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THE NATIONAL RESEARCH CENTER ON THE GIFTED AND TALENTED

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A Study of Musical Talents and Persons With Williams Syndrome

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ABSTRACT

This monograph describes the Music & Minds program, which was designed through the collaboration of educational psychology professors specializing in gifted and talented education with faculty members in music, drama, and creative movement. The purpose of the research was to investigate the implications and impact of a strengths- and interests-based program on a special needs group of young adults with Williams syndrome (WS).

This exploratory study employed multiple methodologies. Comparative case study and descriptive analysis were used to examine the experiences of the participants, and a mixed methods approach provided input into the effectiveness of using music (a self-reported area of interest) to achieve gains in a demonstrated deficit area (fractions).

The Schoolwide Enrichment Model (SEM), a comprehensive, well-researched approach to enrichment, was selected as the conceptual framework for Music & Minds. Instruments used were either developed specifically for the study or adapted from SEM programs to provide group profiles and individual insights into interests and learning preferences.

The participants, 8 female and 8 male young adults with WS, exhibited strong affinity for music and sound. There was a wide range of demonstrated musical ability, operationally defined as "the ability to understand and improvise in music, as well as the high level of skills, both potential skill areas and those present that can be developed in music."

Findings from the 10-day residential program showed that when academic learning was incorporated into an enriched music-infused curriculum, achievement increased and enthusiasm for learning was enhanced. Most notable was an increased willingness on the part of the participants to investigate new areas and ways of learning. When the students were given opportunities to combine academic and arts experiences, they were more likely to explore and persist in trying to increase skills in deficit areas.

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Executive Summary

The more a teacher is aware of the past experiences of students, of their hopes, desires, [and] chief interests, the better will he[she] understand the forces at work that need to be directed and utilized for the formation of reflective habits. (Dewey, 1939, p. 615)

Smiling, sociable, and often both musically interested and adept, persons with Williams syndrome (WS) have only recently been recognized as a distinct group of people with specific abilities that differentiate them from others with disabilities. To investigate these abilities, 16 individuals with WS were identified and asked to participate in a 10-day residential summer program called Music & Minds. The program was based on the Schoolwide Enrichment Model (SEM), a talent development model usually implemented in programs for gifted and talented students (Renzulli, 1977, 1994; Renzulli & Reis, 1985, 1997) that provide enrichment experiences. SEM calls attention to individual learning styles, prior experiences, patterns of talent development, and educational needs. Music & Minds was designed to provide appropriate enrichment experiences for WS participants based on the specific strengths, abilities, and interests of each, since research studies in a variety of fields have shown that learning is more productive and enjoyable when a person is able to work in an area of his or her own selection (Baum, Renzulli, & Hébert, 1995; Bloom 1985; Renzulli 1977; Renzulli & Reis, 1985; 1997). During the program, researchers examined patterns of talent development in music, as well as the efficacy of providing a talent development summer program to persons with WS. This monograph provides a summary of information about the program, including a discussion of academic deficits through the use of an enrichment approach to talent development that focused on the musical strengths and interests of the participants.

Research on Persons With Williams Syndrome

Since its identification in 1961, Williams syndrome, called a "beautiful mystery" by neurolinguist Ursula Bellugi (Boucher, 1994), has emerged from obscurity to fascinate

researchers, physicians, educators, and others. This rare congenital disorder is characterized by a unique pattern of asymmetric abilities that transcends traditional theories of intelligence and cognitive impairment. In describing an individual with WS from a father's point of view, Howard Lenhoff wrote:

> My daughter Gloria, now forty, has a rich lyric soprano voice, and can play on the full-sized piano accordion, with ease and embellishments, almost any song she hears. She has a repertoire of about 2,000 songs and sings in over 20 foreign languages. Yet, like most individuals with WS, she cannot add 5 + 3 nor can she get along independently. (Lenhoff, 1996, p. 1)

Unfortunately, the predominantly used label for persons with WS is "disabled," overlooking any assets. Previous research has focused on their genetic, medical, linguistic, and psychological deficits. Educational programs have generally been developed to address the disabilities of this group, and therefore, have failed to provide opportunities for the specific identification and development of the unique musical interests and abilities observed in many persons with WS.

Cognitive and Musical Abilities of Persons With Williams Syndrome

Reported cognitive levels for this population are described as severe to borderline intellectual impairment when measured by IQ tests, with a score range of 40 to 100 and a mean of 60 (Lenhoff, Wang, Greenberg, & Bellugi, 1997; Levitin & Bellugi, 1998). Poor visual-motor and visual-spatial/perceptual abilities (Bellugi, Bihrle, Jernigan, Trauner, & Doherty, 1990) and limited adaptive skills (Dilts, Morris, & Leonard, 1990) contribute to the inconsistent academic achievement profiles of the WS student (MacDonald & Roy, 1988). Subjects in a study by Pagon, Bennett, LaVeck, Stewart, and Johnson (1987) revealed "serious conceptual failure in mathematics" (p. 90); in fact, 8 out of 9 students could not correctly answer how many pennies made a nickel. Bellugi, Klima, and Wang (1996) documented individual difficulties in the areas of number, space, substance, weight, and quantity. Although individuals with WS generally have below average IQ scores, many also have unique cognitive profiles characterized by relative strengths in language and music, which contrast with extremely poor math, visuospatial, and visuomotor skills (Don, Schellenberg, & Rourke, 1999).

It is only recently that musicality in WS has been a focus of interest for researchers; however, the love of music has been anecdotally associated with WS from the time the syndrome was first described. In an early report delineating the psychological characteristics of the syndrome, each child was noted to be musical (von Arnim & Engel, 1964). In another early case study, music was reported to be the child's "truest love" (Anonymous, 1985, p. 968). More recently, other researchers have initiated both formal and informal studies at a weeklong music camp for individuals with WS.

Any discussion of the musical abilities of persons with WS is fraught with the same lack of consensus that Boyle (1992) described in his evaluation of music ability in "normal" populations, as it is difficult to find an agreed-upon definition of musical talent.

For the purpose of this program, music ability was operationally defined as "the ability to understand and improvise in music, as well as the skills, both potential and present, that can be developed in music."

From another viewpoint of music ability, research by Gardner (1983) described musical intelligence as one of a group of 8 related intelligences, defined by 8 criteria: (a) the potential isolation by brain damage; (b) the existence of idiots savants and prodigies; (c) identifiable core operations in the case of music, such as, the sensitivity to pitch, and rhythm relations; (d) a developmental history that leads to expert performance; (e) an evolutionary history; (f) support from experimental psychological tasks; (g) support from psychometric findings; and (h) the ability to encode the information with which an intelligence deals in a symbol system.

Using Enrichment Opportunities for Persons With Williams Syndrome

SEM (Renzulli, 1994; Renzulli & Reis, 1985, 1997) was selected as the conceptual framework of Music & Minds. SEM, a gifted education/talent development approach, is one of the most comprehensive and well-researched approaches to enrichment (e.g., Burns, 1987; Hébert, 1993; Olenchak, 1988; Olenchak & Renzulli, 1989; Renzulli, 1988; Renzulli & Reis, 1994; Schack, Starko, & Burns, 1991). At the center of SEM's approach is Renzulli's (1994) Act of Learning Model, which highlights the need for teacher, student, and curriculum interaction. All recommendations from SEM are based on a learning process that, in the case of the learner, takes into account: (a) the student's present achievement levels in each content area, (b) the learner's interest in particular topics and the ways in which he or she can enhance present interests or develop new interests, and (c) the preferred styles of learning that will improve the learner's motivation to pursue the material that is being studied. SEM encourages creative productivity in young people by exposing them to a variety of topics, areas of interest, and fields of study and then further trains them to apply advanced content, process-training skills, and methodologies to self-selected areas of interest. Approaching talent development in this way seemed particularly appropriate for use with persons with WS, who demonstrate interest in music, but also require educational adaptations in other areas.

Research Methods and Procedures

This multi-faceted exploratory program included two distinct, but overlapping research studies. The first, a comparative cross-case study (Erlandson, Harris, Skipper, & Allen, 1993; Miles & Huberman, 1994; Yin, 1994), employed descriptive analysis using data from the intensive 10-day summer program, including background data from participants' preschool, elementary, and secondary schools, and postsecondary education. This study explored the familial, developmental, social, and educational experiences of young adults with WS and examined the use of components of the SEM as an approach to providing talent development experiences for persons with WS. As Miles and Huberman (1994) stated: "One aim of studying multiple cases is to increase generalizability. At a deeper level, the aim is to see processes and outcomes across many

cases and thus to develop more sophisticated descriptions and more powerful explanations" (p. 172). It was hoped that composites of a number of case studies would result in descriptors of common characteristics in young persons with WS who are interested in music, and subsequently lead to better information about how they can increase their skills and proficiency in both academics and music.

The following questions guided the research agenda:

1. Can an enrichment/talent development approach using specific instructional strategies based on preferences, interests, and styles, provide a useful framework for the education of persons with WS?
2. How many of the participants demonstrated music skills, and what patterns emerged, if any, in the home experiences, early lessons, and parental support for these participants?
3. What were the participants' reported learning and product style preferences, interests? How did participants and their parents view their strengths and weaknesses in music and academic areas?
4. Did the use of an enrichment/talent development approach based on talents and strengths in an area of interest (music) result in achievement score gains in an identified deficit area (fractions)?

Data Collection and Analysis

Erlandson et al. (1993) advocated gathering qualitative data from a variety of sources in a variety of ways. Data were collected in five phases for Music & Minds. Phase One occurred as appropriate participants applied and were accepted into the program. Following notification of acceptance, sets of preliminary questionnaires were distributed to collect basic demographic, historical, and interest data from the participants and their parents.

Phase Two followed the return of the initial questionnaires. Parents were contacted in an extended, semi-structured telephone interview using an interview protocol. These taped recorded interviews lasted from 1 1/2 hours to 2 hours and were later transcribed. Parents were asked for information about a wide variety of topics, including birth, early years, age at identification for WS, parental and family demographics, with specific questions about preschool, elementary, secondary, and postsecondary education.

Phase Three focused on data collection at the research site. Daily direct participant observation and the completion of a number of surveys by both participants and instructors addressed the questions guiding this study, as well as other emerging questions (Yin, 1994). Field notes, a reflexive journal recording the researchers' reactions, and descriptions of events in the study were maintained as part of the audit trail.

Phase Four constituted transcription and investigation of previously collected data along with the collection of follow-up data to confirm or explore issues that emerged during the previous phases, including interviews with some staff and instructors.

Instrumentation

Instruments used during Music & Minds were either developed or adapted from enrichment programs. The Music & Minds Talent Development Parent Interview Protocol and the Music & Minds Talent Development Participant Interview Protocol were developed for this study to gather preliminary data about participants' medical history, educational background, skills, interests, learning profiles, career preferences, and other pertinent information about enrichment opportunities, social skills, recreation and hobby choices, and employment experiences. The learning styles inventory, preferences for product styles, and interest inventory were selected from available instruments. Criterion-based pre and posttests were also created for the Music & Fractions classes to establish the participants' level of achievement as well as identify deficits within the specific domain of basic fractions.

Limitations

Participants were solicited from the Williams Syndrome Association, which may not be a representative sample of persons with WS and therefore limits the findings. One purpose of qualitative research is to provide descriptions of individuals, and generalizability of findings is not the intended outcome.

In the Music & Fractions portion of the study, several issues within the research design limit the generalizability of the findings. Foremost the treatment was administered by the researchers. For this reason, special efforts were made to ensure the accuracy of the implementation of each lesson plan through the input of unbiased daily observers. Another limitation was the non-random selection of students for this program as all participants of the study were a part of the convenience sample. Additional areas of limitation focus on the test gains demonstrated by students. These gains may have resulted from a feeling of "specialness" that arose from general participation in the Music & Minds program.

Participants

A convenience comprised sample of 8 female and 8 male WS young adults between the ages of 18 and 28 was selected for the Music & Minds program. Advertisements for the program were placed in the Williams Syndrome Association publication, and applicants were screened to ensure they had established interests in music and satisfied the age criteria. Educational psychology professors at the Neag Center for Gifted Education and Talent Development at the University of Connecticut selected participants for the program with feedback from members of the Williams Syndrome Association.

Music & Minds Program

Daily schedules for the Music & Minds were designed by professors specializing in gifted and talented education in collaboration with faculty in music, drama, and creative movement. In addition, allied health and physical therapy professors analyzed physical limitations and developed individualized plans for increased mobility and physical fitness in the participants. The 18 member staff included professors, graduate assistants, Master's level music students, a nurse, and an administrative assistant. Daily classes in chorus, general music, individual instrument or voice, movement, and math using music enrichment to increase proficiency in fractions were part of the multi-faceted program.

Participants were housed in dormitories and took part in regular open meals on the university campus. Outside of scheduled classes, enrichment activities such as field trips, performances, and drama workshops were provided.

Findings

The major findings are organized by the research questions, followed by selected case studies of participants.

1. Can an enrichment/talent development approach using specific instructional strategies, based on preferences, interests, and styles, provide a useful framework for the education of persons with WS?

Music & Minds was entirely based on respect for individual participants' interests, learning styles, and preferences. The approach was flexible. Instructors were willing to try different methods of grouping, teaching and learning experiences, and providing various types of enrichment opportunities, such as evening open-microphone nightclubs, a professional chamber music performance, field trips, and daily drama activities, culminating in a self-designed musical performance. The use of musical enrichment and advanced training in music was found to both enhance all participants' understanding of mathematics and to provide opportunities to further develop their musical talents.

The core category emerging from data analysis for this question was the pervasive educational focus on deficits with little or no attention dedicated to abilities, strengths, and interests in previous school settings. All participants were aware (and parents confirmed) that their academic deficits and limitations were the focal points of most of their school experience. Participants reported that on only very rare occasions, in their many years of education at the preschool, elementary, secondary or postsecondary level, did any teacher or adult discuss their strengths, interests, or talents.

When offered opportunities to find and develop their potential talent areas at Music & Minds, participants responded with enthusiasm for learning, and a willingness to work on previously underdeveloped skills. They responded to higher levels of expectation on the part of staff. In the case of these participants, an integrated approach

to learning that included music proved to be a successful way to engage them with challenging content.

2. How many of the participants demonstrated music skills, and what patterns emerged, if any, in the home experiences, early lessons, and parental support for these participants?

Our music professionals identified 5 participants with high skill and potential in music, demonstrating musical intelligence as defined by Gardner (1983). Another 5 participants were identified as having mid-level skills or potential and, although they indicated interest in music, 6 participants had low performance or potential.

All 16 participants had been involved in music programs sometime in their childhood, and 11 had been in chorus or other choir groups. Ten participants had received specific instrument training in their childhoods, and 9 had some experience with private music teachers. Only the 5 participants who had sustained private instruction in music were identified as having high levels of musical skills. Data clearly indicated that the parents of all of these musically talented participants provided early lessons and encouragement in music, beginning in or prior to elementary school, and followed by continuous musical training and opportunities.

An interesting theme emerged through interviews with parents. Ten parents initially stated that their sons or daughters had demonstrated high ability in music and reported they had supported these talents; however, faculty and staff observations during the Music & Minds program provided insight into the parents' comments. There was great variability in parental understanding and use of the term "talent," as well as in the way they attended to their child's music ability. Our music staff identified only 5 participants as actually having developed high levels of ability, perhaps because others did not receive the systematic and appropriate opportunities to develop their talents.

3. What were the participants' reported learning and product style preferences, interests? How did participants and their parents view their strengths and weaknesses in music and academic areas?

Participants' responses on the Learning Styles Inventory (Renzulli, Smith, & Rizza 1997) where a Likert score of 4 is "really like" and a score of 1 is "really dislike" indicated that the highest instructional preferences were peer teaching (M=3.32, SD=.29), lecture (M=3.32, SD=.30), discussion (M=3.28, SD=.43), and projects (M=3.01, SD=.31), while the lowest preferences were simulations (M=2.67, SD=.44) and drill (M=2.72, SD=.45). These results supported previous anecdotal reports confirming the preferences of many persons with WS for social, verbal, group learning experiences, rather than structured, rigid activities (Levine, 1997).

The expression styles of the participants on the 50-item My Way: Expression Style Inventory (in which a Likert score of 5=very interested, 4=interested, 3=moderately interested, 2=of little interest, and 1=not at all interested) indicated the following group

preferences: service sharing and helping others (M=4.54, SD=.17), oral (M=4.40, SD=.43), musical (M=4.19, SD=.37), dramatization (M=3.99, SD=.19), and artistic (M=3.29, SD=.33). The high means and low standard deviations reflect the group patterns identified in these participants of strong social orientation and expressiveness.

An analysis of the interests of the participants using the Secondary Interest-a-Lyzer instrument revealed clear patterns. The participants were interested in musical activities, socially oriented in their outlook, and interested in learning about multiple areas; however, their responses indicated they avoided activities that involved mechanical or mathematical skills. Nine (56%) said that a perfect opportunity for learning for them would focus on music. Another common response was their collective and individual concern for others. Eleven participants, when asked to select topics that would interest them, said that they would like to learn about issues related to world peace.

4. Did the use of an enrichment/talent development approach based on talents and strengths in an area of interest (music) result in achievement score gains in an identified deficit area (fractions)?

Our research indicated that 94% (n=15) of the WS participants demonstrated an overall gain in comprehension of fractional concepts covered during the Music & Fractions class. Sixty-three percent (n=10) of the participants achieved a mastery level of .80 and above on the posttest. Individual participants increased their understanding of the basic mathematical concepts covered during the Music & Fractions class as demonstrated by the gain in their posttest total scores (t=6.21, p<.001), suggesting that the use of musical enrichment promoted participants' understanding of mathematics.

Discussion

Three findings from Music & Minds can be important for educators. First, the talent development approach proved to be successful. Participants gained skills both in music and in math (an area of demonstrated academic deficit).

The second finding is that educators should attempt to avoid the usual assessment stance of primarily focusing on disturbances or negative symptoms in this population. While school psychologists and special education teachers often base their work on deficits because of the Individual Education Plan (IEP) process, positive behaviors and characteristics can also be used to construct educational plans that address enrichment opportunities and talent development activities, as well as deficits.

The third finding of this study was that most participants were limited by self-held, firm, and sometimes inaccurate, beliefs about their ability to learn certain skills. Participants consistently told us what they could not do, and explained that their teachers had told them they could not do certain things from their early days of school.

These three findings highlight the need for educators to develop knowledge about the ways music can be used to increase interest and teach skills in academic areas. In

addition, by offering persons with WS a broad selection of music and enrichment experiences in a talent development model, educators might increase the possibility that these individuals could engage in a wider variety of musical experiences. Teaching in other academic areas might also be enhanced with the use of a talent development approach based on strengths, interests, and learning styles; however, to develop programs for this population that include appropriate curriculum, along with instruction in music, more information about individual preferences, interests, learning styles, and music abilities is essential.

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A Study of Musical Talents and Persons With Williams Syndrome

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CHAPTER I: Introduction

During the summer of 1998, the Office of Educational Research and Improvement funded a grant for a preliminary study of the musical talents of 16 persons with Williams syndrome (WS). Persons with WS have been recognized as a distinct group of people with special interests and talents that may differentiate them from people with other disabling conditions. The research literature indicates a general absence of knowledge of the behavioral characteristics of persons with WS and a need to further investigate ways to facilitate appropriate educational placement, programming, as well as recognition of their interests, abilities, and unique educational needs. This research project was conducted using data collected during a 10-day intensive music talent development program (Music & Minds) implementing components of the Schoolwide Enrichment Model (SEM) (Renzulli, 1977, 1994; Renzulli & Reis, 1985, 1997). General behavioral characteristics of a sample of 16 female and male participants between 18 and 28 years of age were identified, and specific characteristics of high and low performing sub-samples (as identified by music professionals) were examined. The use of components of SEM as a procedure for developing abilities and implementing enrichment programs for persons with WS was also examined.

Statement of the Problem

WS was identified almost 30 years ago, yet research studies on educational issues for this population are rare, especially for the postsecondary (18 to 28 years) age group. Persons with WS are generally viewed as persons with intellectual disabilities, yet previous research has focused mainly on their genetic, medical, linguistic, and psychological characteristics rather than their holistic learning needs. Recently, a variety of documentaries and television news shows have been broadcast on the musical abilities of this population, but limited formal research has been conducted in this area. In addition, little research has been conducted on the educational options and needs of young persons with WS. Anecdotal evidence seems to indicate that educational programs have generally focused on their disabilities and failed to provide opportunities

for the specific identification and development of their strengths. Little research has been conducted to learn more about their music abilities, interests, and learning styles. No research has examined how enrichment programs can help to develop the strengths, especially the music aptitudes, of this group.

This study explored various characteristics of adolescents and young adults with WS, in the context of a music enrichment program called Music & Minds, which was based on components of the SEM (Renzulli, 1977; Renzulli & Reis, 1985, 1997). The goal of this study was to inform service providers, educators, employers, and parents of better options for the education and development of the potentials of this group.

Music & Minds, the Summer Program

Music & Minds was designed as a 10-day residential summer program at the University of Connecticut in 1998. Encouraged by the results of the program, and the wish to confirm and expand on these findings, an additional Music & Minds was held in 1999; however, data in this report were obtained from 1998 session.

All participants were between the ages of 18 and 28 and came from 14 states and Canada. Participants were accepted into the Music & Minds program based upon two criteria: existing musical interests and activities, and sufficient self-care skills to allow supervised independent living.

During this program, all participants lived in a university dormitory setting where they shared a room with another participant of like gender and age. Participants followed the same basic daily schedule, consisting of individual music lessons, small group and ensemble lessons, and whole group experiences such as chorus and drama. Meals, taken in the regular university open cafeteria, and evening activities were also whole group experiences. All participants were persons with WS and, like many individuals within the Williams population, exhibited a strong affinity for music and sound, including "soundscape sensitivity," a term used to characterize unusual interest in the resonance and distinctive tone of sounds such as voice and musical instruments (Levitin & Bellugi, 1998).

Background of the Study

Limited research exists on young adults with WS, and limited information has been found about their patterns of interests, attitudes, behaviors, learning styles, and skills. The few studies conducted used samples with younger persons with WS and focused on genetic, medical, and psychological concerns, such as language, cognition, and general intelligence.

Characteristics of Persons With Williams Syndrome

From a medical and historical perspective, Lowery et al., indicated that antecedents of WS might be traced to supravalvular aortic stenosis (SVAS) that occurs in

70%-80% of the WS cases (as cited in Toland, 1996). SVAS was first documented by Chevers in 1842 and named by Mencarelli in 1930. Fanconi, Giradet, Schlesinger, Butler, and Blades (1952) reported that vitamin D supplements in milk, following World War II, were associated with an increased incidence of infantile hypercalcemia, with and without features of WS. They also documented infants with elfin facies (as cited in Toland, 1996). After a number of studies reported links between SVAS, elfin facies, and hypercalcemia, J. C. P. Williams (Williams, Barratt-Boyes & Lowe, as cited in Toland, 1996) was credited with the initial description of WS. Beuren, Schulze, Eberle, Harmjanz, and Apitz (1964) first described the WS personality "as friendly temperament, very active and always happy, and charming" (as cited in Toland, p. 3).

Toland (1996) discovered that "submicroscopic deletions of chromosome 7q11.23 causes WS, and demonstrated that hemizygosity of two genes, elastin (ELN) and LIM-kinase (LIMK) (which is associated with the specific cognitive profile of WS), is important for the WS phenotype" (p. iv). "Williams syndrome is a disorder with unknown etiology characterized by facial appearance, vascular disease and infantile hypercalcemia" (Hokama & Rogers, 1991, p. 678). Incidence has been estimated between 1 in 20,000 (Gorman, 1992). WS is evident at birth, affects both males and females equally, occurs in all ethnic groups, and has been reported throughout the world (Pober & Dykens, 1993).

Einfield and Hall (1994) described persons with WS as having a "typical facial appearance, the so-called 'elfin' faces, with an upturned nose, sometimes called retrousse, with a rather bow shaped mouth. Abnormal dentition is always present. There is often a particular iris pattern [in the eyes] described as star shaped or stellate" (p. 276). Nicholson and Hockey (1993) reported that developmental delay was found in 72% of the sample studied.

Characteristics reported for WS include psychiatric disorders with symptoms including anxiety, hyperactivity, preoccupations, inappropriate interpersonal behaviors, sleep disturbance, and hyperacusis (sensitivity to noise) (Einfeld, Tonge, & Florio, 1997), indiscriminate affection (Einfeld & Hall, 1994), poor relationships with peers, and good relationships with adults. Gorman (1992) reported cognitive ability reflected an intellectual range from severe to borderline intellectual impairment. This was confirmed by Bellugi, Bihrle, Jernigan, Trauner, and Doherty (1990); and Pagon, Bennett, LaVeck, Stewart, and Johnson (1987). Crisco, Dobbs, and Mulhern (1988) reported a mean Stanford Binet IQ of 67.5 (range 38 to 93) for their sample.

