attending an on-line MIND Teacher Briefing using your computer?

	Response Percent	Response Total
Yes	82.4%	14
No	5.9%	1
Not sure	11.8%	2
Total Respondents		17
(skipped this question)		4

28. Would you consider accessing information about the ST Math+Music program via the web?

	Response Percent	Response Total
Yes	88.2%	15
No	0%	0

Not sure		11.8%	2
Total Respondents			17
(skipped this question)			4

29. Please expand any answer, or provide comments on the ST Math+Music program. Thank you.

View	Total Respondents	7
(skipped this question)		14

6. Self-control

30. My current ST Math+Music students have more self-control than students I taught prior to ST Math+Music.

	Response Percent	Response Total
Strongly Agree	5.9%	1
Agree	47.1%	8
Neutral	41.2%	7
Disagree	5.9%	1
Strongly Disagree	0%	0
Total Respondents		17
(skipped this question)		4

31. My current ST Math+Music students have more self-esteem than students I taught prior to ST Math+Music.

	Response Percent	Response Total
Strongly Agree	25%	4
Agree	31.2%	5
Neutral	43.8%	7
Disagree	0%	0
Strongly Disagree	0%	0
Total Respondents		16
(skipped this question)		5

32. My current ST Math+Music students self regulate their learning more than students I taught prior to ST Math+Music.

Response Percent	Response Total
------------------	----------------

Strongly Agree		18.8%	3
Agree		31.2%	5
Neutral		50%	8
Disagree		0%	0
Strongly Disagree		0%	0
Total Respondents			16
(skipped this question)			5

33. My current ST Math+Music students display higher achievement in the following disciplines than students I taught prior to ST Math+Music.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable	Response Average
Math	29% (5)	24% (4)	6% (1)	0% (0)	0% (0)	41% (7)	1.60
Language Arts	6% (1)	12% (2)	29% (5)	6% (1)	0% (0)	47% (8)	2.67
Arts	6% (1)	18% (3)	29% (5)	0% (0)	0% (0)	47% (8)	2.44
Physical Education	6% (1)	0% (0)	35% (6)	6% (1)	0% (0)	53% (9)	2.88
Total Respondents							17
(skipped this question)							4