Several studies of the social-emotional adjustment or temperament of individuals with WS have been conducted using questionnaires and rating scales. Considerable agreement in these studies indicates that children with WS exhibit a number of personality or temperament traits (Einfeld et al., 1997; Gosch & Pankau, 1994). Children with WS are generally described as anxious, hyperactive, and lacking in attention and concentration (Einfeld et al., 1997; Udwin & Yule, 1991). Previous research indicates that some persons with WS may appear to be overly friendly and sometimes are described as exhibiting inappropriate behavior as they appear to be too personal or too

physical with requests for hugs, for example. Research has also documented persons with WS to be aggressive with behavioral disturbances (Davies, Udwin, & Howlin, 1998; Gosch & Pankau, 1994) or obsessive and preoccupied (Gosch & Pankau, 1884; Udwin & Yule, 1991). Also mentioned as behavioral characteristics are hyperacusis and sleep disturbance (Einfeld et al., 1997; Gosch & Pankau, 1994). Most of the recent literature is concerned with describing the aberrant, negative, or disturbing behaviors of WS, while little has been written about the friendliness, outgoing personalities, or the empathy and understanding of other people often found in persons with WS.

Gorman (1992) studied language and cognitive skills and found no significant differences between measures of language and cognition for her WS sample. Udwin and Yule (1990) examined the phenomenon of "cocktail party speech" (CPS), a speech pattern where much is spoken, but there is limited substance or meaning. Using Tew's (1979) criteria, they found that only 37% of a sample of 43 persons with WS demonstrated sufficient characteristics to be identified as displaying CPS. The latter were more verbally fluent than those without CPS. Bennett, LaVeck, and Sells (1978) and von Arnim and Engel (1964) noted poor motor coordination. Bennett et al. and von Arnim and Engel also noted unusual loquacity and command of language. Udwin, Yule, and Martin (1987) reported verbal skills were superior in relation to visuo-spatial and motor abilities, while Bihrle, Bellugi, Delis, and Marks (1989) and Bellugi et al. (1990) found poor visual-motor or visual-spatial/perceptual abilities. Bellugi, Sabo, and Vaid (as cited in Gordon, 1992) reported poor visual-motor integration and poor spatial-cognitive abilities demonstrated by an inability to draw spatially organized and integrated pictures of common objects. Bellugi et al. found an ability to draw internal detail "though the parts were not integrated into a functional whole" (p. 118) and Bellugi, Sabo, and Vaid (as cited by Gordon, 1992) reported an inability to accurately trace (motor ability). These patterns of weaknesses are suggested as contributors to limited academic achievement (Gordon, 1992; MacDonald & Roy, 1988). Dilts, Morris, and Leonard (1990) found poor development of visual motor integration skills, adaptive skills (fine and gross motor ability), self-care, domestic care, hobbies, and vocational skills in their study of participants aged from 1 to 29.

There are two unrelated interesting characteristics noted in the literature that shed light on a study involving educational interventions. Stambaugh (1996) reported persons with WS display a complex pattern of strengths, weaknesses, and aptitudes exemplified by being unable to add two digits, to having the ability to recall and accurately play music and sing songs learned over a 20-year period. Levitin and Bellugi (1997) also observed a specific conflict between evidence of motor problems and a higher degree of motor coordination when WS people were involved in playing their musical instruments.

Specific educational programs or strategies that might benefit WS students do not appear to have been thoroughly researched. Survey results reported by Grejtak (1997) involving the families of elementary and secondary school children with WS indicated these WS students have special education classifications, including learning disability (31%), other health impaired (15%), various levels of intellectual impairment (30%), multi-handicapped (8%), with "16% other categories, focusing on physical, emotional,

behavioral or language handicaps" (p. 1). Half of those surveyed were reported in regular education placements with various degrees of support, 35% were served through resource support programs, and 17% were in full-time special education classes. Five WS students were in private schools, and 5 were home schooled. Predominant services were speech therapy (100%), occupational therapy (87%), physical therapy (71%), and counseling services (15%). Music therapy, adaptive PE, vision therapy, social skills, or play therapy were also mentioned.

In recent years, a great deal of publicity, primarily consisting of newspaper articles about a Massachusetts summer music camp for young persons with WS, has accumulated that focuses on the musical abilities of WS persons (e.g., Antolewisc, 1997; Closter, 1998; Gray, 1997; Hanna, 1997; Krasean, 1997; Toppman, 1997; Warshaw, 1996). Levitin and Bellugi (1997) noted that while there is anecdotal evidence suggesting many WS persons have musical abilities, little empirical research has been done. Their qualitative observations of WS individuals aged 8 to 24 years at Belvoir Terrace Summer Music Camp in 1996 (n=40) were reported after a one day observation:

> [They displayed] an unusually high degree of engagement in music. Music seemed to be not just a very deep and rich part of their lives, but one that was omnipresent; most of them spent a great portion of the day singing to themselves or playing instruments . . . . (p. 15)

Many of these students later reported that they continued with music lessons and became involved in music and choral groups at school and in the community. Further research exploring the relationship of musical talent and behavioral strengths and weaknesses of persons with WS is warranted.

The Schoolwide Enrichment Model

Of the numerous approaches to enrichment (Clark, 1992; Davis & Rimm, 1998; Renzulli, 1986a; 1986b), the Schoolwide Enrichment Model (SEM) is one of the most comprehensive and well researched enrichment program models in the world (e.g., Burns, 1987; Hébert, 1993; Olenchak, 1988; Olenchak & Renzulli, 1989; Renzulli, 1988; Renzulli & Reis, 1994; Schack, Starko, & Burns, 1991). The SEM is a talent development approach with Renzulli's (1994) Act of Learning Model at its core. The Act of Learning Model highlights the need for a dynamic interaction between and among teachers, students, and curriculum. According to Renzulli (1994), the "act of learning takes place when these three major components interact with one another in such a way as to produce the intellectual or artistic equivalent of spontaneous combustion" (p. 18). As noted in the diagram (see Figure 1) essential characteristics in the learning process within the role of the teacher are: knowledge of the discipline, romance with the discipline, and instructional techniques. For optimal progress on the part of the learner, students' unique learning profiles need to be recognized and addressed. These profiles include documentation of individual abilities (both cognitive and non-intellectual), interests, and learning styles.

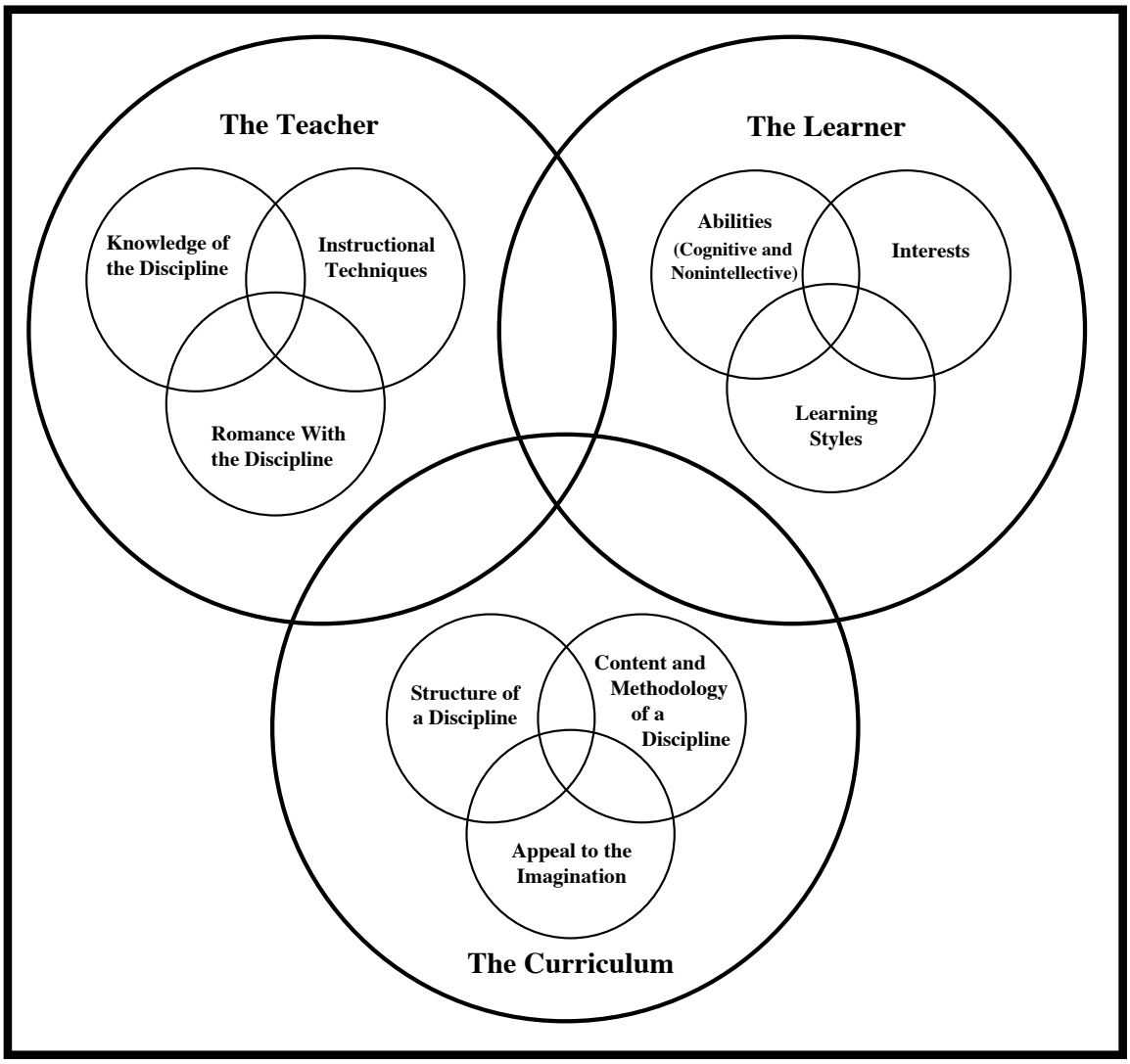

Figure 1. Figural representation of the act of learning model.

All recommendations from SEM are based on the learning process that takes into account: (a) the student's present achievement levels in each content area, (b) the learner's interest in particular topics and the ways in which he/she can enhance present interests or develop new interests, and (c) the preferred styles of learning that will improve the learner's motivation to pursue the material that is being studied. In the SEM, three types of services are provided to students: first, individual interest and learning style assessments; second, curriculum modifications to make existing curriculum more appropriate; and third, the use of a specific set of enrichment opportunities based on a model developed by Renzulli in 1977 entitled Enrichment Triad Model. The Triad Model includes three different types of enrichment: Type I, II, and III (see Figure 2).

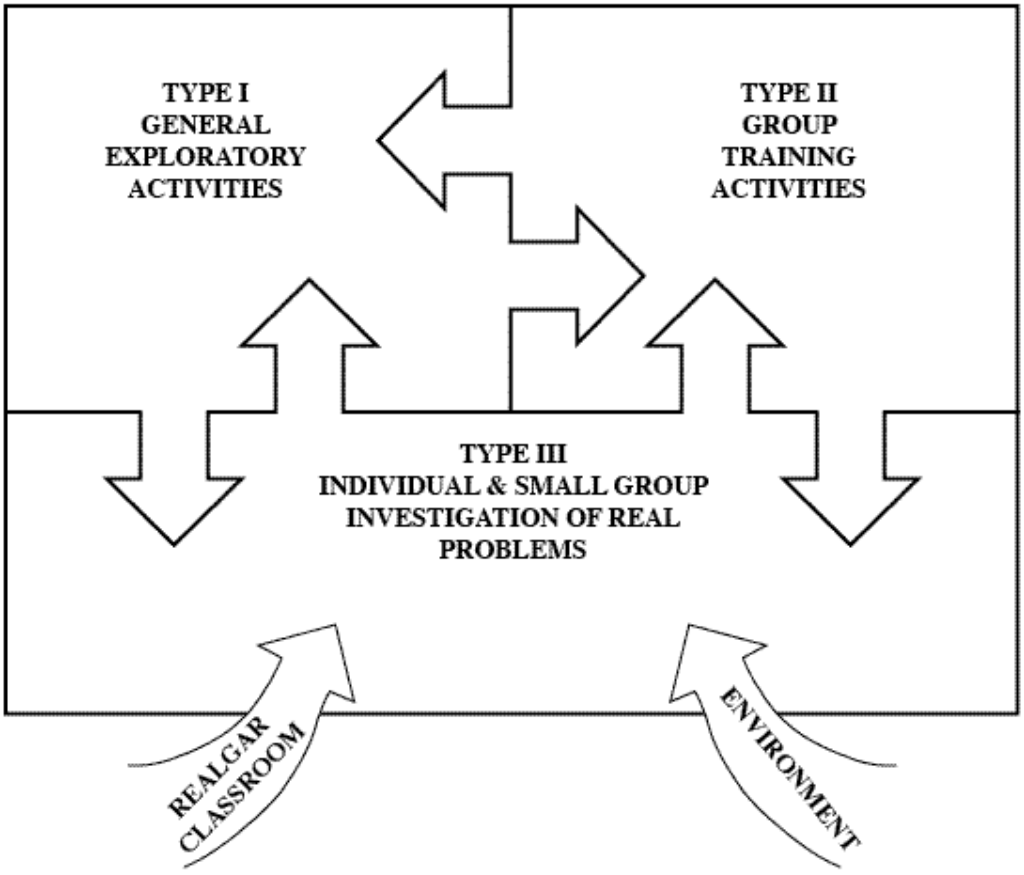

Figure 2. The enrichment triad model.

Type I enrichment is designed to expose students to a wide variety of disciplines, topics, occupations, hobbies, persons, places, and events that would not ordinarily be covered the regular classroom curriculum. Type II enrichment consists of materials and methods designed to promote the development of thinking and feeling processes, as well as training in methodological how-to skills. Type III enrichment occurs when students become interested in pursuing a self-selected area and are willing to commit the time necessary for advanced content acquisition and process training in which they assume the role of a first-hand inquirer. Through Type III enrichment, students develop authentic products that are primarily directed toward bringing about a desired impact upon a specified audience.

Several research articles have summarized the use of the model with various groups (Baum, 1988; Baum, Renzulli, & Hébert, 1995; Burns, 1987; Hébert, 1993; Morishima, 1977; Olenchak, 1988; Olenchak & Renzulli, 1989; Reis, Gentry, & Park, 1995; Renzulli, 1988; Renzulli & Reis, 1994; Schack, Starko, & Burns, 1991). The SEM has been shown to be effective with groups of talented and gifted students, as well as with underserved populations, and the model has recently been approved as one of the national models for which Federal Title One funds can be used. However, no research

has been conducted on the use of talent development models such as the SEM with persons with WS.

Using Enrichment Programs to Identify Strengths, Interests, and Abilities to Address Deficit Areas in Persons With WS

Many persons with WS seem to have exceptionally well-developed musical interests and abilities (Levitin & Bellugi, 1997). The absence of a systematic strategic approach to the continued development of these abilities, and an awareness of the unique strengths and limitations of this group, has placed persons with WS at an educational and occupational disadvantage. The focus of music teaching in schools, especially for special populations, is often guided by past practices. More often than not, educators may not recognize the special needs of persons with WS for music opportunities. Also, music teaching may be dominated by societal and peer group expectations typically excluding those who are different. Music & Minds focused on activities that have the potential to keep musical processes alive and to infuse musical experiences into academic deficit areas and social experiences.

CHAPTER II: Review of Research

This chapter provides a review of the research literature on WS, touching on etiology and medical concerns, with emphasis on cognitive and social/emotional strengths and weaknesses of persons with WS, along with educational issues. It also introduces the SEM as a theoretical rationale for a study of talent identification and development in young people with WS.

J. C. P. Williams, a heart specialist in New Zealand, first described Williams syndrome in 1961, in response to the shared characteristics of four of his pediatric patients. Elfin facial features and mental retardation were closely associated with heart murmurs and supravalvular aortic stenosis (SVAS) in these children (Lenhoff et al., 1997). Since then, physicians have successfully worked to classify characteristic attributes of WS in an attempt to gain a more complete description of the disorder. A comprehensive physical and medical profile of individuals with WS has emerged, beginning with infancy and continuing on through adulthood.

Williams syndrome (WS), called a "beautiful mystery" by neurolinguist Ursula Bellugi (Boucher, 1994), has emerged from obscurity to fascinate researchers, physicians, educators, and others since its clinical discovery. This syndrome, once considered a rare genetic disorder with incidence estimated at 1 in 20,000 births, (Levine, 1998), has more recently been given a prevalence of 1 in 7,500 (Stromme, Bjornstad, & Ramstad, 2002). WS impacts cognitive, behavioral, and motor areas; affects males and females equally; and occurs in all ethnic groups (Pober & Dykens, 1993). It is characterized by a unique pattern of asymmetric abilities that transcends traditional theories of intelligence and cognitive impairment. There can be a striking dichotomy between the strengths and weakness of these individuals which has propelled researchers toward a new understanding of the human brain and the relationship of specific genes to personality, behavior, and cognition.

Establishing a solid understanding of the medical, social and emotional, and cognitive issues of persons with WS holds value not only for medical scientists and researchers, but also for WS individuals, their families, educators, and others. An increasing body of literature is currently becoming available for teachers dealing with WS students. This awareness is crucial to the success of any educational program for these children. Steady progress has been made since "Optimal Teaching Techniques" was published in the Williams Syndrome Association newsletter in 1988. Psychologist Eleanor Semel epitomized the dilemma facing Williams children and their teachers in 1991:

> Educators are confused because the Williams syndrome child tests like the retarded child, talks like a gifted child, behaves like a disturbed child, and functions like a learning-disabled child. The result is that children with WS are generally not well served by schools, yet a proper education is indispensable if a

> child with WS is ever to make his or her own way in the world. (cited in Finn, 1991, p. 4)

Such terms as "retarded," "gifted," "disturbed," and "learning disabled" have specific meanings within special education, however, none of these terms adequately describes the complex learning profiles of a person with WS.

Physical and Medical Aspects of Williams Syndrome

Young children with WS often exhibit similar physical profiles, which become more apparent with age. The characteristic facial appearance of individuals with WS is among the most common features. A small, upturned nose, wide mouth with full lips, small chin, broad forehead, and puffiness around their bright eyes are each common attributes. In addition, blue- and green-eyed children may have a pronounced white startburst (stellate) pattern on their iris. Most of the WS children have small, widely spaced teeth and low pitched voices (Arnold, Yule, & Martin, 1985; Udwin et al., 1987; von Arnim & Engel, 1964).

Etiology of Williams Syndrome

Though not all individuals with WS are exactly alike, they do share conspicuous similarities in defining features across emotional, intellectual, and physical domains. For instance, they are an inherently sociable, loquacious, and endearing group characterized as radiating a "cocktail-party personality" (Boucher, 1994). In addition to their gregarious nature and strong command of language, WS individuals commonly share a love of and remarkable aptitude for music. Perfect pitch is not unusual and many are capable of retaining complex musical melodies for years (Lenhoff et al., 1997). However, despite such extreme abilities in the musical, verbal, and social realms, most WS individuals have an IQ between 50 and 70, classifying them as mildly to moderately retarded (Finn, 1991; Lenhoff, Wang, Greenberg, & Bellugi, 1997; Levitin & Bellugi, 1998). Their characteristic physical features and medical problems are another source of commonality in the typical WS profile. In fact, their resemblance to each other is so noticeable that a WS gathering, camp, or convention may seem like a family reunion. One Williams participant even remarked, "I never had seen anyone who looked like me until just coming to this convention. I was shocked! It was like—there's a person who looks like me! I look like them. This is quite amazing" (Finn, 1991, p. 55).

The ongoing search for the underlying causes of such physical, cognitive, and behavioral similarities has concentrated on the genetics of WS. Since its initial discovery, investigators have been classifying physical symptoms and features, as well as behavioral patterns and cognitive profiles, to gain a more complete understanding of the rare condition (von Arnim & Engel, 1964). By locating and concentrating on the specific genetic abnormalities in the WS brain, researchers have been attempting to connect its unusual organization to the particular spectrum of asymmetric abilities exhibited by so many WS individuals (Bellugi et al., 1994).

Efforts to discern the biological foundations for this asymmetric profile reached a new level of understanding in 1993, when a team of researchers including Dr. Colleen Morris at the University of Nevada found the microdeletion on chromosome #7 responsible for WS (Bellugi et al., 1994). They conducted a study of SVAS, a heart condition, in subjects who did not have WS and discovered a defect in one copy of a gene responsible for the production of elastin. Curious whether WS individuals, who likewise experience problems in organs dependent on elasticity, may have a similar genetic defect, they investigated further (Lenhoff et al., 1997). Researchers from both the University of Nevada and the University of Utah examined over 40 patients with WS, and all showed microdeletion of the elastin gene on chromosome #7. Using a technique known as fluorescent in situ hybridization (the FISH test), they were able to detect the deletion, and today the test accurately detects the elastin deletion in 95% to 98% of those with WS (WSA facts, 1998). In each case, the parents both possessed normal elastin genes, which indicates that the mutation was indeed a random event that occurred spontaneously during meiosis. Such a finding can be a tremendous relief to the families of WS children, who are reassured that the mothers bear no responsibility for such a defect (Lenhoff et al.).

Substantial progress has been made in efforts to understand the nature of the estimated 15 genes deleted on chromosome #7 in affected individuals. LIM-kinase 1, FDZ 3, and WSCR 1 are three of the genes currently under investigation, and though researchers have not yet determined their exact function, many speculate the LIM-kinase 1 may help to explain the WS individual's dramatic weakness in visuospatial ability. "This integrated approach to the study of Williams syndrome—connecting genes to neurobiology and ultimately, to behavior—may become a model for exploring how genes affect brain development and function" (Lenhoff et al., 1997, p. 69). Children with WS are usually born to normal parents and usually have normal siblings. There are, however, exceptions. Sadler, Robinson, Verdaasdonk, & Gingell (1993) evaluated a mother and son with WS, and suggested that some cases are autosomal dominantly inherited.

There may be other potential causal agents for WS. Adams (1996) argues that exposure to teratogenic agents during various pre-neonatal stages may be responsible. Chodirker et al. (1997), in a retrospective study, found lower than normal maternal serum alpha feto-protein (MSAFP) in 5 mothers during pregnancy with children who were identified with WS.

Medical Issues

Medical problems such as hypercalcemia, low birth weight, difficulty feeding, poor sleeping habits, and prolonged irritability are common among Williams infants (Arnold et al., 1985; Udwin et al., 1987; von Arnim & Engel, 1964). It is not unusual, one author noted, to hear a mother of a WS child say, "He cried constantly for the first three years of his life" (Finn, 1991, p. 57). Elevated blood calcium levels have been shown to account for much of the "colic-like" symptoms in these infants. The condition often improves with time, and many of the symptoms can be alleviated with the proper nutritional intervention (Garabedian et al., 1985).

Musculoskeletal problems are also common, and many persons with WS require physical therapy to improve their muscle tone and joint range of motion. Young Williams children often exhibit delayed physical and mental development, as well. They may experience slow weight gain during the first several years of life, and milestones such as walking, talking, and toilet training are routinely late (WSA facts, 1998). Long-term morbidity in children with WS is mainly due to mental handicap and arteriopathy, but hypertension (29%), kyphoscoliosis (19%), hyperacusis (75%), and obesity (50%) may be additional complications (Martin, Snodgrass, & Cohen, 1984). Recent reports include difficulties with joint contracture (50%) (Kaplan, Kirschner, Watters, & Costa, 1989), and limited average head circumference development (Pankau, Partsch, Gosch, Winter, & Wessel, 1997). Another possible medical problem is renal dysfunction, generally due to calcification of the renal arteries.

The limited calcium metabolism of WS individuals and the lack of the elastin gene appear to contribute to SVAS, a narrowing of the aortic and sometimes the pulmonary arteries. Aortic stenosis in WS is a well-recognized cause of sudden death (Bird et al., 1996; Cohle, Graham, Dowling, & Pounder, 1988). Hallidie-Smith and Karas (1988) suggested SVAS as a useful diagnostic sign for WS. They examined 66 patients with WS using an echocardiograph and found SVAS in all of them. Similarly, Shumskii, Konstantinova, and Pokidkin (1989) found SVAS in all 7 of their WS patients. Most WS individuals have SVAS, but SVAS is not contingent upon WS.

Another striking characteristic of WS is the hyperacusis or over-sensitivity to particular sounds. Often this hyperacusis is at a level that interferes with daily activities; individuals are often aware of sounds in the environment before other people, or are startled by sounds not normally regarded as out of the ordinary (WSA facts, 1998). Klein, Armstrong, Greer, and Brown (1990) reported high rates (95%) of auditory over-sensitivity in a sample of 65 persons with WS. The prevalence of otitis media (middle ear infection) in the same sample was 61%. Van-Borsel, Curfs, and Fryns (1997) found a similar occurrence of hyperacusis, otitis media, and hyperactivity in a group of 82 of Dutch-speaking subjects with WS. Not much is known of the etiology of this symptom, which is sometimes observed in individuals with high anxiety. Many investigators believe the seemingly innate musical ability found in so many WS individuals stems from their hypersensitivity to auditory information (Lenhoff et al., 1997). However, this characteristic can result in disabilities and academic underachievement (Finn, 1991; Levine, 1997).

Regarding the medical issues faced by the majority of WS individuals, it is important to look at hypercalcemia, SVAS, and thickening arterial walls from a developmental point of view. Since the vascular changes are apparently evidenced early in prenatal development, they can affect all succeeding development. One of the effects of the lack of the elastin gene is to decrease the permeability of the vascular walls, which in turn inhibits the transmission of oxygen and other nutrients to developing cells. Reduction in available oxygen and nutrients will effect the proliferation and migration of neurons in the developing brain and may be the responsible mechanism for such neurological effects such as hyperacusis, strabismus, and faulty binocular and spatial

vision. Many of the remaining WS symptoms may not be direct consequences of the genetic anomalies, but are the effects of these vascular changes on the subsequent development of the embryo (Bloomer, 2000).

There are several ophthamalogical conditions that have been associated with WS. De-Ancos and Klainguti (1996) report the most common WS ocular findings are iris abnormalities (stellate pattern), vascular tortuosity, and strabismus. In subjects with WS there is a relatively wide range of reported prevalence of strabismus (cross-eye), from 27% (Olitsky, Sadler, & Reynolds, 1997) to 78% (Kapp, von-Noorden, & Jenkins, 1995), with Winter, Pankau, Amm, Gosch, and Wessel (1996) reporting a moderate 54% of their large sample with the condition. The high prevalence of the esotropia (inward moving eye) form of strabismus (Winter et al., 1996) in patients with WS, 72% compared to 0.1% for the general population, led Kapp et al. (1995) to postulate a genetic link between WS and the hereditary form of infantile esotropia.

Monofixation syndrome is also common. Sadler, Olitsky, and Reynolds (1996) examined 12 WS patients and found the 6 testable subjects in their study to have monofixation syndrome as evidenced by subnormal binocular vision and poor visuospatial performance. Similar findings reported by Olitsky et al. (1996) led to the speculation that monofixation syndrome may be related to abnormal brain morphogenesis in the region of the occipitoparietal cortex.

Social and Emotional Characteristics

Several studies of the social-emotional adjustment or temperament of individuals with WS have been done using questionnaires and rating scales. There is considerable agreement among these researchers that WS children exhibit a number of shared personality or temperament traits. Children with WS are generally described as anxious, hyperactive, and lacking in attention and concentration. Some may be considered overly friendly, interpersonally inappropriate, obsessive, and preoccupied, and tend to be aggressive with behavioral disturbances. Also mentioned are hyperacusis and sleep disturbance. Table 1 summarizes the social emotional traits of those with WS explored in recent literature.

Most of the recent literature is concerned with describing the aberrant, negative, or disturbing behaviors of WS; however, rare comments have been made concerning some positive attributes. Notable among these are skill with facial recognition and superior language skills when compared with autistic children (Karmiloff-Smith, Klima, Bellugi, Grant, & Baron-Cohen, 1995) and Down Syndrome (DS) children (Reilly, Klima, & Bellugi, 1990).

Table 1

Social and Emotional Traits of Individuals With Williams Syndrome

- Good Facial Expressions (Karmiloff-Smith, Klima, Bellugi, Grant, & Baron-Cohen, 1995)
- Good Language Skills (Karmiloff-Smith et al., 1995)
- Hyperacusis (Einfeld, Tonge, & Florio, 1997; Gosch & Pankau, 1994)
- Anxiety (Davies, Udwin, & Howlin, 1998; Einfeld et al., 1997; Udwin & Yule, 1991)
- Hyperactivity & Concentration Issues (Davies, et al. 1998; Einfeld et al., 1997; Udwin & Yule, 1991)
- Inappropriate Interpersonal Behavior (Davies et al., 1998; Einfeld et al., 1997; Gosch & Pankau, 1994; Udwin & Yule, 1991)
- Over-friendliness (Davies et al., 1998; Gosch & Pankau, 1994)
- Preoccupations (Davies et al., 1998; Einfeld et al., 1997)
- Sleep Disturbance (Einfeld et al., 1997)
- Obsessions (Udwin & Yule, 1991)
- Aggressive Behaviors (Gosch & Pankau, 1997; Udwin & Yule, 1991).

Cognitive Strengths and Weaknesses

Other facets of the asymmetric WS profile, most notably in the cognitive and behavioral domains, have also attracted considerable attention from researchers. At the Salk Institute for biological studies, for instance, a team of researchers led by neurolinguist Ursula Bellugi has been investigating the particulars of WS (Boucher, 1994; Lenhoff et al., 1997). WS individuals have proven to be an intriguing and invaluable resource in enabling researchers to better understand the distinction between processes of language and reasoning. Whereas much of the normal population demonstrates a close connection between their language and reasoning abilities, WS subjects exhibit a significant dichotomy in this particular area. Poor visual-motor and visual-spatial/perceptual abilities (Bellugi et al., 1990) and limited adaptive skills (Dilts et al., 1990) contribute to the inconsistent academic achievement profiles of the WS student (MacDonald & Roy, 1988). Some individuals with WS have also been identified with deficits in conceptual reasoning tasks based on failure of the Piagetian tests of conservation (Bellugi, Wang & Jernigan, 1994). Bellugi, Klima, and Wang (1996) documented individual difficulties in the areas of number, space, substance, weight, and quantity. Furthermore, Levine (1998) lists in the Williams Syndrome Association teacher information brochure the following specific areas of difficulty in math skills: using money, time concepts, and manipulating columns of numbers.

Language and Verbal Ability

Investigators at the Salk Institute have made dramatic progress in assembling a WS profile, with the overarching goal of these studies to link cognition and behavior to its neuroanatomical foundations (Bellugi et al., 1994). To accomplish this, the team of researchers carefully devised methods of assessing specific abilities in WS subjects, as well as those considered representative of both the DS and general population for purposes of a comparative analysis (Lenhoff et al., 1997). Though the Williams subjects performed poorly on tests of overall cognitive ability, they demonstrated remarkably well-developed linguistic skills, particularly in their lexical, grammatical, and style abilities. Analysis of their speech reveals highly expressive, grammatically correct sentences that employ a variety of forms. For instance, one 18-year-old with WS made the following remarks regarding her goals: "You are looking at a professional book writer. My books will be filled with drama, action, and excitement. And everyone will want to read them . . . . I am going to write books, page after page, stack after stack. I am going to start on Monday" (Bellugi et al., 1994, pp. 27-28).

In contrast to the DS individuals, these subjects were able to develop well-structured narrations that included a clear orientation and description of the characters, in addition to the incorporation of dramatic emphasis, such as sound effects. Overall, they performed better than the DS subjects on all assessments of grammatical comprehension and production, demonstrated more expressiveness than even normal subjects, and had more comprehensive vocabularies than would be predicted given their IQ scores. For instance, when asked to list animals, "they often did not stick to easy words but chose such exotic examples as yak, Chihuahua, ibex, condor, and unicorns" (Lenhoff et al., 1997, p. 71). Researchers also noted that the WS subjects tended to use these unusual vocabulary words regularly in conversation, and Bellugi commented that they were "syntactically correct, but semantically just a little off the mark" (cited in Finn, 1991, p. 56). For example, a WS subject might say something like "I'll have to evacuate the glass," meaning they have to empty the glass (Bellugi et al., 1994). Further investigation into the cognitive abilities in WS individuals found their actual understanding to be less extensive than their verbal expressiveness, "which tends to be grammatically correct, complex and fluent at a superficial level, but verbose and pseudo-mature. They have a well developed and precocious vocabulary, with excessive and frequently inappropriate use of clichés and stereotyped phrases" (Udwin, Davies, & Howlin, 1996, p. 1021).

Other Areas of Strength and Weakness

Musical Ability

Another region of the WS brain that has come under considerable scrutiny is the primary auditory cortex, located in the temporal lobe, as well as the planum temporale, a region considered instrumental in the development of language and musicality. At the University of Windsor in Ontario, researcher Audrey Don studied these areas of the brain in her efforts to gain a greater understanding of the musical ability in WS subjects. Though relatively few brains have been examined so far, findings indicate the left region

of the planum temporale is so enlarged it compares to that of professional musicians. Such a capacity for auditory perception seems to account for some of the hyperacusis exhibited commonly in Williams individuals and their corresponding musical ability, thus establishing a closer link between unusual neuroanatomical features and the unique WS behavioral profile (Lenhoff et al., 1997).

A recent study by Lenoff et al. (1997) identified music as a particular talent in persons with WS and found that participants showed "significantly more interest in and emotional responsivity to music" (p. 68) than their age-peers. The desire to communicate with and through music can be so strong for these individuals that it becomes a means of understanding the world around them. As one participant in the Lenoff et al. study stated, "Music is my favorite way of thinking" (p. 68).

Lenhoff (1998) suggested that individuals with WS appear to "show a special affinity toward music" (p. 33). They exhibit an ability to learn and retain complex music, including lyrics written in foreign languages. Lenhoff also reported that some persons with WS have an ability to improvise and compose lyrics and music with facility and spontaneity.

Several studies were conducted between 1972 and 1999 to learn more about the connection between musical abilities and cognitive growth within specific domains (Campbell, 1997; Graziano, Peterson, & Shaw, 1999); however, no research examined if and how instructional methodologies could be modified to take into account the specific musical strengths of the WS population to address and stimulate learning in their acknowledged deficit areas.

Summary of Information on Cognitive Abilities

Cognitive abilities for this population are described as severe to borderline intellectual impairment when measured by intelligence tests, with a score range of 40 to 100 and a mean of ≈60 (Lenhoff et al., 1997; Levitin & Bellugi, 1998). Poor visual-motor and visual-spatial/perceptual abilities (Bellugi et al., 1990) and limited adaptive skills (Dilts et al., 1990) contribute to the inconsistent academic achievement profiles of the WS student (MacDonald & Roy, 1988). Subjects in a study by Pagon et al. (1987) revealed "serious conceptual failure in mathematics" (p. 90); in fact, 8 out of 9 could not correctly answer how many pennies made a nickel. Some individuals with WS have also been identified with deficits in conceptual reasoning tasks based on failure of the Piagetian tests of conservation (Bellugi et al., 1994). Bellugi et al. (1996) documented individual difficulties in the areas of number, space, substance, weight, and quantity. Furthermore, Levine (1998) lists difficulty using money, time concepts, and manipulating columns of numbers in the Williams Syndrome Association teacher information brochure.

Although a number of similarities are found among persons with WS in both physical features and cognitive profiles, the WS population, like any normal population, has great variability and diversity in their behaviors and abilities. Because of this

complexity, confusion has resulted regarding educating WS students and a lack of specific services have been provided for them (Finn, 1991). Individuals with WS generally have trouble within the regular classroom because of their cognitive deficits and their hypersensitivity to sound, which can result in distractability and underachievement (Finn, 1991; Levine, 1997). Semel, as cited in Finn, suggested that educators are confused about how best to teach these students because of inconsistent patterns in test scores, personality attributes, and other academic skills. Individuals with WS, a ". . . recognizable . . . subgroup of the overall developmentally disabled population" (Pagon et al., 1987, p. 90), have educational needs that are often overlooked.

Fine Motor Skills and Visual Spatial Skills

Drawing is largely a visual-motor-spatial task, which is thought to be the province of the parietal lobes and the frontal motor areas of the brain. Most research findings indicate that WS individuals have difficulty with tasks that require drawing. Bertrand, Mervis, and Eisenberg (1997) reported difficulty drawing or copying simple figures such as a flower, house, or an elephant from the Boston Diagnostic Aphasia Evaluation. Gosch and Pankau (1996) reported responses on the Draw-a-Person test to be inferior to verbal intelligence scores in a group of WS individuals.

Difficulty perceiving overall shape and a concentration upon details is reported by Bellugi (Bellugi et al., 1994) using the Delis Local-Global. The difficulty may not rest in the specific motor aspects of the response, since MacDonald and Roy (1988) report that WS individuals perform normally on the simple motor finger-oscillation task. Other studies indicating normal visual memory or superior facial recognition (Udwin & Yule, 1991; Wang, Doherty, Rourke, & Bellugi, 1995) suggest the problem does not lie in simple visual perception or visual memory per se. The limited drawing skills, and particularly the fragmentation of drawings and the focus on detail (local) versus overall (global) aspects of the figure, point to the complex integration processes that seem to develop more slowly in WS individuals.

Howlin, Davies, and Udwin (1998) noted that differences between Verbal and Performance IQ, and between receptive and expressive language skills, were smaller in the group they studied than generally found in other studies of children with Williams. Greer, Brown, Pai, Choudry, and Klein (1997), also in contrast to the findings of other studies of WS, found that language skills and short-term memory skills were weak. They conclude that a single predictable cognitive or behavioral phenotype cannot be assumed.

Wang and Bellugi (1994) reported that the superior language ability of WS participants was accompanied by significantly better performance on a verbal short-term memory task (Wechsler Intelligence Scale for Children—Revised [WISC—R] Digit Span). In studies reviewing verbal and visual-spatial short-term memory, Vicari, Brizzolara, Carlesimo, Pezzini, and Volterra (1996) and Vicari, Carlesimo, Brizzolara, and Pezzini (1996) compared WS children with normal children of similar age on two verbal memory tasks (short term memory digits forward and long term memory word list learning) and on two spatial tasks (the Block Tapping Test and the Rey Figure). They

concluded that memory abilities of WS children appeared to be characterized by defective visuo-spatial memory, both in the short-term and long-term domain, and by a dissociation between normal short-term, but deficient long-term verbal learning. Udwin and Yule (1991) also found WS individuals to have significantly poorer visuo-spatial and motor skills than control group participants. However, participants with WS were not uniformly poor in all areas of nonverbal abilities. Visual recall skills were as good as those of controls, and were superior to controls on a task of face recognition as well as tasks requiring recall of verbal material.

Bertrand et al. (1997) compared 8- and 9-year-old WS children with chronological age and mental age matched youngsters and found all three groups were following a similar developmental sequence, which has led to the speculation that Williams children may make progress in visual-motor integration, but at a slower rate than normal. Their examination of the types of errors indicated that both the Williams group and the younger mental age matched 4- to 7-year-olds were likely to make errors that involved integration of simple shapes. If this finding is replicated, studies attempting to provide rehabilitative instruction in visual integration processes might prove interesting. Presently the problem lies in identifying the complex sub-processes that are involved in producing the integrated result.

Educational Implications

Karen Levine, Co-Director of the Williams Syndrome Program at the Children's Hospital in Boston, Massachusetts, compiled a particularly relevant pamphlet for teachers, currently available on the Internet (Levine, 1997), which highlights behavioral hallmarks of WS and suggests strategies to adjust the classroom environment and instruction accordingly. A short attention span, extreme emotional states, hyperacusis, a tendency to fixate on "favorite topics," anxiety over changes in routine, and difficulty building age appropriate friendships are all areas addressed in the pamphlet. In addition, Levine also explained the particular asymmetric learning abilities in WS students and cautioned educators against searching for a single IQ that averages these peaks and valleys:

> For example, it would not make sense to average an 8-year-old child's age appropriate vocabulary with his 3-year-old level of design copying skills and conclude he is at a 5-year-old level and mildly retarded! Rather it is more meaningful to discuss the child's level of performance in specific areas and to plan curriculum according to these different levels. For example, the child may be ready to understand third grade science curriculum, but may need first grade math instruction. (Levine, 1997, p. 7)

Levine also analyzes specific learning strengths and weaknesses characteristic of children with WS. An expressive vocabulary, long term memory for information, musical ability, auditory memory, heightened awareness of the emotions of others, and the ability to initiate social interaction are all relatively strong areas in Williams students. On the other hand, fine motor and visual-motor integration skills, spatial analysis, word

finding, and mathematics skills are areas of difficulty. Several strategies are provided to help minimize these weaknesses in the learning process, including the use of computers and the adaptation of materials. Levine is particularly careful in asserting that these asymmetric abilities are characteristic of WS students as a whole, and may or may not be especially relevant to any particular individual (Levine, 1997).

School Programming and Placement

Anecdotal evidence seems to indicate that a majority of educational programs focus on disabilities and fail to provide opportunities for the specific identification and development of talents (Reis, Neu, & McGuire, 1995). Discussions of appropriate programs for WS students do not address talent development options. Levine and other specialists considered questions of programming and placement (Grejtak, 1997; Levine, 1997). In a recent survey, 112 families with a WS child responded to questions regarding elements of the schooling process. Results indicate that 50% of students are in regular education with the support of either a full- or a part-time aide. Approximately 35% are placed in a resource support program, but spend at least 50% of their day in regular education classes, and 17% or the students are in a special class setting for the entire school day (Grejtak, 1997). Whereas the 1980s witnessed the majority of students pulled out of regular classrooms for special instruction, throughout the 1990s the trend shifted towards the full inclusion model of education. Therefore, in the coming years, it is likely that more and more WS youngsters will be served with full- or part-time aides in regular classrooms.

Other facets of the WS student's educational experience have been subject to exploration. Parents responding to the Grejtak survey (1997) offered their insights into the characteristics of successful programs, including the importance of the teacher, teaching styles, small class size, and regular education peers to serve as role models. In addition, questions focusing on the most successful reading (phonics) and mathematics (Touch Math) programs, as well as different computer programs and other beneficial modifications were investigated.

Grejtak made an influential contribution to the body of educational WS research through her research, "Connecting the WS Cognitive Profile to Educational Strategies" (Grejtak, 1998). She described several significant comparisons between WS students and those with nonverbal learning disorders, including handwriting problems, difficulty with mathematical concepts, and abstract reasoning abilities. An analysis of the benefits of direct instruction programs for these youngsters, emphasizing processes of student verbal mediation and self-direction, provided some additional strategies for educators in the IEP (Independent Educational Program) planning process.

Postsecondary Educational Issues

Though some progress has been made in developing the awareness and strategies crucial to the effective education of WS youngsters, there is still substantial work to be done. A recent longitudinal study of cognition in WS subjects, initially in their early

teenage years and later in their early twenties, revealed a discouraging degree of uncertainty regarding the progress of these individuals within educational programs (Udwin et al., 1996). Though the sample size was small, findings indicate that Williams subjects demonstrated little improvement in reading, spelling, and math skills beyond their early teenage years. However, the researchers explained that only further investigation could determine whether the educational "ceiling of attainment" for WS students peaked at the 7- to 9-year-old level, or there would be continued growth long after others (Udwin et al., 1996). This uncertainty clearly indicates the need for more longitudinal research into the adult capacities of WS individuals, which is becoming increasingly possible as the children diagnosed in the 1980s grow into adulthood.

Other Postsecondary Options

Since 1994, music camps have been established "to foster the natural musical ability common to many with WS, and to provide them with advice that will help guide their music activities after they leave camp" (McGovern, 1998). Investigations have begun into creating year round residential schools for individuals with Williams. As we learn more about the WS cognitive and behavioral profiles, especially as it pertains to the effective education of these individuals, the possibilities abound. However, a 1990 survey of 119 WS adults found that most remained unable to live independently, requiring supervision in their everyday activities. Only a minority of these respondents had supervised jobs, and the remainder attended adult training day centers or had no employment at all (Udwin et al., 1996). Nevertheless, as researchers, physicians, psychologists, educators, parents, and friends continue to augment their own understanding of WS, the ultimate goal of independence for these individuals may become more and more of a reality.

A true appreciation for the endearing nature and innate musical gifts of people with Williams can subvert traditional notions of what it means to be cognitively impaired. Understanding people in terms of what is possible within the framework of their potential strengths, instead of reducing expectations of persons with WS to the level of their weaknesses, can be much more productive and rewarding for everyone involved. As Lenhoff explained,

> A good number of people labeled mentally retarded have a range of talents, some possibly even greater than a large number of people of normal intelligence. Such retarded people should be able to make a living through their craft and fill a much needed role in society if they receive training, help, and encouragement. (Lenhoff & Lenhoff, 1997, p. 2)

Using Enrichment Programs to Address Strengths, Interests, and Abilities

The Music & Minds program selected the SEM to address WS children's strengths, interests, and abilities because this model shifts focus away from identifying deficits and toward discovering learner's strengths. By taking notice of individual

interests, and learning preferences, the SEM provided a framework for taking advantage of and extending the participants' musical affinities and abilities.

SEM is a model currently used across the world as a general school improvement model, as well as a model for talent development. The SEM has three major components: analyzing students' talents, interests, and learning styles to identify patterns; modifying curriculum to address unique interests, abilities, and styles; and providing a series of planned enrichment opportunities based on the Enrichment Triad Model (Renzulli, 1977). SEM is considered to be one of the most widely used enrichment program in the country. The Enrichment Triad Model, the cornerstone of the SEM program, has over 20 years of research and development. It was designed to encourage creative productivity on the part of young people by exposing them to various topics, areas of interest, and fields of study; and to further train them to apply advanced content, process-training skills, and methodology training to self-selected areas of interest. Accordingly, three types of enrichment are included in the Enrichment Triad Model.

Type I enrichment is designed to expose students to a wide variety of disciplines, topics, occupations, hobbies, persons, places, and events that would not ordinarily be covered in the regular curriculum. In programs that use this model, an enrichment team consisting of parents, teachers, and students often organizes and plans Type I experiences by contacting speakers, arranging minicourses, demonstrations, or performances, or by ordering and distributing films, slides, videotapes, or other print or non-print media. The Type I experiences in Music & Minds included a number of musical, creative, and dramatic presentations for participants in areas many had not previously encountered.

Type II enrichment consists of materials and methods designed to promote the development of thinking and feeling processes. Some Type II enrichment is general, consisting of training in areas such as creative thinking and problem solving, learning show to learn skills such as classifying and analyzing data, along with reference and communication skills. Other Type II enrichment is specific, as it cannot be planned in advance, and usually involves in-depth instruction in an interest area chosen by the learner.

Type III enrichment occurs when students become interested in pursuing a self-selected area and are willing to commit the time necessary for advanced content acquisition and process training. The goals of Type III enrichment include:

- providing opportunities for applying interests, knowledge, creative ideas, and task commitment to a self-selected problem or area of study.
- acquiring advanced level understanding of the knowledge (content) and methodology (process) that are used within particular disciplines, artistic areas of expression, and interdisciplinary studies.
- developing authentic products that are primarily directed toward bringing about a desired impact upon a specified audience.

- developing self-directed learning skills in the areas of planning, organization, resource utilization, time management, decision making, and self-evaluation.
- developing task commitment, self-confidence, and feelings of creative accomplishment.

Type III enrichment emphasizes using professional approaches for the development of self-selected interest areas. Resulting products or performances are then presented to "real audiences" for use and appreciation (Renzulli, 1994; Renzulli & Reis, 1985, 1997).

Renzulli's (1194) "Act of Learning" model presents the essential characteristics in the learning process within the role of the teacher: knowledge of the discipline, romance with the discipline, and instructional techniques. The curriculum must not only take into account a discipline's structure, content, and methodology, but should also appeal to the imagination so it can come alive. For optimum learning to occur, the learner's abilities (both cognitive and non-intellectual), interests, and learning styles must be acknowledged. In the "Act of Learning" model, learning styles include instructional, environmental, thinking, and expression style preferences (Renzulli, 1994).

Use of Music

With the exception of using music at the beginning and end of class to relax and calm students, music has not been incorporated into traditional instructional methodologies to meet the needs of special populations (Schuster & Vincent, 1980). Although Frances Webber Aronoff (1969) proposed integrating music with the regular curriculum to "heighten a child's cognitive and affective development" (p. 14) with the belief that this approach to curriculum may help not only the gifted, but also those with other impairments and disabilities, there has not been research into its effectiveness with WS students.

A continuing study linking music and the mastering of academic subjects in Minneapolis schools has already shown that just an extra half-hour of specialized music training per week can produce dramatic gains within content areas (Schneider, 1998). Additional studies have found evidence that the brain can apply what is learned in one area, like music, to another, such as math (Gardiner, 1997; 1998; Gardiner, Fox, Knowles, & Jeffrey, 1996). In other words, learning is not just taking in or absorbing information, it is a process where the brain is trained in necessary skills.

According to Gardiner, who found that art and particularly music skills lead to gains in math and word recognition, music can be a key ingredient in a child's education, a "secret weapon" in learning (1996, p. 2). Educators in Minneapolis found that connecting concepts and melody resulted in increased classroom participation (Schneider, 1998). Nash, an elementary music teacher who moved into the regular classroom, also noted that students learned faster and more effectively when music was incorporated in the instructional methodology (as cited in Cary, 1987). In 1997, Howard Gardner said

that "music helps structure people's thinking and working by assisting them in learning math, language, and spatial skills" (Gardner, as cited in Black, 1997, p. 21). These findings support the application of music to the general curriculum as a method of enriching children's intellectual and creative abilities.

For the purposes of this study, the application of the Act of Learning model has been extended to include the population of persons with WS because of their demonstrated clear patterns of interests in the area of music (Levitin & Bellugi, 1998), as well their preferences for oral, visual, and dramatic expression (Reis et al., 2000).

Summary

The lack of research that addresses instructional modification and the integration of music and math into the learning process for populations with special needs, such as WS, has led to the following 4 main questions that guided this study:

1. Can an enrichment/talent development approach using specific instructional strategies based on preferences, interests, and styles, provide a useful framework for the education of persons with WS?
2. How many of the participants demonstrated music skills, and what patterns emerged, if any, in the home experiences, early lessons, and parental support for these participants?
3. What were the participants' reported learning and product style preferences, interests? How did participants and their parents view their strengths and weaknesses in music and academic areas?
4. Can the use of an enrichment/talent development approach based on talents and strengths in an area of interest (music) result in achievement score gains in an identified deficit area (fractions)?

CHAPTER III: Methodology

This study employed multiple methodologies. Comparative case study and descriptive analysis were used to examine the experiences of young persons with WS and provide answers for research questions 1 and 2. A mixed methods approach was used to provide input for questions 3 and 4. Details regarding the research process, sampling procedures, data collection, coding and analysis, and other procedures are described in this chapter.

Research Questions

This research began with the following 10 questions:

1. What are the parental perceptions of strengths and weaknesses of musically talented students with WS?
2. What are the students' own perceptions of their strengths and weaknesses in music and in academic areas such as math?
3. What were the participants' reported learning and product style preferences, interests, and perceptions of strengths and weaknesses in music and in academic areas?
4. How many of the participants were musically able and what patterns, if any, in early lessons, home experiences and parental support emerged in these participants?
5. What is the incidence of perfect pitch in the participants in this study?
6. Will an integrated instructional strategy based on preferences and styles within an area of interest (music) result in achievement score gains in basic fractions?
7. How can the teaching process be modified for participants with WS to provide small group or individualized instruction in math (fractions)?
8. What general instructional processes were modified and worked well for our participants?
9. In what ways did we learn to teach music to persons with WS?
10. Will an enrichment/talent development approach using specific instructional strategies, based on preferences, interests, and styles, provide a useful framework for talent development and educational experiences to use with persons with WS?

As themes and patterns emerged from data analyses, these 10 questions were condensed into the following 4:

1. Can an enrichment/talent development approach using specific instructional strategies based on preferences, interests, and styles, provide a useful framework for the education of persons with WS?

2. How many of the participants demonstrated music skills, and what patterns emerged, if any, in the home experiences, early lessons, and parental support for these participants?
3. What were the participants' reported learning and product style preferences, interests? How did participants and their parents view their strengths and weaknesses in music and academic areas?
4. Did the use of an enrichment/talent development approach based on talents and strengths in an area of interest (music) result in achievement score gains in an identified deficit area (fractions)?

Music & Minds Program Structure

Music & Minds Program was designed by educational psychology professors specializing in gifted and talented education in collaboration with faculty in music, drama, and creative movement. In addition, allied health and physical therapy professors analyzed physical limitations, and developed individualized plans for increased mobility and physical fitness for individual participants. The 18 member staff included 4 professors, 5 graduate assistants, 7 music students at the Master's level, a nurse, and an administrative assistant. Daily classes in chorus, general music, individual instrument or voice, movement, and math using music enrichment to increase proficiency in fractions were part of the multi-faceted program. Only choir class was taught as a whole group. Creative movement classes, which focused on expression and fluidity, were taught in three sections of 5 or 6 students at a time. Computer skills and percussion ensemble were selected by groups of 3 to 5 students. Although most instrumental and voice lessons were individual, several duos were also established.

The content of the math curriculum taught during Music & Minds included identifying equivalent fractions, understanding components of fractions, and practical applications to time, money, measurement, musical notes, and objects. Teaching of fractions was tied to daily living and music rather than taught theoretically or in isolation. Two daily math sessions (AM and PM) were held for a total teaching time in mathematics of 80 minutes per day over a period of 5 days (6 hours 40 minutes total teaching time). Music was used both as an instructional methodology and learning tool for learning fractions; a drum set and piano were present in the classroom and were used by instructors, guest artists, and participants throughout the program.

Evenings and weekend enrichment activities included drama, an in-house musical nightclub, field trips, and social opportunities. Participants were housed in single sex dormitory double rooms and ate meals in the university cafeteria with hundreds of students near their age who were attending other university summer programs and classes. Music & Minds concluded with a public performance reflecting program goals.

Data Collection

Erlandson et al. (1993) advocated gathering qualitative data from a variety of sources in a variety of ways, and in this study, data were collected in four phases. Phase

One occurred as appropriate participants applied and were accepted into the program. Following notification of acceptance, sets of preliminary questionnaires were distributed to collect basic demographic, historical, and interest data from participants and their parents. These questionnaires included information such as participants' ages, school experiences, interests, health, and questions about musical background (see Appendix A).

Phase Two followed the return of the preliminary questionnaires and involved an extended, semi-structured telephone interview with parents of participants using an interview protocol (see Appendix B). These taped recorded interviews lasted from 1 1/2 to 2 hours and were later transcribed. Parents were asked about a wide variety of topics, including birth, early years, age at identification for WS, parental and family demographics, and extensive information about preschool, elementary, secondary, and postsecondary education. Familial, developmental, social, and musical experiences were also probed. In this way, the first two phases involved the collection of status information and collation of documentation as well as archival sources of evidence (Yin, 1994). It was at this point that the construction of the rich case studies began, coinciding with planning for the curricular and extracurricular experiences in the Music & Minds program. It should be noted, however, that although the resulting daily program activities were scheduled, they were not fixed. As there were faculty and staff with the participants around the clock throughout the 10 days, opportunities were available to change methods of instruction along with planned events and personal schedules.

Phase Three focused on data collection at the research site as the case studies were further developed. Daily direct participant observation and the completion of a number of questionnaires by both participants and instructors addressed the preliminary questions guiding this study, as well as other emerging questions (Reis, Milne, Schader, & Shute, 1998) (see Appendixes C, D, E, F, and G). Instruments described below were administered to participants during the first two days of the study. Some items were read to those participants whose reading levels were not sufficiently high to enable independent completion. Daily open-ended and focused interviews (recorded and written) were also conducted to explore and elaborate specific issues as they emerged (Yin, 1994) with questions about participants' reactions to their daily lessons in music and math. Participants also completed a brief reflection journal about their experiences each day focusing on what they had enjoyed and their reactions to lessons, classes, academic, and social experiences (see Appendix G). Direct observations were also videotaped daily in both music and mathematics classes. Participants were encouraged to discuss relevant artifacts (music written in composition class or a good grade on a quiz about fractions) and participants written responses were elaborated (Yin, 1994).

SPSS (Kinnear & Gray, 1994; Norusis, 1990) was used to obtain means and standard deviations for responses to the Likert items on the instruments.

Phase Four constituted transcription and investigation of previously collected data along with the collection of follow-up data to confirm or explore issues that emerged during the previous phases. Field notes, and a reflexive journal recording the researchers' reactions, and descriptions of events in the study were maintained as part of the audit trail

to facilitate triangulation and cross validation from the methods and sources (Erlandson, et al., 1993) in addition to follow-up interviews with some staff and instructors. Comprehensive case studies were then completed on each participant.

Coding and analysis of case study data began with the commencement of Phase One and continued until the conclusion of Phase Four. Formal coding involved open coding (data sorting for comparison and contrasting to facilitate conceptualization and categorization), axial coding (weighing and contrasting categories to identify descriptive relations among them), and selective coding (core category was selected and systematically related to others). Triangulation, using a number of sources, was used to support objective validity claims, clarify meaning, and verify perceptions for individual case studies, and cross case analyses (Erlandsen et al., 1993; Yin, 1994). Individual case studies were compared and contrasted, core categories identified, and research questions discussed.

In this study, the accuracy of the observations was enhanced by the use of multiple perspectives. Because of the range of backgrounds and training of the faculty and staff, the observations, interviews, and field notes were continually discussed, questioned, and critically analyzed by team members. This enabled the researchers to examine and clarify information. In addition, photography and video were used to document and study specific situations and/or settings. To further increase trustworthiness, all researchers kept journals during fieldwork, and daily de-briefing meetings were scheduled to explore ideas and conduct data checks.

Data Coding and Data Analysis

Initially, recorded data were organized chronologically for each case study, however, after a month of fieldwork, the data were organized using indexes. Data matrices were developed for interviews and field notes. For example, key words or relevant phrases embedded in all recorded data (concordances) were underlined. In cases where no embedded cues were readily available in the data then the researchers inserted words to identify the segments in need of a label. Each field-note journal, and other collected data was filed into an individual notebook for the participants. Notebooks included information such as the informant's name, number of interviews, date of the interview, date of transcription, descriptors, and a tape identification number. The record of pictures followed a chronological format. Transcriptions, field notes, students' records, tapes, photos, and other documents were stored in a file cabinet in the researchers' office at the University of Connecticut.

The coding paradigm suggested by Strauss (1987) was used in this study. Data were coded for relevance to specific phenomena within a given category for: "conditions, interaction among the actors, strategies and tactics, and consequences" (pp. 27-28). Three types of coding were used in this study, as explained below.

Open Coding

The initial type of coding, known as open coding, involved unrestricted coding of all data through the careful scrutiny of field notes, interviews, cultural artifacts, and other pertinent documents. Researcher tried to identify concepts that seem to fit the data and "open up" the inquiry (Strauss, 1987, p. 29). At this point, researchers attempted to remain open and code by the data as well as the experiential background of the various researchers and the body of literature reviewed.

While involved in open coding, researchers analyzed whether the data were pertinent to the category various incidents indicated. With open coding, data were analyzed minutely and coded to verify and qualify the emerging theory. During open coding, researchers did interrupt the coding to write theoretical memos. Strauss (1987) defines these theoretical memos as "writing in which the researcher puts down the theoretical questions, hypotheses, and summary of codes" (p. 22). He explains that memo writing is a system of keeping track of coding results and stimulating further coding. This technique also serves as a means for integrating the theory. In open coding, individual codes emerge and initially may be plentiful. As the researcher attempts to verify codes and determine relationships among and between codes, a determination is made about the relationship of a code to a category.

Axial Coding

After initial categories were determined, axial coding enabled researchers to intensely analyze one category at a time in terms of the coding paradigm discussed earlier. This allowed cumulative knowledge to emerge about relationships between that category and other categories. Axial coding did not take place during the early stages of open coding, but became important after the initial data were collected and analyzed. In this study the following areas were originally coded as separate categories: teachers who cared, helpful coaches, and counselors who provided guidance. In the axial coding stage, it became apparent that relationships existed between and among these concepts, and they were eventually merged into a category labeled "supportive adults." Axial coding enabled researchers to specify relationships among the many categories that emerged in open coding that ultimately resulted in the conceptualization of categories selected as the "core."

Selective Coding

A core category is defined as one "that is central to the integration of the theory" (Strauss, 1987, p. 21). When a researcher codes systematically and purposefully for the core category, selective coding occurs. In this stage, a core category is selected and coding is conducted to limit coding only to those areas that relate to the core category. The core category "becomes a guide to further sampling and data collection" (Strauss, 1987, p. 33). In this study, "aspirations," "inner will," and "appreciation of differences" were identified as categories as a result of the first few interviews in the earliest stages of open coding. They were grouped as one category in axial coding and later became the

core category labeled "belief in self" during the stage of selective coding. For example, asking about student motivators was not planned in the initial interview protocol. However, after 2 or 3 participants indicated that an internal love for sound and music was compelling, questions were asked about this inner love and the ingredients of this inner will were sought and discussed with all subsequent participants.

Strauss (1987) describes the emerging categories as two types: sociological constructs and in vivo codes, which are described as taken or derived from the language used by the participants involved in the study. The participants use certain terms to describe their situation and how to deal with their culture appropriately. In vivo codes are used both analytically and for imagery. In this study, in vivo coding was extremely useful in creating images of the positive relationships among professors and WS. Sociological codes are formulated by the researchers' scholarly knowledge and the knowledge of the field under study. Sociological constructions are broader and are usually based on social science concerns.

Data Collection for the Music & Fractions

Multiple methods of data collection such as observations, pre and post interviews, audio recordings, visual images, and documents were used to gather information on the effectiveness of the treatment to produce gains in the basic understanding of fractions and to improve participants' overall attitude toward mathematics. Observers included the researchers and independent program staff. Researchers also conducted phone interviews with all parents prior to participants' arrival to the Music & Minds summer program. Three weeks following to the conclusion of the program, phone interviews were conducted with 14 parents and all 16 participants to ascertain retention of concepts taught during the program.

Casual observations of participants' integration of fractions were reported and noted during staff meetings. A single-page observational protocol was designed to collect both descriptive and reflective notes on classroom activities, student interaction, and instructional methodologies. In addition, a structured protocol designed to elicit information concerning students' educational and personal background was developed for the preliminary parent interviews. A semi-structured protocol with open-ended questions was used during the follow-up interviews with parents and participants.

Audio tapes captured individual participants' class responses and provided an overview of each session's events, including the application of the "Act of Learning" model. Video recordings provided collaborative evidence of classroom interactions. Finally, students' nightly reflection journal entries provided information about each participant's thoughts on their day.

Instrumentation

Instruments used during Music & Minds were either developed or adapted from enrichment programs and used to identify interests and learning styles preferences in

young people. The Music & Minds Application (Appendix A) the Music & Mind Talent Development Parent Interview Protocol (see Appendix B), and the Music & Minds Talent Development Participant Interview Protocol (see Appendix C) were used to gather preliminary data about participants' interests, medical and educational backgrounds, skills and attitudes, learning profiles, career preferences, and other pertinent information about enrichment opportunities, social skills, recreation and hobby choices, and employment experiences. The Learning Styles Inventory (LSI) (Renzulli, Smith, & Rizza, 1997) (see Appendix D), a 65-item instrument used to assess participants' preferences in learning styles such as projects, independent study, drill, and simulation was selected to provide information on learning preferences that would facilitate the selection and development of educational strategies. "The Secondary Interest-A-Lyzer" (SI) (Hébert, Sorenson, & Renzulli, 1997) (see Appendix E) includes 25 items that provide an opportunity to probe interests in a variety of areas. "My Way...An Expression Style Inventory" (MWESI) (Kettle, Renzulli, & Rizza, 1998) (see Appendix F) assesses preferences for styles of products, such as visual, verbal, and musical options using 50 items that are scored to provide a profile of 10 separate expression styles such as written, oral, artistic, or audio-visual. Questions are asked about preferences in doing tasks such as "helping in the community" (service), or talking about my experiences (oral), or role-playing a character (dramatization), or performing music (musical). These instruments have been used in enrichment programs for decades, have been revised during the last 10 years, and have high reported validity and reliability (Renzulli et al., 1997; Kettle et al., 1998). In addition to these instruments, anecdotal reports, checklists, and Daily Journals (see Appendix G) were used to collect information to develop appropriate programming for the participants.

The Music & Fractions pre and posttests were criterion-referenced instruments designed for this study and created to establish the students' level of achievement as well as identify deficit areas within a specific area of fractions. The content of these tests focused on the identification and application of basic fractions and the recognition of whole, half, and quarter notes. The items included on the pre and posttests were based on a review of elementary math textbooks. Within the written portion, items measured students' abilities to identify the fractional portions of particular shapes represented by shading. Items from the performance section reflected the students' ability to apply their understanding of basic fractions to everyday experiences. For example, one question from the performance section asked the students what fraction of a dollar was needed to buy a piece of candy that cost 25 cents. Another item asked students to pour a third of a cup of juice into a glass that had been clearly divided into equal sections.

Inter-rater reliability for these instruments was established by 4 judges with expertise in the field of mathematics. These judges were provided with a form to indicate whether the combined tests sufficiently measured the concept of basic fractions (87.5% agreement among judges) and whether the Music & Fractions pre and post sections were parallel to one another (93.7% agreement among judges).

Participants

A convenience sample of 8 female and 8 male young adults with WS described in Table 2 and Table 3 was selected for the first Music & Minds program. All participants were identified with WS and, like many individuals within the Williams population, exhibited strong affinity for music and sound. Music ability for this study was operationally defined as "the ability to understand and improvise in music, as well as the high level of skills, both potential skill areas and those present that can be developed in music." Advertisements for the program were placed in WS Association publication, and applicants were screened to ensure they satisfied the age criteria and had previously established interests in music. Participants for the program were selected by educational psychology professors at The National Research Center on the Gifted and Talented at the University of Connecticut, with feedback from members of the Williams Syndrome Association. All participants and their parents or guardians were willing to cooperate in the research aspect of the program.

Music & Fractions Participants

To create equivalent groups to answer research question 4 (Music & Fractions substudy), participants were assigned to either a Music & Fractions treatment or comparison group based upon pretest scores in both written and performance measures. The average total pretest score was .49. Both groups had 2 students with scores below .29 and the comparison group had the only participant with a score over .75. The treatment group consisted of 8 students: 5 females and 3 males. The comparison group of 8 students had 5 males and 3 females. The average age of both participants in the treatment and comparison groups was 23 years.

Table 2

Student Demographics for Date of Birth, Age of Diagnosis, Education Completed, Reading Level, and Math Level

Student	Date of Birth	Age of WS Diagnosis	Education Completed	Reading Level*	Math Level*
Males					
Craig	3/27/77	2 months	SPED Degree	6th grade	3rd grade
Bob	8/13/69	1 year	SPED Degree	8th grade	1st grade
Charles	3/2/74	2 years	NY Institute Tech/Voc Independence	5th grade	2nd grade
Sam	8/24/70	5-6 years	SPED Degree	4th grade	2nd grade
Bill	9/21/71	19 months	H.S. Diploma	3rd grade	1st grade
James	2/8/81	4 years	H.S. Diploma	7th grade	5th grade
Seth	12/23/73	4 years	H.S. Diploma	3rd grade	1st grade
Jack	3//11/72	4 years	H.S. Diploma	3rd grade	1st grade
Females					
Katie	10/2/76	5 months	H.S. Diploma	5th grade	4th grade
Penny	3/25/71	15 years	H.S. Diploma	7th grade	4th grade
Linda	10/23/78	14 months	Private Tutoring	3rd grade	1st grade
Karen	2/16/71	25 years	SPED Degree	4th grade	3rd grade
Cynthia	6/11/74	3 years	SPED Degree	5th grade	1st grade
Susan	3/14/80	16 months	Will get SPED Degree next year	5th-6th grade	3rd grade
Molly	9/2/76	18 months	Will get SPED Degree next year	8th grade	3rd grade
Allison	11/5/79	2 1/2 years	High school	3rd grade	2nd grade

* Data were gathered from a combination of academic records and parent information.

Table 3

Family and Parental Demographics

Student	Siblings	Parents' Marital Status	Parents' Occupations	Parents' Educational Levels	Parents' Involvement in Student's Life
Males					
Craig	3 younger	Married	M-Sub. Teacher F-Graphic Designer	M-Bachelor's Degree F-Two Bachelor's Degrees	M-Yes F-Yes
Bob	2 younger	Married	M-K-9 SPED Teacher F-Builder	M-Bachelor's Degree F-Bachelor's Degree	M-Yes F-Yes
Charles	1 younger	Married	M-Property Management F-VP Life Insurance	M-Post-Grad Work F-Bachelor's Degree	M-Yes F-Yes
Sam	3 older 1 deceased	Married	M-Pediatric Nurse F-Retired Math Teacher	M-Bachelor's Degree F-Bachelor's Degree + 45 Credits	M-Yes F-Yes
Bill	none	Married	M-Housewife F-Capital Mgmt.	M-High School F-Bachelor's Degree	M-Yes F-Yes
James	1 older	Married	M-Asst. Prof. English F-Actuary	M-Doctorate F-Doctorate	M-Yes F-Yes
Seth	1 older	Divorced	M-Secretary F-Director	M-High School F-Bachelor's Degree	M-Yes F-Phone conversations
Jack	3 older	Married	M-Interior Design F-Executive with major research firm	M-Two years college F-Master's Degree in Engineering	M-Yes F-Yes

Table 3 (continued)

Family and Parental Demographics

Student	Siblings	Parents' Marital Status	Parents' Occupations	Parents' Educational Levels	Parents' Involvement in Student's Life
Females					
Katie	2 older	Married	M-Teacher Aide/ Receptionist F-Consultant	M-High School F-Bachelor's Degree	M-Yes F-Yes
Penny	2 younger	Married	M-Business Secretary F-Minister/School Psychologist	M-Bachelor's Degree F-Bachelor's Degree	M-Yes F-Yes
Linda	none	Married	M-Not employed F-Engineering Salesman	M-Business College F-Some College	M-Yes F-Yes
Karen	2 older	Married	M-Retired F-Retired: NYC Transit	M-High School F-High School	M-Moderate F-Moderate
Cynthia	1 younger	Married	M-Raises Horses F-CPA-CFO of Corp.	M-Bachelor's Degree F-Bachelor's Degree	M-Yes F-No mention
Susan	none	Married	M-Teachers' Aide F-Transportation Engineer	M-Some College F-Master's Degree	M-Yes F-No mention
Molly	2 older	Divorced	M-Real Estate Agent F-Corp. V.P.	M-Master's Degree F-Master's Degree	M-Yes F-Yes
Allison	2 older	Married	M-Teacher F-Sales Manager	M-Bachelor's Degree F-Bachelor's Degree	M-Yes F-Yes

Music & Fractions Class

Both the treatment and control groups participated in two daily sessions of 40 minutes for the Music & Fractions class. During the time the treatment group was in the Music & Fractions class, the comparison group was involved in individual and small group programming options such as voice or instrumental lessons, or small group work such as percussion ensemble. The rotation then switched when the comparison group was participating in the Music & Fractions class.

The treatment was designed to span a total of 9 days (12 total hours), however individual students in the treatment group became so excited by their newly found success with fractions that they enthusiastically encouraged participants in the comparison group. The posttest was administered to both groups earlier than scheduled because of experimental treatment diffusion.

A specially designed curriculum focusing on the strengths, abilities, and interests of the students covered the following areas of basic fractions: thirds, halves, quarters, and wholes. Students were administered two assessments to determine their learning styles and expression styles: the My Way Expression Style Inventory (Kettle et al., 1998) and the Learning Styles Inventory (Renzulli & Smith, 1978). Using the responses to these instruments (strong preferences toward discussion, drill and recitation, lecture, simulations, peer teaching, and teaching games with preferred expression styles of oral, dramatization, and music), lessons were developed that incorporated visual aids, games, lecture, discussion, and simulations.

The curriculum was influenced by the Renzulli "Act of Learning" model described in Chapter II (see Figure 1), in which the teacher, learner, and curriculum are considered an interactive dynamic. In the "Act of Learning" model, the three components interact dynamically and asymmetrically as learning takes place. In the same way that the abilities, learning styles, and interests of the learner (the learner's profile) guided the curriculum development, the particular skills used by the teacher were also influenced by the group's learning profile. The interest of music and the various learning preferences that were identified by the program participants guided the types of activities, materials, and processes included within each session.

In particular, the content of the curriculum revolved around identifying equivalent fractions, understanding each component of a fraction, and applying fractions to situations in five major areas: measurement, time, money, musical notes, and objects. The structure of the discipline was based upon an integrated approach to fractions in the real world. Fractions were not taught theoretically or in isolation, but were tied to areas within daily living; for example, students were asked to locate and identify the building halfway between a home and a shopping center on a town diagram. To appeal to the imagination, instructional techniques using simulations and learning games were incorporated in each lesson.

The same lessons were implemented with the treatment and comparison groups. All lessons for each group reflected basic fraction concepts and their relationship to each other as well as the connection of fractions with daily living.

On the first day, in the morning lesson, fractions were introduced by lecture and discussion showing how and where fractions can be seen in everyday life. While a framework was developed for each lesson, flexible planning allowed the later lessons to be guided by the students' needs as directed by the "Act of Learning" model. These needs were identified and the upcoming lessons were shaped during the instructor planning meetings held after each day's sessions.

The instructional methodologies incorporated a variety of practical applications mixed with theoretical concepts. Mini-lectures explained and illustrated the various concepts of basic fractions while demonstrations using manipulatives provided an extension of these discussions and a reinforcement of the ideas. Games and simulations were other methodologies that supported the various concepts. All games were designed to bring meaning to fractions by presenting real-world situations and problems.

The "Fraction Is Right" is an example of one of the games incorporated into the learning process where participants were given the opportunity to apply their learning style preference, such as dramatics, with their desire and enthusiasm to teach their peers. Much like Charades, the goal of this game was for the class to guess what fraction the student "contestant" was demonstrating. As the participants volunteered, they selected from the game bag a task card with a fraction printed on one side. The contestant would try to demonstrate and attempt to elicit the correct response from the rest of the class. Participants used any of the materials provided in the classroom to help them with this task, and they were given the opportunity to ask either instructor for assistance or clarification of the concept. Once the class determined the right answer, the student would then explain the process she followed, demonstrate why she did what she did, and teach the solution to the group.

As an example one "contestant" selected the task card one-third. She proceeded to unwrap a pound cake and cut it into three equal parts. While she passed out the pieces of pound cake to the students in the class, she asked them how much of the cake each person was receiving. Ultimately, the class identified each piece as 1/3 of the pound cake. During her final explanation, this student reviewed the process of writing 1/3 as she explained that this one piece was "one out of three total equal parts."

In addition, the development of another learning game, Fishing for Fractions, resulted from the students' success on the "Fraction Is Right" and their input on how they might learn best. This game followed the structure of the "Fraction Is Right;" however, the task cards now had word problems that the "contestants" might encounter in everyday life. Both of these learning games facilitated an interaction between the learner, knowledge, and related skills.

Manipulatives were also incorporated into the learning process to support and illustrate the application of fractions into everyday experiences. For example, students were given a handful of jellybeans and were then asked to separate 1/4th of their jellybeans onto the table. This activity was followed by a brief discussion. Both instructors and those students who understood the process guided any individuals who needed assistance. At various points throughout the lessons, the jellybean activity was used to reinforce the fractions covered in the curriculum. Additional manipulatives were paper shapes, candy bars, coins, and household items.

All learning activities were designed to represent the 5 main areas where fractions are commonly observed. Within the area of money, for example, the concept of fourths was applied as students were given play coins and asked to assess how many quarters made up a whole dollar. Liquids like water, soda, and juices were used in a discussion on measurement. Students were asked to divide and mark their containers (empty glasses or cups) into thirds, fourths, or halves. They were then asked to pour the appropriate amount into the cup. Another content area related to measurement was distance. During one class, a line was taped to the floor and students were asked to walk a fractional distance along the line and leave a marker.

The values of musical notes, including quarter notes, half notes, and whole notes, were taught as basic fractions. Recognizing and understanding the time value of notes was a goal of this area, as well as learning about music measures and the number of notes needed to satisfy a particular time signature. However, sounds and rhythm were incorporated only into the lessons of the treatment group.

Time was the final area of fractions covered by the lesson plans. Most of the students felt comfortable reading a digital clock, but they had difficulty reading an open-face clock. During the lessons on time, students were asked to look at the clock in relationship to a circle equally divided into fourths. They learned to assess quarter after, half past, and three quarters past (or quarter to) the hour.

Treatment

Although the same lesson framework was used for both groups, the treatment condition incorporated several aspects of music into the instructional practices and curriculum implementation. One aspect of the treatment condition was the use of various selections from Mozart as background music. This music greeted participants upon entering the classroom at the beginning of every lesson and was not only an environmental stimulus, but also a means by which fractions were communicated to the students and learning was facilitated and stimulated.

Music was used as another instructional methodology and learning tool. A piano and drum set were present in the classroom and used by instructors, guest artists, and participants throughout the treatment. At appropriate moments, the piano provided parallel sounds and rhythms to the discussion of fractions. This was evident during the opening discussion where the piano helped illustrate the relationship between a fraction's

denominator and numerator. For example, the concept of one-fourth was enhanced by playing four (4) quarter notes to represent the denominator and one (1) quarter note to represent the numerator. The difference between one-fourth, one-half, and one-whole was also demonstrated using musical notes and sounds. These differences were intensified by using rhythmic lines with clapping of hands and stomping of feet.

In an effort to strengthen memory, rhythmic "songs" were created by the students. These little musical ditties stemmed from the various rules or dimensions of fractions. One example was "To • tal • eq • ual • parts" (G-G-G-G-C) played as four quarter notes followed by a whole note. Students applied this rhythmic line to remember the meaning of the denominator, and instructors hummed the notes in rhythm (without words) as a prompt when needed during classroom activities.

Musical variations were used as an overarching theme to relate the idea that fractions are not a singular, isolated schoolhouse concept, but one that can be found in and throughout real-world situations. Mozart's "Twinkle, twinkle" variations were selected to link the concept of fractions to the various areas of time, money, measurement, objects, and the reading of musical notes. On the first day, a guest artist played the main theme and students hummed along. As each variation was performed, students were asked to find the theme and to respond when they recognized the familiar tune in its various guises. In this way the relationship between the musical variations and the graphic representation was illustrated to the students and connected to their lessons.

Finally, music became the "hook" that students used to hold onto the concept of fractions in the various areas of the curriculum and to apply that knowledge in their lives. During the early stages of the treatment, and carried throughout each lesson, a musical sound was played as this "hook." When the idea of the "hook" was first introduced, the instructors selected the sounds used, however, the students quickly modified and embellished the sound combinations to personalize their learning as they identified their own "hooks."

Establishing the Soundness of the Study

For the purposes of this study, the accuracy of the observations of this investigation were enhanced by the use of multiple collection tools. Additionally, techniques discussed by Marshall and Rossman (1989) were used to establish the trustworthiness. For example, non-involved researchers from The National Research Center on the Gifted and Talented (NRC/GT) played "devil's advocate" to critically question the project researchers' analyses and to identify negative instances. Researchers checked and rechecked the data, conducted purposeful testing of rival hypotheses, asked questions of the data, and conducted an audit of the data collection and analytic methods.

Tape recorded interviews and field notes allowed the researcher to examine and clarify information, and as a way of assuring completeness and faithfulness to the informants' words. Photographs and video were used to document and study specific situations and/or settings that required more than a single viewing. Researchers kept

journals during most parts of the fieldwork. Some researchers noted the daily writing served not only as documentation, but also as a catharsis.

Throughout the investigation, conversations were held with co-workers at the NRC/GT not involved in the research project as well as peer researchers in the project to explore ideas, doubts, and as a source of personal support. These discussions took place in various places and occasions. Conversations were carried out in the office of the NRC/GT, in the cafeteria, the student lounge, and during an afternoon debriefing time scheduled each day. In addition, two investigators used a tape recorder for daily review and self-debriefing.

Limitations

The participants may not be a representative sample of persons with WS, which therefore limits the findings. However, a purpose of qualitative research is to provide descriptions of individuals, and generalizablity of findings is not the intended outcome.

CHAPTER IV: Case Studies of Selected Participants

In this chapter, representative case studies of the participants in this study are provided, including males and females, those with higher and lower aptitude, and higher and lower interests and skills in music.

James

James, who is 18, has an older sister studying law at a prestigious university. Both of his parents have their doctorates and his mother was a professor of English at a well-known eastern college until James' birth and her realization of his special needs. His mother is an advocate for persons with special needs, and has provided family support, access to the medical care, and educational support that James required from an early age. Her life after his birth has been devoted to his care and to learning more about WS. James' father, whose doctoral degree is in mathematics, works as an executive in a large financial institution. Both of James' parents and his sister are very caring, and have been actively involved in his education from an early age, at home, in the community, and through the education system.

At 3 years James was reading letters on airport signs, and could count to four. Although he spoke only 2 to 3 word sentences, James sang entire short songs at that age. Once after observing an Appalachian clog dance, he walked on to the stage and started dancing. His parents gave him a keyboard, plastic clarinet, and saxophone during his preschool years. James is a serious young man, quiet, and shy, but assertive in terms of his interests and his time. He enjoys music, reading, swimming, basketball, and his collection of airplanes.

While James' birth history was normal, his mother became allergic to milk products during the pregnancy. When he was 8 days old, James was diagnosed with a heart murmur, but it took another 3 years, a combination of signs, and many specialists, to finally reach a diagnosis of WS. At 10 years he underwent surgery for supravalvular aortic stenosis.

Early forms of intervention began when James was 1 1/2 years old. An occupational therapist visited James' home, and provided modeling and guidance to the family to assist James in learning how to play and to develop his gross and fine motor skills. He attended a language based, special needs, preschool program for multiply disabled children, funded by the town, for 2 years. The emphasis was on speech and occupational therapy through a play program employing many hands-on activities. He was later placed in an advanced class where words and letters were used. James did not really begin to speak again in full sentences until age 5 even though he knew letters. He then became a fluent speaker. His mother subscribed to the philosophy that James should be challenged at the highest possible level. James was transferred into an integrated, cluster group kindergarten program. There he received additional language and motor training. Musical and singing abilities were recognized through his playing notes on a

keyboard. Although there was a clear delay in imaginative play, he demonstrated skill in other areas such as completing jigsaw puzzles. James was the only student in the special needs kindergarten to move on to first grade, although he was distractible and had trouble remaining at his desk.

When James entered first grade, he had already mastered prerequisite skills. He spent one third of each day in a resource room developing his reading skills. In a school pageant, he was given a short, but difficult solo to sing by his classroom teacher and subsequently became involved in many musical productions and music groups at school and through his church. The school music teacher's musical training with him was also beneficial, and she continued to work with him through third grade. Beginning at age 7, he started piano lessons using the Suzuki method. For the next years, he had an excellent piano teacher. Interestingly, James was not considered to be talented enough for the recorder group in school and so he taught himself.

Beginning in the fourth grade, he was placed in regular classes with support from a special education teacher. Due to large class sizes, in fourth and fifth grades James had a teacher aide for mathematics. When presented with direct questions, James often could not answer as this format confused and scared him. James preferred a less pressured approach to instruction.

During James' freshman year at a public high school, his mother helped him every night with his homework, consisting mainly of worksheets. Then, James decided he wanted to work on his own, although he continued to receive help with written papers. He was enrolled in special education classes for consumer math and basic mathematics skills and English, and in regular classes for all other subjects. He currently enjoys reading and acquiring factual information from non-fiction and travel books. He has good decoding skills; however, his analysis skills remain limited. His parents encouraged him to develop comprehension and analysis skills by asking him questions each night about his current reading. Directed study hall has been found to be effective in helping him complete his work, due to the small numbers of students. He has been forced to organize himself. James has developed functional mathematics skills. He is able to count, sort objects, tell time, complete basic addition and subtraction equations, and with the use of a calculator, he can complete multiplication and division computation. James has difficulty with fractions and measurement of liquids and solids. He displays a positive mathematics self-concept and is able to apply his skills in a number of settings.

As an 18 year old, James reads at a sixth to eighth grade level, and he generally received average grades (with accommodations) in all content areas, apart from music. His teachers describe him as being well motivated, a hard worker, and kind and caring. During his time at high school he has had voluntary experience working in a local library, as well as paid employment as a musician.

James likes to organize his commitments so he knows ahead of time what he is doing. Not knowing his daily schedule makes him nervous. He has well-developed self care skills, and can cook simple meals. He enjoys daily sessions on the Internet and

using e-mail. James is involved in many musical activities as well at his high school program.

While not taking music lessons at high school, he takes private clarinet lessons, and has played in a select youth wind ensemble. He plays saxophone with a school band, and is a member of a drum and bugle corps where he plays horn. He reads music, and has an excellent sense of pitch. His various musical activities take up many hours in practice, and presentations each week, demonstrating his commitment to music. James would like to improve his music improvisation skills and become a professional musician or work in a bookstore.

Bill

Bill is 20 and an only child. His mother, who has a high school education, has had a number of jobs, and is currently a homemaker. His father graduated from college and works in investment banking. Both are very committed to Bill's welfare. Bill was born by Cesarean section, although there seemed to be no problems with pregnancy or birth. However, feeding was challenging when he was an infant, and he had difficulty keeping food down even while he was still in the hospital. Between the ages 3 and 4 he was hospitalized for treatment of minor problems. Three years ago he was hospitalized for a broken pelvis, following a car accident, from which he fully recovered. He currently takes Prosac for Attention Deficit Disorder and for mild depression problems.

Bill's parents noticed there was something different about Bill around the age of 5 months. They were then referred to a university clinic pediatrician who diagnosed him as at the extreme of the normal range. A year later, at 19 months, he was again referred and at this time was diagnosed with WS. Bill's parents were advised by the pediatrician to give him plenty of love, and not to let him affect their marriage. Later they met with a geneticist, who recommended early intervention and at the age of 22 months they enrolled in a home focused, parent education program for mentally retarded children. Advisers provide training for his mother and recommended walkers, toys, and procedures for avoiding self-stimulation. At 2 years Bill entered, and quickly came to enjoy a very successful, church organized, intervention program with targeted milestones which was offered 2 to 3 times a week. Part of this program involved music therapy. He liked the noise, dancing, moving around, and playing lots of musical instruments. Bill, who had been demonstrating limited speech, talked about his experiences in music a great deal, and his parents began to understand that he was capable of more sophisticated speech and higher levels of conversation. At age 3, his program was mixed, with 3 mornings at home, and 2 in a regular child development program, which soon became the major program he attended. Bill was initially nervous, but enjoyed the extra supervision, and attention. He subsequently spent nearly 3 years in a mainstreamed, public preschool and kindergarten program. However, his parents were frustrated with trying to get access to special services through the public school system. They were worried about supervision as Bill was anxious, was not steady on his feet, and, while controlled, had frequent urinary problems. For first grade, he was enrolled in a small, private school that catered to students who were not doing well in regular classes. There were 50 to 75 children in

the school, with 4 to 5 children in each class. He stayed there 4 years, and flourished with the individual attention provided, achieving well in reading, and to a lesser degree, in mathematics. He had music therapy for up to 2 hours a day that involved group singing and individual piano lessons.

At age 10, Bill entered third grade at a local, regular middle school, with resource class pullout for mathematics and speech therapy. In sixth grade, English was added. During this time, he also achieved well on mathematics worksheets through middle school, but had difficulty in applying math in real life situations (e.g., money). While being able to read and follow instructions with simple concepts very well, Bill lacked understanding and retention of abstract and complex text material.

Bill's parents gave him considerable help with his schoolwork. They used concrete, real world materials to help him understand and complete his homework, and also employed tutors. They limited his use of paper and pencil tasks as much as possible. The programs he experienced were eclectic and lacked consistency. At graduation, he received a Certificate of Attendance, but he came very close to achieving a diploma; state competency requirement changes and the addition of algebra "nixed it for him," according to his parents. He particularly enjoyed creative teachers who helped him to understand his work.

He has attended a community college for jazz and vocal groups for the last 2 1/2 years. He is ambitious about going to college, but lacks understanding of what this means. In his conversations, he is overconfident about his abilities to do everything and displays high self-esteem.

Bill is courteous, kind, obedient, talkative, and happy. He is also socially outgoing and generally popular at school, but few people call him for social reasons, although he does call friends on the telephone, he prefers to meet and hang out with them. Bill has a girl friend at high school who is also fascinated with his music. He has a number of friends with WS with whom he visits, and will sometimes stay over at their homes. Bill can take care of himself and his possessions and cook basic meals. He is a selective eater, eating heartily what he enjoys, but going for long periods without food if there is nothing he likes. He becomes irritable when he is hungry.

Bill has not developed independent use of public transportation, as his parents believe it is not safe where he lives. He loves flying and is able to find his way around an airport. Bill has traveled under supervision, to many states, and can recall details of these flights, the airlines, and airports. He can read a map, and once familiar with a new location, can find his way around.

Bill currently achieves at about a sixth to seventh grade level in mathematics with the help of paper, pencil, and a calculator, but often still lacks comprehension of daily applications. Bill tells time using digital clock faces. He would avoid mathematics if he could. He has problems with spatial presentation and writing equations. He has hundreds of books he enjoys reading, including non-fiction books with specific themes

such as carpentry, aviation, and medicine. He also reads newspapers and comics, and is good at interpreting symbols. Bill plays, sings, and listens to music for at least 2 hours each day. His interests range from classical to rock, although his favorite is country music, as it is slower and easier to understand. He prefers harmony to melody.

He is an enthusiastic supporter of the local professional basketball team and has attended their basketball team camps for 4 years. He has also attended YWCA camps and mission trips with his church, where he has helped repair homes and build a wheelchair ramp. Bill is involved in health and fitness training, "his body being his shrine." He is frightened of thunderstorms and the noise of popping balloons, which hurt his ears. He collects baseball cards and matchbox cars, but has difficulty organizing them.

He has had no paid employment as yet and started a rehabilitation vocational training program in 1998. He maintains his involvement in music and wants to continue at the summer music camp to be with other people with WS and to improve his musical skills and opportunities. While he sometimes expresses a wish not to marry or leave home, he found a girlfriend and recently the question of marriage and related issues has emerged.

Bill's sensitivity to music was first observed prior to age 2 when he reacted to musical mobiles in his crib. "He seemed to soak it up, singing along with tapes, when his vocabulary was still mama and papa," his mother explained. Both his parents had had some music training; his mother studied piano for a year and his father also played the piano, and was a member of a school band. At age 2 Bill was given a toy piano. At 4 years, his grandparents bought him a real piano. He also demonstrated perfect pitch at this age, and was able to distinguish and name, 5 to 8 notes played at the same time. Bill's parents realized they had to do more, so they began a program of individual music therapy to supplement the early intervention group program. He attended music therapy, and took piano lessons in elementary school; he played bass and cello in his middle school orchestra. He was a member of the concert choir in high school and attended community college after school for jazz and vocal groups, with whom he sings. His parents indicate that "he is a real ham." He has attended the summer music camps for 4 years, where he has been involved in voice, piano, and guitar training.

Bill is involved in church music groups, where he plays for seniors. He has experienced a range of instruments most of which he plays by ear including electronic and acoustic guitars, bass, cello, organ, piano, recorder, and two electronic keyboards. When listening to music, he can identify and imitate individual instruments. He is comfortable with the electronic keyboard, and through a computer, writes down his compositions, although he has limited ability to read musical notation. Bill has attended many concerts, including a Four Tops Concert, where he was handed a cordless microphone, and was able to sing with the lead singer. He becomes very emotional when listening to music, becoming annoyed at being interrupted and is often moved to tears while listening to a particular piece of music.

He composed a song after the death of his grandfather that his parents taped. While he enjoys composing, he often does not remember what he has played.

Bob

Bob is 28 years of age, and the eldest of three siblings. His sisters are 21 and 16 years old; the oldest a senior in college, and the other in high school. His mother is a certified teacher who hopes to gain graduate qualifications as a special education teacher, but is currently working in merchandise. His father is a qualified marine biologist, who after a military career, is now a builder and entrepreneur.

Bob was born while his father and mother, who were both 20 years old, were stationed overseas with the military. The delivery was normal, and when a heart murmur was later detected, it was not considered to be "abnormal." Bob's mother did not think he was "different," but his father noticed that at 9 to 10 months Bob was unable to balance well. His feet were round at the bottom, and he was very cautious as he moved. When his father left the army Bob was one year old. The army pediatrician, using illustrations of other children with WS, identified Bob, and because he had little knowledge of the condition, he referred Bob to a specialist. The doctor diagnosed supravalvular aortic stenosis, outlined the physiological and mental aspects, and dropped a "bombshell" about mental retardation.

Heart surgery was recommended when Bob reached age 12; however, this has not yet been done. He was treated for strabismus prior to the age of 3. The condition is re-emerging, but Bob does not want to have surgery to correct it. Bob has demonstrated a high tolerance for pain. He declined anesthetics while having his wisdom teeth extracted. The pediatrician referred the family to an expensive psychiatric center where the focus was not so much on Bob, but rather, on counseling his parents. They left the clinic, and sought early intervention. As a very young child, he appeared to be developing in a relatively normal manner. He started occupational therapy between the ages of 2 and 3. This therapy focused on tactile activities and occurred mainly in the home. Bob's parents discovered there were no special education programs available, so they established a support group for parents with children with learning disabilities. They also were successful in advocating for legislative changes to provide services. Initially, even though Bob was unable to tie his shoelaces, and lacked other skills, he was enrolled in a regular kindergarten, where he spent one year.

For the primary grades, he attended a special school. He developed writing skills that he has used (unknown to his parents at the time) to write to the President. The letter was published in a newspaper. He also likes writing short stories and poems. Bob was reported to have had teachers who understood individual differences, and to have enjoyed his early years of schooling. In the fifth grade he was placed in regular class with resource room pull-out for mathematics. His school results indicated a jagged profile, with above age level results in language tests and low scores in mathematics. He has always liked reading.

Bob is not easily inhibited and at the age of 8, easily greeted a previously unknown bank chairman in an elevator using his correct name. His father reported this as "a weird thing" that happened not infrequently. His social skills continued to develop and he completed middle school in regular classes with special education support services.

Bob was then enrolled in a regular high school program. His father feared that Bob had far more potential than he was allowed to develop through the challenges he experienced in school. His father worked with him diligently helping him learn to read a tape measure, add, and subtract, but Bob seemed unable to understand abstract concepts. He does not manage money well. On one occasion he withdrew a large amount from his account, and gave it to a "friend." He appeared to have no understanding of dollar values. He has developed his own way of handling money and change. Bob's mother recalls she set up a "shop" at home and encouraged him to buy things and use change, and he seems better able to manage money. Bob graduated from high school in 1988. On a number of occasions Bob has surprised his father with new achievements such as in his part-time job at a deli, where he made deliveries and handled change.

Bob declares, "Every day is the best day of his life." He has great faith and a positive outlook on life. His parents believe that "he makes people's day." He knows when to get help if he needs it. He maintains his room, including his collections of books, letters, photos (including his favorites of Harley Davidson motorcycles), tapes, CDs, and tapes, "to his own standards." Pictures are not hung straight - "that is the way he likes them." Although he can tell time, Bob becomes nervous about getting to places on time, and is usually ready hours beforehand. He cooks meals "by taste," though he sometimes has problems with measuring quantities. His favorite games include Yahtzee (using a calculator) and cribbage. He likes drawing house plans that resemble Picasso's style. While dimensions are provided, they are unrelated to function. Bob intends one day to build his own home.

He has good general knowledge demonstrated by his ability to often answer "Wheel of Fortune" questions ahead of contestants. He can memorize certain things, and retain them for amazingly long periods. He enjoys reading newspapers, signs, comics, and books. His favorite reading includes: romances, the Bible, the Hardy Boys, westerns, and Scott King books. He has skills that enable him to use computerized library indexes, but he does not have a computer at home. Bob likes to be independent and is a very social person, with a wide range of experiences. He is able to hold an interesting conversation for extended periods of time, both sharing his own experiences, and responding to those of others. These go beyond "cocktail party syndrome" conversation.

Bob gets along with everybody, goes to church, attends parties, visits the mall, and restaurants. He does not drive a car, but uses a bicycle and walks to get around the area in which he lives with his family. He enjoys writing "poems of encouragement from the heart, to friends," but many are not delivered. While having poor coordination, Bob enjoys swimming, shooting baskets, bowling, playing tennis, and has taught himself how

to dance. He has volunteered at a nursing home where he worked in the kitchen as part of a government program. Unfortunately he was considered too slow and lost that position, and a number of others. Bob is active in seeking work, but tends to oversell himself.

His father has, on occasion, perceived that he must intervene to avoid Bob being criticized, and having his self esteem damaged. He has, however, gained paid employment as a builder's helper, painter, lawn mower, and in restaurants and shops downtown. While he knows his parents will pass away, it is not clear if he fully understands the implications. He does not seem to worry. "God will help take care of me."

"Sesame Street" provided an early stimulus for the demonstration of musical talent, and a "free spirited" dancing ability. He spent a great deal of time singing and at age 2 demonstrated an interest in the Beach Boys and the Mamas and Papas. However, his father, a "perfectionist" musician, did not consider Bob to be talented. There was no comparison with his cousin, a professional musician, who had great difficulty teaching Bob. He and two companions played at a music contest during middle school, and finished in second place. A teacher discovered his wide-ranging voice in grade 6, and through grade 7 Bob was involved in singing with the school choir, chorus, and a multiple award winning school madrigal group. He does not read music, but has a strong memory for music and plays by ear. He taught himself how to tune an acoustic guitar, but prefers electronic instruments. Bob does not like sitting still for long periods. When his parents took him to concerts and films, as a child, they had to leave early as Bob could not sit through them. A 3-day 4th of July concert was different, mainly because people were constantly moving everywhere.

He loves to play his karaoke machine at home after work. He plays his music loud, and generally manages 10 to 15 minutes of practice with karaoke each day. He sings along with the Beach Boys, Turn The Page, Kiss, and Bon Jovi. His mother is concerned that singing hard rock is damaging his voice. He enjoys playing his electronic keyboard and music tapes. While not having had formal lessons, he has displayed interest in playing the electronic guitar. When given the opportunity, "he tunes it his own way, to match what is in his head," ("a weird thing there"), and while playing it "backwards," being left-handed, he plays clearly recognizable tunes much to the amazement of his father. Presently, Bob attended a 2-week vocal music camp at another out-of-state university prior to his experience at the University of Connecticut in 1998.

Linda

Linda is 19 years old. She is an only child to her mother, who has a business degree, but has not worked since Linda's birth, and her father, who has partially completed a science degree and now works selling engineering equipment. Both parents are strongly supportive of Linda's education and her other activities. Neither parent has a musical background, but her mother sang in a choir as a child. Linda's birth was normal, though she was 2 weeks late, and the pregnancy had to be induced. As a baby, she had

eating problems, took only small amounts during breast-feeding, and had constant diarrhea. She was diagnosed with aortic stenosis at 6 weeks. Linda started taking medication for epileptic seizures in 1993, which began as Petite Mal attacks. During the summer, she also began having Grand Mal attacks in her sleep. Various medical tests showed heterotophias around the cerebral cortex, suggesting the gray matter was not migrating appropriately. There has been an increase in the number of night seizures in the last year. Seizures limit her activities, and she has to have knowledgeable persons with her who understand seizures and her need for medication.

Her mother more clearly noted that Linda was not developing normally when she was about 6 months old. At 12 months she could not crawl or sit up, and was very passive, remaining in a position for hours. She was never large, always at the bottom of the growth chart, but "she was always a well child." Linda's doctor diagnosed her with WS when she was 14 months old, explaining that WS had been suspected, but he had waited for additional input. The diagnosis was then confirmed by genetic tests.

Early developmental intervention began at 18 months with a social health care who visited the home once a week to work with Linda's mother. The ensuring program focused on toilet training, shape recognition, and other stimulation and motor activities such as riding bikes, stair climbing, puzzles, therapeutic toys, an aquatics program (a gym, maze, swimming activity which helped develop bodily spatial awareness), and music therapy. Linda was not a curious child. She was unmotivated and very passive. However, when she was taught activities, she learned them. The activities were stopped when she started school as Linda did not enjoy many of them. Her mother read to her "all the time." She enjoyed nursery rhymes, and still has a favorite nursery rhyme book on her shelf. During the ages of 2 and 3, her favorite toys were books. She leafed through them, and played with them.

Linda began a preschool for developmentally delayed children for half a day, 4 days a week when she was 3. The classes were small and the instructional pace was slow. Linda was very sociable and she mimicked the bad behaviors of other children. She had a short attention span, and encountered difficulty in dressing, yet she continued in the program, which included physiotherapy, for 4 years.

At age 5, Linda was enrolled in a normal elementary school with special education classes. While it was called integrated, there was only limited contact with other children. The next year she attended normal kindergarten for half a day, and continued in what her parents considered to be a very good developmental program in the special class for the other half of the day. She continued in this program for 3 years, but it became a problem. Her parents wanted her to attend a regular school in a regular education program, so Linda was enrolled in a school close to home. She entered in first grade, where she had an IEP, which outlined a modified program and the help of a teacher's aide. The school faculty and staff welcomed her, and involved her in school activities.

She took part in a French immersion program from grades 4 to 9; a normal practice for students in her country. By grade 6 Linda was reading at grade 2-3 level. While she did the same work as other students, her assignments were modified. She joined the Brownies and Guides, where she liked the people, but not the activities.

Linda was integrated into regular classes for the 5 years of high school. She continued with individualized education plans and the support of a teacher's aide. Multiple teachers posed a problem, and her parents observed decreasing academic work, as there were insufficient resources to modify the curriculum. School programs were not effective. They were not systematic, and presented a frustrating experience, especially at high school. Linda has had a private tutor for the last 5 years for reading, writing, English, and mathematics. This experience has taught her the money system, time, and reading. She responds well to praise and rewards that enable her to do what she wants, such as computer games. Linda did progress with the same class group, graduating in June, 1998. She gained a "Certificate of Attendance," and an award for "Excellence in Music," having scored over 90% in the normal school music program. In her final year, she studied English, music, computer, with resource classes in life skills, French, mathematics, and work experience. Linda was involved in a Senior's Home Center voluntary care program for 2 years while at school. She attended once a week and set tables for the evening meal. This was difficult as there were specialized cutlery, and settings for various clients, but she was able to learn to do it. Through a work-study program she received a job grant to work at a summer camp where she received $100 per week. She cleaned up art supplies and helped out with campers. On other occasions she helped out at a swimming club selling donuts.

Linda has minimal mathematics skills. While she is fascinated by mathematics for its symbols and equations and considers it her best subject, she has no understanding of the subject, its importance, or her lack of ability. She requires concrete materials and activities to be successful. She has difficulty sorting by function and into groups of 10, or more. While Linda can count to 1,000, she does not understand completely the concepts; both her parents and Linda indicate addition and subtraction are difficult without a calculator. She learns a "pattern," and applies it. Time and money are difficult concepts.

Linda reads constantly, but does not necessarily read entire books. Reading and long periods of attention are challenging for her. She reads "People" magazines, books on Britain and Scottish people, and is fascinated by the Bible, as her parents bought her a simple language version. She touch types using the computer with difficulty, and she has poor manual dexterity and spelling skills. She has not yet developed the skills of "real communication" using e-mail, and word processing packages.

She is fascinated with cooking programs on television, but has very limited skills. "Linda likes to pretend to cook. She is not keen on the concrete," her parents explained. She attends the outdoor community pool during summer for lessons, and sports teams, but is not interested in racing. Linda swims, but does not dive, and she will not swim in a lake. She enjoys expressive dance (but not ballet), aerobic workouts, and musical activities generally. She is sociable and talkative, and people are attracted to her. She

prefers adult company to the company of her peers, and she was observed in a number of instances during the summer program in situations where she bothered new friends because she does not seem to understand people's needs for personal space and time. At times, when asked to do something, she did not want to do such as make her bed; she used profanity when indicating she would not. It was clear in the summer program that she likes to be with people, and to follow them around. She likes sociable activities such as sleeping over at her friend's homes, school field trips, winter camps, skiing trips, Sunday school, choir, youth activities, adult choir, and adult life at church, such as being involved in church plays such as "Old Jonah." She requires the stimulation of a topic to chat, and often needs to have questions clarified. She soon "runs out of steam." If she finds activities difficult, she uses avoidance strategies such as "I am tired."

While Linda can travel to school by bus, she has not developed other independent travel skills. Her parents drove her to and from various summer music programs. She is disorganized and forgetful, and needs cueing on things such as personal hygiene, and cutting her food. She prefers to ignore the alarm clock and schedules and requires supervision.

She has a range of spare time activities, including an "organizer" (filing system), containing her school papers that she enjoys using, pretending to be a teacher. She listens to music "from her giant heap of tapes," demonstrates a sense of humor, and writes, but not well. She finds museums "dead boring," but enjoys the "tourist stuff," and is fascinated by period costumes and places such as "The Upper Canada Village."

When she was 3 years old, her ease with language, and skill at memorization of rhymes and radio jingles was apparent. Toys were of no interest to her unless they were musical. Her interest shaped toy selection for her. She enjoyed watching The Muppets, Sesame Street, Lawrence Welk tapes ("the best since sliced bread!"). She was able to reproduce songs in perfect key even before she could speak. Music was constantly to be heard in the house. Linda attended many concerts and plays at the theater (e.g., Phantom, Les Miserables, symphonies, opera) to the extent "it has become a rut."

She learned the recorder at elementary school. When she was between 6 and 7 years of age, Linda was given a small keyboard that she played for hours in the home and when traveling in the car. Her parents then realized that she could play music by ear. When visiting friends, she would gravitate towards a piano and play with it. Her parents bought her a piano. For 6 years she had an existential piano teacher who was immersed in the instrument and regarded her students as individuals, encouraged them to enjoy music, and to musically explore the instrument, rather than providing formal lessons. She also sang in the choir Linda had joined, and helped Linda learn the songs by ear. Linda can usually memorize a song after hearing it 1 or 2 times. A friend who also played the piano used to visit Linda, and they encouraged each other through their music playing.

She was a member of a school choir from third grade to present. She was one of the best singers, learning songs and music by ear. She played bass drum in the high school concert band (the core music program in the school). For 2 years, she attended a

one-week summer music camp where she was introduced to the guitar. Initially she was not overly interested, although she now wants to learn so that she can accompany herself when singing. She experienced difficulty playing the clarinet. She initially appeared more reticent than other WS persons at the camp, who were more outgoing. She was observed to be "very musical, and is very sensitive about doing well."

Linda is very aware of high-pitched sounds, and becomes agitated in the presence of vacuum cleaners, hair blowers, and branch trimmers. She was somewhat upset by thunder during a summer rainstorm. She has plenty of music records and tapes at home, and has friends involved in ballet. Although she recently played three piano pieces at the end of year school recitals, her mother found it to be a chore to get Linda to practice. She also sang solo and duets at the recitals, and other talent shows at school.

Linda also sings in church and community choirs. For the past 6 years she has worked with her piano teacher learning to follow music and read the words in hymnbooks. Having changed members' perceptions, she is now accepted in the choir as she is. She has been receiving private voice instruction and has decided to become serious in developing her voice so that she may sing in the soprano section of choirs. Her goal has been to improve her head voice, and relax tension in her jaw and neck. She works on choir pieces, especially German pronunciations for Bach's "St. John's Passion." She has reverted to playing the piano with only her right hand. Her fingering is non-traditional, and she senses where to go without looking. When playing a piece with accompaniment, she integrates, and plays them both together. Music theory is not progressing well, and she wants to know where she is going with the piano. Much of her piano time is currently spent on her singing. Linda dreams of being a soloist in the choir and performing in Broadway type entertainment.

Linda plans to enroll in a work/study program at a nearby community college in the fall of 1998. She would like to be a nurse, but has no idea of the prerequisites, especially in mathematics, and has a poor work ethic. She does not have an understanding of work or of post school life as a community member. Her parents' next task will be to identify what she can do. She worried about attending the Music & Minds program, as she understands she is not a self-starter and she is used to having a lot of care.

Sam

Sam's mother describes him as a good sport, and it is clear that he is a cheerful and friendly 28 year old. He is the youngest of 5 living children, He has 2 older sisters and an older brother who is closer to his age. Sam's mother indicated that her third child had died. Sam's parents both hold Bachelor degrees. His mother has a BS and a BSN and his father holds a BA along with an additional 45 credits. Sam's mom was previously a middle school social studies and English teacher. His father is a retired middle school math teacher.

According to Sam's mother, she had no complications during her pregnancy. Beginning at the age of 6 months, she noticed particular feeding problems occurring such

as projectile vomiting. Sam was subsequently hospitalized at 9 months for failure to thrive. At this point the doctors provided no diagnosis. It was not until Sam was 3 that his parents suspected that he might have WS. Sam has not been hospitalized since; however, a heart murmur has been found, but he has not required major heart surgery as many other WS individuals. During his later childhood years, he was on Ritalin, but he currently does not take any medication except for Dramamine that he sometimes takes prior to flying.

Around the age of 6, a doctor at the nearby Children's Hospital finally provided a working diagnosis, which resulted in one-on-one behavior management sessions. As a preschooler, Sam was involved 2 days a week in an educational program through a local hospital. Then he was placed into the public school early childhood program. In both the hospital and the public school programs, Sam received basic skills training and preparation for learning readiness. He moved into the public school's contained classes where he remained until high school, at which he was mainstreamed for physical education and other non-academic classes.

Sam received a diploma of special education as he met his state's basic high school requirements. However, he has difficulty with math concepts. While he can count to 10 and 100, his mother was unsure if he could count to 1,000. Furthermore, he is able to sort objects by color, shape, and function and can also sort objects into groups of tens or thirties. His mother stated that if Sam tried to sort objects into groups of 100's he would most likely lose concentration. Sam can add and subtract single digits but finds it difficult. He has no multiplication or division skills. Fractions are also an area where he is unable to perform. His mother reports that with coaching Sam can measure solids and liquids and can tell time using a single clock face format. Sam does not have a great deal of confidence in math as he does not pay much attention to it and does not have much opportunity to use math throughout his day. This lack of attention may have resulted from a poor relationship with a high school math teacher, who had definite difficulties with Sam's learning styles and special needs.

He likes to pick up *Newsweek* magazine. And on a daily basis Sam reads approximately 10-30 minutes a day. He usually chooses to read the Bible, according to his mother, although he also enjoys picking up the newspaper and reading the weather and sports page. He is not working and is often lonely, according to his own perceptions and the opinions of his parents.

Sam loves music and enjoys playing at the piano, but not in a serious way. He has not had formal lessons.

Charles

Charles is 24 years of age and is part of a large family, with loving grandparents and a younger brother, in addition to many cousins, aunts, and uncles. His mother has a college degree, an incomplete postgraduate degree in cytogenetics, and currently works as a property manager. Charles' father has a college degree in psychology, and is vice

president of a life insurance company. Charles' birth was difficult, but normal. He was first recorded as being developmentally delayed at 6 months, with heart problems that were not initially diagnosed. Growing up, Charles had numerous physical challenges; he often fell from bicycles, and was clumsy in most physical activities.

Charles was diagnosed with WS when he was 2 years old. Once identified, he was referred to a nearby association with an early intervention program. He attended this program for 4 days a week for 3 years. He next attended a local kindergarten where he began special physical and occupational therapy that continued until he was 12. Since the local middle school had no appropriate program for students with special needs, he was enrolled in a self-contained special education school in a nearby town where he stayed until he was 21 years old. At school, he participated in transition and work-skills programs that involved daily living skills training, including work off campus one day a week. In school, Charles performed poorly in mathematics, and hated all worksheets. He still has difficulty writing and solving numerical problems. He can count to 1,000, and sort music tapes and cassettes by musical category, having developed the latter skill while working at a music store. He tells time with and without a clock; explaining, "it is a rhythm thing." When shopping, Charles dislikes handling change, so he accumulates it until his bills run out. His reading skills are quite good. He enjoys reading The Hardy Boys books, Scottish novels, British heritage books and magazines, and romances, especially if the cover presents "a guy in a kilt." He likes enthusiastic teachers who are "in sync," and says he learns best by hearing and doing. Throughout his schooling, he received help from his parents, particularly his mother. He is organized, cooperative, friendly, and cheerful, and has a strong Christian background. His mother explained that she particularly appreciates the way he quietly brings her coffee, and does small jobs around the house such as opening the shades in the morning.

From the age of 3, Charles demonstrated his musical talent by singing "Sesame Street" songs in both English and Spanish. He has had access to a piano from a very young age. When he was 6 years old, his cousin gave him a Pavarotti record, and Charles began to play along on the piano prior to receiving any formal lessons. At age 7, he received tickets to a professional opera performance and both he and his mother recall that tears of joy and sadness poured down his face throughout the 2-hour performance. Both Charles' mother and father took music lessons as children and his mother helped him with his music. Traditional music lessons were not successful because he learned by ear rather than by reading music. He has demonstrated perfect pitch, and has developed the ability to follow musical notation once he has heard the music played. "He relates to the ups and downs of print," his mother explained. Charles was not offered music at school until his mother began lobbying for him to have an opportunity to do what he loved. At age 13, he began regular drum lessons, and later became a full member of a local Scottish Pipe Marching Band, where he has been promoted to snare drummer first class. He plays his instruments (snare drum, piano, keyboard, bagpipe chanter, and saxophone) for at least 2 to 3 hours a day, and listens to his records, CDs, and tapes for at least 4 hours. Most of his tapes are Scottish music and he knows all the details of each tape. He enjoys opera, country, jazz, and Scottish music as well as listening to Elvis Presley. Charles loves creating his own music, but seldom replays or records it. He has

attended several years of summer music camps at the one place a summer program has been held for this population.

Charles is very sociable, and enjoys the company of others, chatting, going to places, and he continues to attend annual reunions at his special school. He is able to initiate and maintain conversations that are well beyond his own interest areas. Charles also enjoys listening to his police scanner, where he hears details about various crimes and other events. He explains he "swims like a rock," and hates to get his face wet. He loves watching hockey and basketball, as well as playing roles in the annual summer theater program in a nearby city, where he is an enthusiastic performer, often getting a lead role. A minister at Charles' church began a once a week social hour at a nearby senior center nursing home where Charles flourished as voluntary master of ceremonies, singer, storyteller, and companion for several years. Charles recently completed a 3-year residential postsecondary program focusing on independent living skills. Although he explains "music is my life," his mother and he both reported that no opportunities were available to study or even play music during this 3-year program. He currently can play over 1,000 musical selections on his keyboard and will respond to almost any request category such as "Could you play a song about spring?" by giving several options. If the name of the song cannot be provided, he will ask for cues, such as the first few notes (by singing or humming) and then he can play what he perceives (usually correctly) to be the song. At this time, employment possibilities for Charles are scarce and his family worries about what might be available for him, as he grows older regarding both living arrangements and occupational pursuits.

Molly

Molly's mother describes her daughter as friendly, caring, and outgoing. A tall, happy young woman, Molly loves to dance, perform, and sing. Molly is 23 years old, has an older brother and sister, and a stepfather who adores her. Her older sister is also disabled and lives in a group home. Molly's mother confided that, because of the fears she had about Molly's older sister's disability, she was anxious throughout her pregnancy with Molly. Molly was delivered by Cesarean section and had some problems at birth, including heart irregularity and breathing problems; this improved within a few weeks and Molly has not had major heart surgery, as has been required by so many other young people with Williams. Molly's father and mother divorced when she was very young and her stepfather entered her life when she was 10. Her mother has a college degree and a graduate degree in social work. Her stepfather has a graduate degree in business and is an executive with a pharmaceutical company. The family is financially well-established, and Molly has had many opportunities, resources, and a great deal of encouragement to develop her talents.

Molly was identified as having WS when she was 18 months old. At that time it had become apparent to her mother that she was delayed in both physical as well as intellectual tasks. Molly's mother sought help from a highly regarded genetics clinic at a teaching university where data about Molly, including photographs, were sent throughout the medical system resulting is a positive diagnosis of Williams. Molly began an infant

intervention program that included sensory stimulation, speech therapy, and occupational therapy. She began walking at about 2 1/2 years, but her speech was delayed. She said her first word at 2. When she did talk, she had good vocabulary, but poor comprehension and reasoning. When she was 3 years old, she attended a regular preschool in her neighborhood where she played with other children and practiced normally appropriate skills such as the alphabet, numbers, and working in learning centers. She stayed in that preschool until the age of 5, at which time she entered a public kindergarten. There was no special education pull-out program at the school and personnel discussed sending Molly to a special education facility. Her mother refused to accept the school analysis of what having WS meant; that, for example—Molly would not be able to master many basic skills. "I did not perceive Molly's identification as having Williams syndrome meant there was an inherent limit on what she could accomplish," her mother explained.

Despite the teachers continued perception that learning would be a challenge for her, Molly maintained a very high self-concept. During elementary school she attended regular classes and was pulled out for special education resource room time, which included basic skills remediation in reading. Reading continued to be difficult for her and her mother finally decided to teach her to read at home after realizing that the schools would not be able to meet her needs. She purchased a recorded set of stories with accompanying books that included phonics instruction. Molly's mother read books to her daily and worked on reading with her every evening. She also hired high school students and other young people to read and work with Molly until she could read independently. Currently Molly reads "all the time" and her reading level exceeds ninth grade. She loves non-fiction, magazines, and also enjoys romance novels. "She is never without a bag of books," her mother explained.

The pull-out resource room program lasted until Molly went to middle school and then she was put in a special education class along with youngsters who had Down's Syndrome and other disabilities. Her mother insisted that she attend other classes with students who were not disabled and she went to music, art, and physical education classes that were mainstreamed for all students. As she was usually the highest functioning student in the class, she generally felt different from other students. Her mother explained that she felt great compassion for all of the other students who were all functioning at lower levels and was depressed when they were made fun of or teased. She also looked for opportunities to "hang out with the regular kids," explained her mother, because she knew she was different from the children with more severe disabilities. She never really belonged with either group. After finding her crying on the staircase at home after school on more than one occasion, Molly's mother decided that she had to intervene to make school more enjoyable. Molly told her mother she was made fun of by the middle school students and teased unmercifully. Her mother made a very difficult decision and sent Molly to a private residential school. The private school was for students with severe learning disabilities and Molly flourished there for 2 1/2 years. It was an environment of hands-on learning, with a great deal of time spent on active learning experiences. Molly's skills improved in all areas and she really enjoyed the learning process. She even improved in math, which was the first time her mother believed she had made progress in math. This was also the first time that attention was

paid by school personnel to Molly's interest and talent in music, which had previously been nurtured by her parents but not particularly by the schools.

Molly liked the private school where she flourished academically, but she did miss her parents. Unfortunately, in eighth grade, she was abused by a staff member, and her parents immediately withdrew her and brought her home. Molly needed a great deal of reassurance and love and attention to overcome the pain associated with this episode. Her parents decided to enroll her in the local public high school in which she registered for all regular classes. She needed support and help in most classes that she received from a learning disabilities resource teacher, but managed to earn grades of B and C in most of her classes, which were modified for her special needs. Her parents were very proud of her adjustment and loved having her home. She continued to participate in various high school opportunities including clubs and music classes throughout her public high school experience. She also worked part-time in Pizza Hut throughout high school and after school. For 6 years she worked in the kitchen at a pizza restaurant and she also worked part-time as a nurse's aide in a senior citizens' home.

Molly's mother wanted her to be able to continue her education after high school and she enrolled in a midwestern university where she took music classes, dance classes, and drama classes. She stayed for 2 semesters and was able to survive in the new atmosphere because her mother hired a personal assistant to help her with all of the new issues she was facing, such as how to use a cafeteria line and how to find her classes. However, Molly knew she was different. Other students did not accept her as a peer and she began feeling lonely and isolated again. She came home on weekends and her mother soon learned that Molly wanted her to take her out to buy groceries because she was not eating in the cafeteria since she felt different. "I am so tired of everyone looking at me. I don't want to eat in the cafeteria because I have no one to eat with." Soon after, Molly came home from that university.

Currently, Molly is involved in a special program for students with special needs where she lives in a dorm and is fully independent from her family. She is happy in this environment and hopes to develop the skills necessary to work in an independent job at some point in the future. Molly spends 2 days a week in special classes in budgeting and child development and 3 days a week in job training. She has worked in a hospital emergency room and hopes to try a job in a music store, which she thinks she will love.

She is also better at math than some other participants, but did not do any college math classes. Molly loves music and her parents noticed her love of music at a very early age and continued to nurture and develop her talents in this area. Her mother purchased a piano for her and she started taking Suzuki violin in second grade. She was continuously exposed to music, taken to concerts, encouraged to practice and sing, and was able to count on her mother driving her to practice and paying for lessons. Her mother insisted that music be a part of every educational experience she had. When she was at private school, Molly starred in plays and was in the chorus. The schools she attended before going to private schools had not provided many musical experiences. Molly's mother indicated that she had been "adamant that music had to be part of the curriculum" so

more opportunities were created for Molly than she would have had if her mother had not been such an assertive advocate. Her parents also encouraged her talent by taking her to concerts and community drama performances. They indicate that she has very good musical abilities in all areas. She has taken lessons since second grade, can read musical notation, has perfect pitch, loves to improvise, and has excellent rhythmic memory. She does best with patient teachers who have good energy and are gentle. Since she was abused, she does not do as well with male teachers until she gets to know and trust them.

Molly loves Debbie Gibson, and dances and mimics her constantly. She loves to be involved with music technology and uses the Internet frequently. She enjoys classes in all kinds of music and loves music appreciation classes. In her music concerts, she frequently stars as the sole vocalist and loves every opportunity to sing, and be in the public eye in music. She recently was featured on "60 Minutes" and this appearance brought her much fame in the local neighborhood. Her community is very proud of Molly, according to her mother. Molly has superb social skills, is independent relative to personal skills, and is proud of her physical appearance. She has performed three times professionally for a group called Potential Unlimited in New York, and won best vocalist in her state in the Very Special Arts Program.

CHAPTER V: Findings, Discussion, and Implications

Research Questions

Music & Minds focused on the discovery of aspects of teaching and learning. Findings emerged over the course of the study that can be useful in planning and implementing educational programs for young adults with WS. The following section addresses each research question, along with discussion of additional observations that became apparent through the 10-day residential program.

1. *Can an enrichment/talent development approach using specific instructional strategies, based on preferences, interests, and styles, provide a useful framework for the education of persons with WS?*

As noted in the literature review, students with WS have definite interests, strengths, and learning disabilities. All too often, development of their strengths and interests have not been included as part of their regular school experience. Music & Minds was based on respect for each individual's interests, abilities, learning styles, and learning preferences. All 16 participants displayed enthusiasm, empathy, and engagement in learning when focused on an activity they enjoyed. This finding contrasts with Lenhoff's (1998) observation that persons with WS have a limited attention span for most subjects.

Throughout the program, instructors were flexible and willing to try different methods of grouping, teaching, and learning experiences and watched for opportunities to connect participants to learning through their interests. Various types of planned and spontaneous enrichment opportunities were offered, such as dances, evening open-microphone nightclubs, a professional chamber music performance, and daily drama activities. As the participants were invited to share their interests, counselors and instructors were open to finding ways to extend and link what was happening in class to additional resources. Music, in many forms, was the primary link.

The use of musical enrichment was found to both enhance all participants' understanding and willingness to further develop their musical abilities. Results from observations, interviews, and posttests supported the effectiveness of a program centered around participants' interests. Increased skills in the content areas of music and math were noted. In addition, this enrichment program radically changed perceptions of the participants. At the conclusion of the program Charles' mother exclaimed:

> If only this could have started when he was young. No one, ever, in the 18 years in which he was in public school ever asked me about his musical talents or involved his musical abilities in his school programming. Even when we told them about the hundreds of songs he was teaching himself at home and his efforts at song writing and musical theater, nothing was done to encourage or support this

interest in talent. Why couldn't they do what you did—try to teach him math by using what he loves most—music?

After reflecting on his daughter's success in Music & Minds, another parent wrote, "Music & Minds has raised the bar and there will be no return to previous expectations." The use of an enrichment-based talent development model, such as the Schoolwide Enrichment Model, helped to provide positive learning experiences for this population and to address deficits and develop musical talents.

Using a talent development approach for education provided benefits well beyond the classroom. For example, when parents arrived on the first day of the program, they were each asked to provide a list of explicit instructions for each participant about health, safety, and learning concerns. Within only a few days, a majority of these had been modified because of participants' incremental successes. In other words, even in the area of living skills, prior expectations proved to be limiting. For example, a participant who was to be driven rather than walk the relatively long distances from dorm to music building indicated he wanted to be with the others as they talked and sang their way to classes. The nurse and a resident assistant began to slowly walk with him, and by the end of the first week, he was showing more energy and general awareness. Not only was he more engaged in classes, he was willing to extend in all activities. His parents, who had been concerned about his health and thus had asked for accommodations, were excited with his obvious progress across domains. It should be noted, however, that there were broad differences in the living skills of this group. Some participants were already extremely independent and required flexibility on the part of staff, along with respect for their ability to live as almost self-sufficient adults. Others required much more support and help but, when encouraged, moved towards relative independence in some areas.

2. *How many of the participants demonstrated music skills, and what patterns emerged, if any, in the home experiences, early lessons, and parental support for these participants?*

Musical talent has been defined as a capacity for musical performance (Boyle, 1992; Lundin, 1967; Schoen, 1940). However, a musical performance may involve not only a capacity, but previous learning as well. Boyle (1992) suggests musical talent be recognized as an imprecise term often used to describe an individual whose musical ability is above their peers. Shuter-Dyson (1982) says Gordon points out that the use of words such as "ability" and "talent" include both aptitude and achievement, and thus can be confused. For this study, we defined musical talent as the observable musical abilities that appear to be common among the WS participants in this study.

In addition to perfect or relative pitch, which is discussed later in this section, other common indicators of musical talent include: ability to correctly reproduce melodies, well-developed sense of rhythm, ability to harmonize without or with education at an early age, ability to play an instrument by ear, ability to play an instrument without formal education, responsiveness to music, ability to read music without training, fascination and gravitation towards music, emotional involvement with

music, commitment to practice, and a desire to perfect performance. This does not represent an exhaustive list of indicators, but several interesting trends appeared when comparing Music & Minds' participants to this list using anecdotal evidence collected during the study.

• *Ability to correctly reproduce melodies*: This ability was evident in all participants; however, accurate intonation was not consistent among participants; even when the melody was correct.

• *Interest in musical instruments*: The WS participants were given numerous opportunities to see, hear, and experiment with instruments including: clarinet, flute, piano, synthesizer, trumpet, drum set, auxiliary percussion, cello, acoustic and electric guitar, trombone, mellophone, and alto saxophone. They were also exposed to professionally trained male and female voices, These experiences were within lessons, recitals, computer class, percussion ensemble, and casual performance sessions in the dorm. During these events, several spontaneous positive changes were observed, including more appropriate body posture, ceasing of body rocking, and verbal expression of the desire to personally engage.

• *Well-developed sense of rhythm*: Rhythmic conservation was consistent among this group similar to findings of a prior study by Levitin and Bellugi (1998) at the Belvoir Music Camp. Rhythmic performance of musical material was accurate, although a tendency for some individuals to rush the rhythm was observed in group chorus class. Particularly those participants who had training and interest in percussion instruments demonstrated the ability to reproduce varying rhythmic patterns; however, participants rarely deviated from familiar patterns by including original and/or complex rhythms. Further investigation is needed to determine whether exposure and training can increase the ability to extend and create rhythmic patterns.

• *Ability to harmonize*: Individual ability to harmonize was not specifically investigated within the programs, although the whole group chorus was able to perform a canon that required independence of vocal performance in creating harmonies. Two participants also freely sang harmonies to "Over My Head" and "Amazing Grace." It should also be noted that it was not clear if the harmonization was original or brought from previous musical experiences.

• *Ability to play an instrument by ear*: Students were given opportunities to experiment with different instruments. One participant was able to play familiar melodies freely on clarinet, alto saxophone, piano, and mellophone with ease. Another played melodies on the piano and chordal harmonization on the guitar by ear. One participant played song upon song on the keyboard without music. According to pre-program parent and participant surveys, 5 of the 6 participants who played melodic instruments did not use music when playing. Although the accuracy may have been compromised, the music was learned, repeated, and performed by ear.

• *Ability to play an instrument*: Only those who accepted the various opportunities provided at Music & Minds could be assessed. For example, one participant had never played an instrument before the program and left capable of playing a number of songs with melody and chordal accompaniment, all of which were learned by ear. Even though some participants had physical limitations, they found ways around those limitations when attempting to play particular instruments (i.e., laying guitar on lap, alternate bar tuning of the guitar, piano chord inversions, and tonic chord drones).

• *Deep and passionate love of music*: These attributes were in evidence throughout the program. However, despite an expressed interest in music by all participants (which was a condition of application to the program), by the conclusion of the program, participants demonstrated differing levels of passion about music and interest in pursuing it to a deeper level.

• *Ability to read music*: Only one participant of the 16 demonstrated the ability to accurately read musical notation. This skill was neither taught nor required in the program. In fact, during pre-interviews, some parents actually indicated resistance to having their child try to learn the skill, stating that it might make him/her lose spontaneity and enjoyment, noting that music was something special and they were concerned about making it seem more like work.

• *Fascination with, and gravitation, towards music*: This was observed in all participants at different times throughout the study. The intensity and duration of individual engagement was noted as the program continued. Some participants would gravitate to music during any spare minute, others would read or visit, or become distracted by another interest.

• *Emotional involvement with music*: Differing degrees of emotion were observed among participants. One student gushed, "Huh! That's nice!" when a C major chord was played during his Pitch Identification assessment. Another repeatedly wept during performances of "Amazing Grace." It was observed that one participant who almost continually rocked his body substantially reduced or completely curtailed that behavior during intense or evocative sections of music performances.

• *Commitment to practice*: This was not measured formally during the program, as little time was set aside, nor were students encouraged to schedule practice time. The best opportunity to observe any form of repetitive, systematic work on improving musical performance was during free evening time in the dorm lounge. Three participants often brought their instruments and sang or played together for extended periods. The "free time" included, but was not always devoted to, music they believed they needed to play again and again. It is difficult to comment on whether this behavior indicated an awareness of the benefits of repetition or whether it was solely for pleasure. Parents indicated hours of playing and singing at home, but they did not make a clear distinction between time performing or just playing through pieces, and time practicing with intent and concentration.

• *Desire to perfect performance*: This may depend on the individual interpretation of "good enough" and/or perfection. The chorus did move toward an improvement model when the expectation was clearly set forth by the Choral Director. Outside class, some individuals repeated notes, rhythms, phrases, and songs numerous times until they were satisfied. Staff noted that other individuals appeared to lack drive for improvement on repeated occasions.

Based on information presented prior to Music & Minds, instructors reported that their expectations about the participants' prior knowledge and talent had not been realistic. As one instructor explained at the end of the first full day: "I wish I had known before today . . . I wish I had known that some of the participants are *very* talented musically and some honestly are just *not*. I was expecting a little more."

Through observations and assessment, our music professionals identified 5 participants with high skill and potential in music, or demonstrating musical intelligence as defined for this study. Another 5 participants were identified as having mid-level skills or potential, and 6 participants were rated as having low performance or potential. Of the participants who displayed the highest levels of musical ability, 4 had very good reading skills, while math skills in this group were not consistent and varied from low to high. These 5 participants all had similar patterns of strong parental encouragement with opportunities to both enrich their experiences in music and to develop their musical talents. Comparisons of parent and participant reports indicated that those with the highest skills in music had been provided with the most enrichment opportunities as children and adolescents, including attendance at numerous concerts and shows, lessons with appropriate teachers, and the purchase of appropriate instruments, as well as gifts of music CDs, tape, and records.

All 16 participants had been involved in some type of music program in their childhood: 11 were in chorus or other choir groups. Ten participants had received specific instrument training during in their childhoods, 9 had some experience with private music teachers, but only 5 actually participated in sustained private instruction in music. These were the 5 participants identified as having high levels of musical skills. Data clearly indicated that the parents of all of the musically able participants had provided early lessons and encouragement in music, beginning in or prior to elementary school, and followed by continuous musical training and exploration. In addition, the parents of more musically accomplished students had purchased a variety of instruments, found the best match of teacher for lessons, and persisted in the face of resistance when some music teachers had difficulty in trying to teach music to these special needs students who could not read music. James' mother, for example, indicated that because his hearing and understanding of sound was so intense, they purchased the finest instrument they could for him as soon as he began to excel in the clarinet. Charles' mother drove him over an hour each way twice a week when she found a music teacher who understood his needs and the startling fact that he could not read music. The parents of participants who were lower in musical performance provided support, but it was not necessarily in the form of lessons, instruments, or specific encouragement in music.

An interesting theme emerged in the interviews with parents. Ten parents believed they had supported the musical talent development of their child and reported in the initial interviews that their sons or daughters demonstrated high ability in music; however, faculty and staff observations during Music & Minds did not uniformly support this perception. Several parents said they encouraged their child's musical ability by "buying music tapes," as if they believed that listening to music would or could increase musical abilities. Five of the parents were quite realistic in their appraisals, noting that their son or daughter had taken lessons for years but played only at an average or slightly above average level. The majority of parents indicated that their son or daughter displayed an unusual affinity and love for music and interpreted this joy in music as an important factor in the personal happiness that would be achieved in life. "For my son, life without music is life without heart and joy," one parent explained. Parents of 8 other participants used language that echoed this sentiment. In addition, the joy in music was contagious. As one Music & Minds vocal instructor remarked, "They have taught me to enjoy music for the sake of music."

Limited prior research had provided initial evidence that some musically talented persons with WS taught themselves to play a musical instrument—the drums, guitar, or perhaps the piano. This was also true in the high music ability group at Music & Minds. These participants knew the kind of sound in which they had an interest, and insisted on the right equipment. They listened to respected musicians and teachers and tried to emulate them. Although they often ran into problems of sound production and control, they were able to find their own way through the challenges. They did compare and discuss playing with fellow participants. They could follow the example of preferred models.

Incidence of Perfect Pitch

Perfect pitch, absolute pitch, and relative pitch are terms used to indicate someone who can hear and accurately identify individual notes. For our purposes, we operationally defined perfect pitch as the ability to produce or label a designated musical pitch without reference to an external musical source. Relative pitch is therefore defined as the ability to produce or label a designated musical pitch with reference to an external musical source (Randel, 1986; Ward & Burns, 1982).

When using letter names to label musical pitches (in reference to the musical scale), the participants in our study displayed a wide range of performance. Seven participants were immediately able to accurately use letter names to label pitches. Two participants had the letter system explained to them and subsequently showed an accurate ability to use this system. The remaining 7 could not demonstrate accuracy using this labeling system even after a full explanation. Any correct identification of pitches by this third group was no greater than could be attributed to guessing.

Prior to Music & Minds, a team of staff members discussed methods for evaluating perfect pitch in this population. During the program, one staff member evaluated the participants for perfect pitch using methods unique to this study. Four

subsections were used: visual note identification from keyboard, aural pitch identification, aural pitch identification of three note melodies, and aural chord identification.

- Visual Note Identification from Keyboard: Random notes were played on the Roland keyboard and the participant was asked to label the note name with a letter name after looking at the keyboard.
- Aural Pitch Identification: Random notes were played on the Roland keyboard and the participant was asked to label the note name with a letter name after having heard the pitch. The participant was not given feedback as to correctness to control for relative pitch being confused with perfect pitch.
- Aural Pitch Identification of Three Note Melodies: The evaluator played 12 predetermined melodic patterns of three notes each and asked the participant to either play back on the keyboard or to verbally label the pitches played. Some participants completed this section by searching the keyboard until they found the correct pattern, which indicates they may have been using tonal memory and pitch discrimination to be successful.
- Aural Chord Identification: The evaluator played a series of 15 chords that progressed in difficulty. The participant was asked to either play back on the keyboard or to verbally label the pitches played in each chord. The participants who successfully completed this portion correctly labeled or played the pitches, but did not always list or play the pitches in the same order.

Two participants demonstrated the potential of possessing absolute pitch. One participant had pitch identification that was 100% accurate at on all four subsections, except for the last chords. The other correctly identified the root, fifth, and seventh of this chord and did not label the third. The instructor gave him 7 additional chords with sevenths and he identified each the same way. Another participant identified all but one pitch, and played back the chords in section four. He accurately played the pitches in each case, but not always with the proper inversion.

Four participants demonstrated the potential of possessing relative pitch. Three of the 4 had previous understanding of pitch names and the fourth demonstrated an ability to accurately use this labeling system. This grouping of individuals appeared to do generally well with the identification of pitches and chords using only the pitches of the white keys on the piano (A, B, C, D, E, F, G). On one student's evaluation, the instructor indicated a question about the use of accidental names in aurally labeling despite being able to name the accidentals when visually seen on the keyboard. The correct identification of pitches by this group was greater than would be anticipated from guessing. One participant had slightly more incorrect responses than the other 3 and did not complete the entire assessment, as she presented numerous excuses to not complete the assessment. The accuracy was higher for this student in the first half of each test subsection when compared to the latter half.

The data for remaining 10 participants were inconclusive and lack evidence either to demonstrate or fail to demonstrate perfect or relative pitch. The methodology proved to be inappropriate across the range of participants. Eight of these 10 participants reported they did not know the names of the notes prior to the instructor's explanation. Two reported knowing the names, but the evaluator indicated that one participant needed to count the piano keys to correctly label. Another in this group, after making an error on the first attempt continued to search until finding the correct pitch: she correctly labeled the pitch, but only after a given number of attempts. The student's previous attempts were not recorded. This incident indicated an ability to perceive the pitch, retain tonal memory, and perform pitch discrimination through more than one mistake. Only one in the group could complete the entire task, despite errors. Three participants did not finish the assessment. One appeared to be confused by the chords and did not complete that section. Three others were unable to complete the task due to distraction, unwillingness, and a lack of interest. Due to these limitations, it is not possible to make assumptions regarding relative or absolute pitch for 10 participants.

Further limitations of this exploratory assessment are recognized. Different means of assessing perfect pitch and relative pitch need be explored with this population. Additional ways to express pitch could be included, i.e., playing on clarinet. The task should control for relative pitch being interpreted as perfect pitch by playing white noise between examples. The subsections should also be alternated for order effects and re-testing during different times of the day to control for fatigue and maintain interest level. These concerns need to be addressed in future research.

3. What were the participants' learning and product style preferences, and interests? How did participants and their parents view their strengths and weaknesses in music as well as academic areas?

It was very clear to all of the faculty and staff that although all the participants in the Music & Minds program had WS and were predisposed to certain cognitive and physical difficulties, every single student was unique. The students exhibited a wide range of abilities and learning preferences and each presented a different combination of ability, interests, concentration skills, communication skills, and learning preferences. For example, 7 participants appeared to be primarily auditory learners, 6 were more visual learners, and others were mixed.

One instructor wrote in her daily journal that because of these differences, she ". . . needed to use every possible trick to ensure that learning and fun are taking place. The challenge is exciting, the trial and error in teaching here is frustrating. There doesn't seem to be a commonality in learning styles. Each of them is responsive to different things."

Learning Style Preferences. Participants' responses on the Learning Styles Inventory (Renzulli, Rizza, & Smith, 1998), where a Likert score of 4 is "really like" and a score of 1 is "really dislike," indicated their highest instructional preferences were peer teaching (M=3.32, SD=.29), lecture (M=3.32, SD=.30), discussion (M=3.28, SD=.43) and

projects (*M*=3.01, *SD*=.31), while the lowest preferences were simulations (*M*=2.67, *SD*=.44) and drill (*M*=2.72, *SD*=.45). These results supported previous anecdotal reports confirming the preference of many persons with WS for social, verbal, group learning experiences, rather than structured, rigid activities (Levine, 1997). Individual responses varied greatly, explaining the standard deviations. For example, Allison had a score of 1.2 and 1.6 on her response to preference for simulation and drill, while Molly responded with 3.2 and 3.6 for the same items.

Expression Style Preferences. Participant responses on the 50 item My Way: Expression Style Inventory (in which a Likert score of 5=very interested, 4=interested, 3=moderately interested, 2=of little interest, and 1=not at all interested) indicated the following group preferences: Service, sharing, and helping others (*M*=4.54, *SD*=.17); oral (*M*=4.40, *SD*=.43); musical (*M*=4.19, *SD*=.37); dramatization (*M*=3.99, *SD*=.19); and artistic (*M*=3.29, *SD*=.33). The high means and low standard deviations reflect group patterns, leaning toward strong social orientation and expressiveness. While the mean for music was high, the larger standard deviation indicated a dispersion of responses and varying individual interest in music performance. In fact, two of the participants with the lowest responses in music were listed among the lowest in ability and potential. The lowest group responses for expression styles were manipulative (*M*=2.72, *SD*=.57); technological (*M*=2.75, *SD*=.17); commercial (*M*=2.76, *SD*=.48); and written (2.91, *SD*=.25).

Interests. An analysis of the interests of the participants using the Secondary Interest-a-Lyzer instrument revealed distinct patterns. One section of this instrument lists 26 items for respondents to indicate the level of interest with a Likert scale (where a score of 3=Yes, I would like to do this; 2=I might be interested in doing this; and 1=I do not want to do this). The activities the participants selected most often from this list of 26 were: involvement in a neighborhood project (*M*=2.8, *SD*=.77); photography (*M*=2.8, *SD*=.81); and cartooning (*M*=2.6, *SD*=.81). Their most unpopular activities were studying the stock market (*M*=1.2, *SD*=.89), repairing a car or appliance (*M*=1.5, *SD*=.82), organic gardening (*M*=1.7, *SD*=.90), and starting an astronomy observation group (*M*=1.7, *SD*=.95). In general, the participants were interested in learning about multiple areas and in trying new activities. Their responses indicated a strong tendency to avoid activities that appeared to involve mechanical or mathematical skills. Nine said that a perfect opportunity for learning for them would focus on music. Another common area of response was their collective and individual concern for others. Eleven participants, when asked to select topics that would interest them, said they would like to learn about issues related to world peace. Eleven also expressed interest in knowing more about career opportunities, reflected their concern about their own lives, as well as the lives of others. Interestingly, when asked about the type of book they would like to write, 12 participants responded they would write an autobiography, a very uncommon response on this instrument. Charles wrote, " I want to tell the world about me." Susan echoed his remarks, explaining, "I will write a book about Susan, telling everyone who I am."

In summary, data from these instruments indicated clear group patterns, yet with individual variability in learning styles, expression styles, and interests.

Parent Perceptions

Parents were very forthright about the academic strengths and weaknesses of their children and provided specific information about their child's abilities and deficits in content areas such as reading and math. All parents indicated that their child had poor or low skills in math, the content area consistently mentioned as the area of greatest weakness for these young people. Responses to questions such as "describe your child's math skills" included representative responses such as "slim to none." Most parents also had realistic appraisals of their son's or daughter's reading ability, and could indicate the grade level at which he/she reads. All parents were inclined to discuss strengths in realistic terms, giving examples of reading preferences, time read on a daily basis, and independent reading ability. Parents told stories of how elementary and secondary educators perceived numerous other problems and deficits in school related issues. They consistently discussed their child's low abilities and low IQ scores. Many of the parents had learned, through the popular press and popular current literature, that young persons with WS had high musical potential. Some of these parents developed an expectation that they should find "this" musical ability in their child.

Parent reports, self-report, psychological testing, and school records indicated most participants had below average, but relatively strong verbal skills such as vocabulary and memory. By contrast, they demonstrated notable deficits in math abilities. Although participants' math skills were low, particularly in the area of fractions, they were sometimes able to accurately use basic arithmetic facts and, to varying degrees, could add and subtract. However, participants revealed poor self-concept with regard to math skills and were hesitant about their ability in this area. Parents reported that their children lacked practical basic math skills, and that math was rarely applied in daily living, for example, counting change when making a purchase.

In contrast to the agreement between parent appraisal and academic records, parent descriptions of extreme potential and/or demonstrated ability in music were not corroborated by faculty and staff observations. In addition, parental claims tended to be based their own perceptions of how one would develop music ability. For example, several parents indicated that they supported their child's ability in music by "buying music tapes," indicating they may have believed that listening to music would be a way to increase music aptitude. Other parents were very realistic in their appraisals, indicating that their son or daughter had taken lessons for years but played at a slightly above average level. Most parents indicated their son or daughter with WS demonstrated a particular love for music, and they hoped this joy in music could positively impact learning in other content areas.

Participant Perceptions

Participants had reasonably accurate appraisals of their abilities when compared to school records received for this study and other psychological assessments. As shown in Figure 3, participants' math scores were quite low, and students indicated they were aware of their demonstrated deficiencies in math. In addition to the low scores, almost all participants had strong and limiting beliefs about their ability to learn, consistently explaining what they could not do such as: I can't measure, I can't cut (with scissors, or with knives). One participant had an acute physiological reaction to taking a pretest in math, as he sweated profusely, was extremely nervous, and very apologetic: "I can't do this at all." Through the interviews, participants continually discussed their low abilities in math. "I stink at math and they (my teachers) always told me I just could not do it," was a phrase repeated in a slightly different way by every participant. "Math was my downfall!" one participant exclaimed dramatically. Many became visibly upset when they had to take a pretest in math and the majority expressed their fear of math work. Bill's math deficit cost him a high school diploma; he received a Certificate of Attendance when he graduated because state competency requirements had changed, and algebra was added. The fear of mathematics was often manifested by an inability to understand money, and all parents indicated that mismanagement of money would be a major obstacle to independent living for this group. For example, Bob's father worked with him diligently teaching him to read a tape measure, add, and subtract, but Bob seemed unable to understand any abstract number concepts. Sam also had difficulty with math concepts. Even though Sam possessed some basic addition and subtraction ability, he had no multiplication or division skills. Fractions were also an area where he indicated little understanding.

Most of the students indicated that they avoided areas in which they believed they had deficits so, for example, one participant refused to try to count her change when shopping because she knew this was a problem area. She only used large bills to pay for items and then stuffed the change in her purse, not to use it again. This avoidance seemed to emerge from firm beliefs that if they could not achieve in certain areas, it was not worth the risk of trying.

Participant impressions related to music varied from realistic such as: "I'm really not that good at guitar, but I can work on it" to quite unrealistic perceptions of exceptional ability and skill in music. Some participants were familiar with popular press reports about WS persons being extremely talented in music, and believed the generalization but actually demonstrated only an average to below average ability, even though they showed love for music. Many participants displayed a love and affinity for music, but only 5 had developed the musical talents instructors and staff had been led to believe would exist within a population of persons with WS.

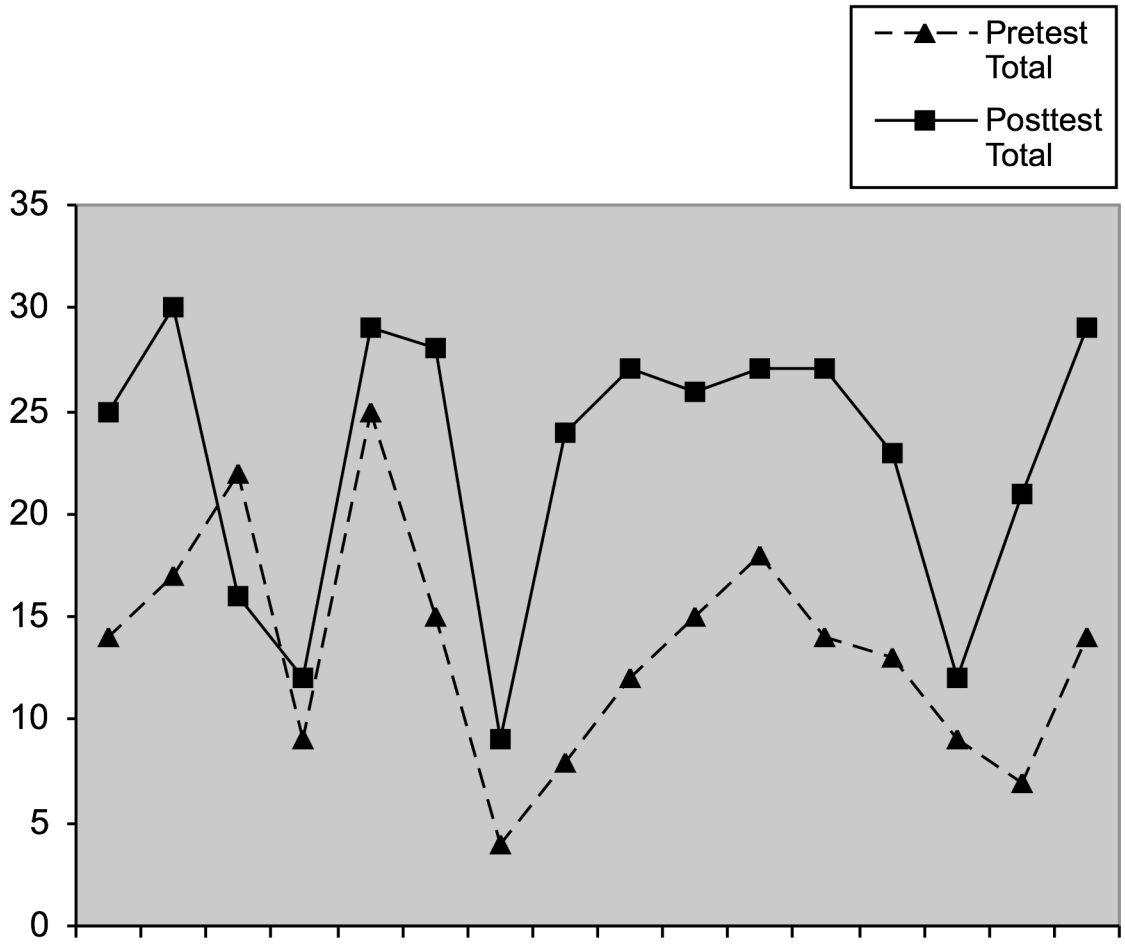

Figure 3. Total gain scores for participants.

4. *Did the use of an enrichment/talent development approach based on talents and strengths in an area of interest (music) result in achievement score gains in an identified deficit area (fractions)?*

Our research indicated that 94% of the WS participants demonstrated an overall gain in comprehension of fractional concepts covered during the Music & Fractions class. Sixty-three percent of the participants achieved a mastery level of .80 and above on the post test. Because of the small sample size, a follow-up *t*-test was run on the pre and post test total scores to determine if overall growth was evident. Significant gain for all students regardless of group (t=6.21, p<.001, R^2=.362) was noted. Individual participants increased their understanding of the basic mathematical concepts covered during the Music & Fractions class as demonstrated by the gain in their posttest total scores and their mastery level in Figure 3 below.

Perhaps most importantly, parent and student post-program interviews indicated that a pattern of increased confidence emerged in the use of money, especially in making fractional change. Numerous parents reported a general improvement in their son's or daughter's willingness to problem solve and most parents found that despite some inconsistency of application, the participants retained a sense of what makes a fraction. One parent stated that his son now reasoned through fraction problems with parental support where previously he would not have tried at all. More than half of the students commented that they were either planning to try more math classes in school or that they wanted to learn more about fractions.

Data collected through observations and interviews were analyzed to determine the presence of overarching themes. Enthusiasm, speed of assimilation, accuracy of application, understanding of concepts, and general attitudes toward fractions emerged as consistent patterns of similarities and differences between the groups. For example, students in the treatment group accurately demonstrated the application of fractions to cafeteria servers by the end of the third class session. Comments such as "I've eaten one fourth of my ice cream," "I would like four fourths of a sandwich," and "Now I only have one-third of a banana left" were inserted into normal meal conversations.

The use of music as a tool for students to connect ideas was apparent throughout the videos, audio tapes, and daily observation logs. Participants used the concept of the "hook," or a distinctive musical sound, to hold onto fractional concepts like numerator (num • ber • on • top!), and denominator (the • whole!) when required to demonstrate their understanding. An often heard request in class was "Give me a HOOK!" or "Do you need a HOOK?" as students grappled with fraction problems.

Teaching Music

Findings from Music & Minds indicated that some of the rules traditionally used for teaching music did not apply to this population. As previously noted, only one participant was able to read music notation, despite the numerous attempts to traditionally teach others. For example, Charles (with a musical repertoire of over 1,000 songs) cannot read music and was unable to learn notation. The principles advanced by Mason (1837) proved to be appropriate for developing and sequencing teaching/learning music for persons with WS. These principles include:

1. Teaching sound before sight.
2. Leading students to observe by hearing and imitating instead of explaining.
3. Teaching one thing at a time—rhythm, melody, and expression before requiring students to attend to all elements simultaneously.
4. Requiring mastery of one step before moving to the next, giving principles and theory after practice.

A day at Music & Minds included composing-listening, performing-listening, and audience-listening within a musical and cultural range wide enough for participants to

appreciate music more fully than what they had previously experienced. Smaller groups than whole-class or whole-band or whole-chorus were found to be essential for student interaction. These smaller groups were then incorporated into larger classes when needed. Formal and informal music classes extended beyond the actual time designated for instrumental or vocal instruction. Curriculum within the classes was broadly defined and flexible, rather than predetermined and scripted, so that it could be quickly adapted to individual circumstances and daily challenges. Throughout the program, participants were encouraged to move beyond a preexisting emphasis on performing for others by extending their musical understanding and techniques to include perceptive listening, improvisation, and composition. Future efforts will require further, in-depth analysis of how people with WS learn and advance their musical skills. Gordon's (1997) work on the learning hierarchy of music, for example, might be useful, particularly in the areas of discrimination learning and inference learning.

Other Findings

Other findings from Music & Minds related to a combination of the core categories and research questions, as well as general teaching strategies. In addressing the question of how the teaching process can be modified for participants with WS to enhance instruction, some general observations were made by the instructors across the various content areas of music, drama, and math. Overall, students had difficulty with visual tracking, visual motor skills, and difficulties with working memory. On the positive side, they were highly sociable as a group, engaged easily with others and were sensitive to musical sounds. Several teaching strategies seemed to work more effectively than others with the participants. These successful teaching strategies emerged in academic and music classes, as well as extra-curricular activities such as creative drama, and include organization components, environmental issues, and pedagogical strategies. These were developed by reviewing the behavioral impairments of persons with WS described by Levine (1997) such as: short attention span and distractibility, difficulty modulating emotions, heightened sensitivity to sound (hyperacusis), perseverating on favorite subjects, anxiety around unexpected changes in routine/schedule, rocking, nail biting, and difficulty building friendships. Since many of these deficits were present in the Music & Minds participants, instructors first spent time learning about and focusing on participants' strengths and interests rather than their problem characteristics. Second, we learned to use music as a routine background sound in the beginning of each class to calm and help students focus. Third, we discovered that because anxiety is often an issue, it was essential to provide clear and consistent direction along with a routine for students to be prepared to learn.

Within the classroom, students responded well to group activities, but often asked for, liked, and needed individual attention when learning difficult or new material. Tasks were accomplished with more command and confidence with one-on-one teaching/coaching. Repetition was a common theme. As a reply to the daily journal question "Tomorrow I would like to . . .," one student replied "think. Do the same thing over and over again."

This list of general strategies was developed through review of videotapes, teacher logs, and participant interviews:

1. Provide clear, explicit instructions about one task at a time.
2. Use scaffolding techniques whenever possible.
3. Make learning in difficult areas (such as math) more relevant through tasks that participants enjoy (music, rhythm, storytelling, or improvisation).
4. Use imitation to escalate music and academic skills.
5. Use paired groupings or one-on-one classroom patterns to help learning that is difficult, or introduces new material.
6. When introducing new or challenging content, use patterns in structured environments to combat resistance to change, and repeat often.
7. Carefully and consistently connect new knowledge to previously learned material and give visual and auditory examples whenever possible.
8. Provide constant reassurance when pursuing new or challenging tasks. Praise along with a positive approach is powerful for this population, particularly when it is sincere and delivered with excitement or animation.
9. Model and present self-regulation and practice strategies, especially in music. Several participants had poor self-regulation skills and most had not been encouraged to develop a regular practice routine.

Social and Emotional Issues. During Music & Minds, our participants displayed the empathy, caring, and kindness frequently mentioned in the literature in this population. Many staff members had in-depth meaningful conversations with these participants. For example, one participant used historical analogies to explain persistence and then added a humorous anecdote concerning an historical figure. Three participants had difficulty with any conversations because they were very shy and reserved, while most other participants were extremely outgoing and friendly.

Another behavioral impairment suggested by Levine was difficulty modulating emotions. This was observed when participants were unable to focus on their performance because of hypersensitivity to others' emotions. This problem was addressed through the redirecting of attention to the qualities of a good performance, and attempts were made to defuse any situation before it became pervasive by helping participants understand emotional reactions while concentrating on specific tasks at hand.

Social Awareness

The group of participants at Music & Minds were living on the main University of Connecticut campus and eating in a dining hall open to students in a number of other summer programs such as basketball and soccer. As such, they found themselves faced with social issues of how they presented themselves and who they selected as friends. Initially some of our participants did not want to align themselves with other persons with disabilities, and openly expressed discomfort with a designation or identification as a person with WS. In fact, 3 parents mentioned that their son or daughter did not want to

spend a majority of time with other WS participants. They explained that s/he was high functioning and felt constrained when confined to situations that only included other WS persons. It appeared that these participants had been isolated in special education programs with other more severely disabled persons, which had caused them to feel that they had been held back either academically or socially. Through the course of working and playing together in the Music & Minds program, the participants began to form a cohesive group and, by the conclusion of the program, expressed joy in living together. Most (12) demonstrated a clear capacity to understand, befriend, to talk, and to listen. Some of the more verbal participants began to regularly interact, and exchanged promises to continue contact when the program concluded.

Interviews with parents and students indicated another social difficulty in building friendships with persons who don't have WS. This would appear to be in contrast with the hypersociability characteristic of WS persons. Most Music & Minds participants appeared to enjoy good relationships with staff and the staff reciprocated with care and attention. There were some awkward attempts to socialize with the general population of university students in the dining hall or around campus; however, some of the students from other programs were kind and polite, while others ignored and seemed uncomfortable with our participants possibly of their appearance or their extroverted personalities. Only 2 Music & Minds participants seemed completely unaware of any problem; others of the group were genuinely hurt and wondered aloud to our staff about why these college students did not befriend them.

Stressors/Anxiety. Another characteristic of the participants was anxiety and because anxiety was often an issue, students needed clear direction, scheduling, and routine to be prepared to learn. It was clear that many students were upset by unknowns, so Music & Minds participants were provided with daily morning newsletters containing overall schedules and events, as well as their individual schedules. To alleviate uncertainty, several staff members served as guides to show students to classrooms and assure students that they would not be late. In spite of the pre-planning, some students still had difficulty focusing on the subject at hand and frequently asked about what was happening next. For example, one young man was so anxious about the changes in weather, he inquired about the weather forecast for the week and then wore four different shirts on top of each other daily to address possible changing conditions. Staff sensitivity to clear, direct explanation (verbal and written) of schedule and expectations in class, with a minimum of unexpected changes, was a successful strategy for many participants.

Resistance to Change and Ability to Learn New Things. Many of our participants demonstrated resistance to change and to learning new concepts. They were often comfortable with what they already knew and what they could do and did not want to try new things or to do something in a different way. This attitude influenced perceptions of how they approached learning, as did existing routines. Routine was important to all participants, even if the routine was not especially conducive to improving a skill. The need for routine translated into daily living as well, as every participant demonstrated a desire for a clear pattern in daily schedules for meals, classes, free time, and group social activities. The daily printed program provided a scaffold for any adaptations or changes

within the program so that when a pattern was broken, participants had the opportunity to reassemble and begin to learn in a different way. Several participants had distinct patterns of doing a task and could not break their established routine. "I have always done it this way and I can't change." This rigidity of style also appeared in music instruction and may have interacted with individual perceptions of strengths and weaknesses. Several instructors commented on this tendency, and one raised interesting questions in his log: "Many showed some resistance to change, to new concepts. They are comfortable with what they know and don't want to try or risk new things. But, how and when did they learn what they do know? At some point it must have been new. Why were they open to it then and not open to new things now?" In another instructor log, a similar issue was raised about student learning: "It's especially hard to relearn what has been incorrectly learned previously. (Example—attempting to change a left-hand pattern, or encourage James to improvise)." A third instructor described the dilemma in a similar way: "difficult to break people out of their learned (habitual) pattern of doing things. How to get them off the beaten track?"

Our faculty questioned repeatedly, when and how new concepts could best be introduced. At some point content must have been new, and we found ourselves asking at what age and stage these participants had been open to learning new content. We also found that it was especially difficult for our participants to "relearn what had been incorrectly learned previously." For example, we had difficulty changing hand patterns in piano or encouraging some of our participants to improvise. We found it particularly difficult to break people from their habitual pattern of doing things, and wondered how to get them off the track they had taken. It must also be noted however, that when we could change a pattern, most of our participants liked the new skill or technique they had learned and exclaimed after a successful experience: I *like* doing that (to improvise). Teachers also reported positive experiences once students tried new ways of doing things. One teacher explained: "I am finding that this participant learns twice as fast and retains twice as much if I let him explore and use that as a springboard to jump into teaching."

Fear of failure, while legitimate to some extent because of prior failures, also had an impact on any tasks attempted. If participants believed they were poor at something, that perception was difficult to change. For example, Molly's previous music teachers, in their attempt to find alternative ways of teaching her to read and play, led her to think of "tricks" to learn music. She came to strongly believe she could never learn to read music and viewed this task as an opposing force against "what God gave her" as talent (why is reading/writing words "good" and reading/writing music "bad" . . . and how do I remain on the good side?).

Issues Faced When New Learning Occurred. In most cases, when new ideas (like lyrics) were introduced in the music, everything else became difficult and reverted to less accomplished levels. For example, when lyrics were added, previously accurate pitch, intonation, or phrasing often suffered. As our participants struggled with the new learning required of them, they lost ground with previously acquired skills. "We learned to experiment so when we tried a new song, we found that words in voice lessons are a problem that took everyone off course." "We learned to try different techniques such as:

talking about the story behind the music, and making different connections that seem to help students." In several of the areas our students encountered challenges that other learning disabled students often encounter, so we tried known strategies such as highlighting sections of print, and enlarging print on pages of lyrics.

Sensitivity to Sound. An issue that pervaded the entire week came from heightened sensitivity to sound (hyperacusis). As noted in the literature review, loud noises such as thunder cause distress in some persons with WS, and some are also extremely sensitive to broad-band sounds that are not loud, such as those made by motors. Researchers contend it is this hyperacusis that forms the basis of sensitivity to sound and percussive rhythms. Therefore the hyperacusis exists as both a weakness and a strength in this population. Amazingly, Music & Minds participants adapted well to the loud and consistent construction noises that bore through the wall of a building next door, but they did not fare as well in developing resistance to the sound of summer thunderstorms. The final dress rehearsal for the performance was almost cancelled due to distress caused by an approaching storm. Several students needed to be taken from the theater to a car waiting directly in front of the main entrance and even after the students returned safely to their dormitory, it was still necessary to provide comfort and companionship until the thunder had subsided.

Strategies for Learning

Setting a Tone for a Class or Lesson. The manner in which the class or lesson was started often set the tone for the entire period. Students were almost always difficult to focus at the beginning of a lesson; however, establishing routines proved to relax some of the transition tension. For example, the use of recorded music as a routine background sound when students entered the room was helpful in the Music & Fractions class. One student noted, "Some music makes people feel different without them even knowing?" We also found it difficult to keep students on-task, as they were easily distracted, especially when the task at hand was determined to be challenging. We found even our most advanced students could be distracted in the middle of a lesson. They might exclaim aloud: "Boy the keys are shiny today, boy the keys are loose today. Boy this reed is soft today. . . ." We found if we planned more activities to keep our participants on task, and varied the tasks, they did better.

Affective Issues in Learning. Addressing affective needs contributed to better opportunities to learn. Some of our participants needed constant reassurance to continue to attempt tasks—"I did a good job, right?" We observed the power of positive praise, particularly when it was sincere, and even more so when the praise was delivered with excitement or animation. Initially, most participants demonstrated fear and anxiety and worry about being asked to do complicated things, but were able to accomplish more when the tasks were broken down into repetition of simple tasks. Perhaps because of facing years of difficulties and failures in learning, our participants became quite taken by their success. For example, all students had parent and school reported poor skills in math, yet after several Music & Math classes, journal entries included: Tomorrow I would like to . . . "learn more about fractions." In music lessons, success was also a

powerful motivator, as one of the music professors explained about a participant who encountered success in a composition class: "This was Jack's first real success musically in this program. He left the lesson beaming. He was scatting up and down the hall and smiling and laughing, coming up with new lyrics."

Teachers noted an increased desire to learn in our participants. Student evening journal entries repeated the theme: "I'm proud to learn a lot here . . . ." For example, the journal prompt "Tomorrow I would like to . . ." was completed in a similar way by 3 students: "Do a lot," "Learn a lot," "Experience a lot."

Practice and Self-Regulation. Music instructors wrote that participants were not familiar with the concept of practice and may not have been introduced to the idea as a means of improving their performance. Several participants exhibited poor self-regulation skills in academic, social, and living skills. Two of participants appeared to be rather set in their ways and unwilling to do chores. They told us that they did not want to make their bed or pick up their clothes from the floor or go to class. A few of our participants appeared to be somewhat lonely, and seemed to spend a great deal of time on their own. Some reported spending most of their days alone at home watching television or listening to music, and because of this, we saw a range of emotions emerge in our fast-paced daily program, from engagement to pleasure to exhaustion. Due to this, perceptive teachers must understand the need to enable persons with WS to adjust to the situation and have the time needed to understand and react to the schedule. Again it was noted that teaching self-regulation strategies would also be helpful as several of our participants had difficulty finishing tasks, and others became frustrated when they could not do something the right way the first time.

Other Instructional Strategies That Worked. We found shorter lessons and/or paired lessons with two people working together was most successful. We also learned that repetition of content, using patterns, having structure and routine worked well. We used enlarged visual presentation, and tactile guidance to aid visual tracking. There was at least one aide in each student class of 10 participants and we often broke into subgroups within the class. Participants needed scaffolding to make useful connections of knowledge across all areas of learning. Instructors explicitly tried to connect what was being taught (a) to the real world (not abstract problems), (b) to other learning areas, and (3) to prior learning. In the Music's Fraction class, we introduced one major content area or "problem of the day" at beginning of each session, and then tried to solve the problem as a group at the end of class through reviewing the content. Class content (and the problem at hand) was deliberately connected to the music played.

Prior Information and Background

Several musicians who served as faculty had seen popular press pieces on the population of persons with WS and their musicality. At the conclusion of Music & Minds, they reported: "The information/reports [we] had read and received in preparation for this were tainted and misleading." They found that the musical talents of persons in our program had been reported to be much higher than truly exists. Because

of what had been read and watched on television specials or documentaries, instructional techniques were "hit or miss." Some of them worked very well and some of them "flopped." This is due, in all probability, to the variation within the population. One teacher eloquently summarized the reactions and the experiences of the teachers:

> Although they all have WS, every single student is actually completely different—in ability, interests, concentration skills, communication skills, learning preferences, etc. So, as a teacher, I need to use every possible trick to ensure that learning and fun are taking place. The challenge is exciting, the trial and error in teaching is frustrating. There doesn't seem to be a commonality in learning styles. Each of them is responsive to different things.

One of our music faculty members explained:

> Ultimately the best way to instruct them was to enhance their overall experience and encourage them to develop their interests in the fulfillment of life. We were not trying to turn our participants into musical prodigies but rather to give them new ways and skills to enjoy their inherent love for music (interest in and need for music).

While acknowledging the limitations, restrictions, and variability of ability in our group, we searched for answers about how instructors could best to help each participant. We sought to find specific ways to help enjoy, develop, and perfect musical abilities through an open give-and-take between student and teacher. Ultimately instructors noted their own personal learning had increased as a result. One staff member explained: "As a music teacher, sometimes we focus so much on teaching a concept, we forget to enjoy music for the sake of music. These people enjoy it for itself. I had forgotten how to do that!"

Several implications emerged in our experiences with Music & Minds. Our faculty and staff were all emotionally moved by interactions with this unique group of individuals. Several times during the program we laughed and cried with joy or sadness as we observed small victories and worried about the future of our participants. In both music and academics, issues shared between instructors and observed with our participants offered new avenues for discussion, as opportunities to build innovative instructional strategies based on learning rather than teaching became apparent.

Music

In music, we learned that it is possible to build opportunities for persons with WS to learn based on conceptualizations of human experience and direct musical experience. This approach married two very necessary components: learning and direct musical experience. Traditionally, we, as professionals, have been more concerned with the former while our students are especially drawn to the latter. Second, the questions of immediate concern are the same questions that one would ask in any music teaching/learning situation: (a) What are the most effective ways for teachers and

students to analyze the component parts of a complex behavior? (b) How does one focus the students development on the components? (c) What are the most efficient ways to help students master the parts within the context of the whole? Most of these questions are predicated on the notion that all human beings are essentially the same with the same neural system. The role of experience in shaping neural connections is acknowledged, but many of us still believe that we have identical capabilities and limitations overall. This is no less true of persons with WS. The specific musicality may vary in this group for a variety of reasons that are biological, experiential, psychological, or even cultural. How these persons make music, however, is the other part of an extremely dynamic process. If we start with that basis, we can build music instruction that is based on learning rather than teaching and include opportunities to learn that come from the needs and prior experiences of the learner.

This is quite different from a strictly behaviorist approach where objectives are written out and observations are made only of outward behavior to determine if an objective has been reached. For example, if we use the concept that "Music in the West usually moves at a steady pulse," then the structure of a lesson around creative movement may be guided by some direction and accompanied by music that exhibits characteristics of the concept. The inference might be drawn that students, by demonstrating through movement and music, now know and understand the concept. The experience is musical because it is total, however elementary it might be.

Abstractions and verbalizations, on the other hand, can and must occur after the direct musical experience, as needs and readiness dictate. This is a basic formula that can be as complex, musical, and creative as suits a student's level of proficiency and understanding. In short, the participants made important strides to achieving expressed goals when the learning experiences were geared to their needs. All of this suggests endless possibilities. Of course, this approach will require monitoring to assess the need for change, as well as documentation of the process for future use and direction. In this way, each participant will receive continual instruction generated by inside needs rather than an instruction and order imposed from the outside. This, in the view of several of our teachers, was the most successful way to keep the music teaching/learning situation fluid and creative rather than static and rule-bound (which may be the most visible criticism of much music instruction today).

Another area that warrants attention is evaluation. In this situation, the analogy of attending a concert or a play is a useful example. When attending a concert or play, each person begins to make judgments almost immediately. How do we get to these judgments about the quality of a performance? How do we decide if they are good or bad? How do we come to immediate decisions about the quality of the performers' efforts?; how can we be sure if the musical feelings being expressed are those intended by the composers? These questions are far more difficult to answer than what occurs in a traditional teaching situation. Typically, our evaluative efforts usually focus on determining the correctness of a response to measure success or failure. We certainly don't have objective tests to measure these things. But, we do have criteria that have accumulated over the years. We think of the learning process described earlier, for

example, as laying the foundation for and the building of criteria by which to make informed judgments. The trick, it seems, is to maintain broad parameters for judgment, and refuse to impose our own criteria (by giving answers instead of asking questions). If we can successfully offer persons with WS musical experiences that are broad and deep enough, we may be able to significantly increase the possibility that they will then be open to a wider variety of music. We may also enhance their understanding of what is taking place musically, and broaden the musical palettes that are available for their personal and profession use.

To some extent, this is not very far removed from the constructivist approach that claims that a priori knowledge precedes all reasoning. Our reality is constructed by the "knower," based upon mental activity and predicated upon thinking, grounded in the perception of physical and social experiences that contribute to mental models of comprehension. The experiences in the Music & Minds program was gratifying for participants and observers, but it must be recognized that a single 10-day cycle (the amount of time allocated to the program so far) could not generate maximum benefits.

As an example, we attempted to work through a series of activities centered around improvisation and composition. During the last 2 1/2 centuries, improvisation in music is still the best tool teachers have to train well-rounded musicians. It is also a natural way to link the formal training of a musician with the rest of their musical interests and experience. In addition in offers an opportunity for students to express musical individuality, that which tends to get filtered out of often all-too-strict musical instruction. Improvisation, composition, and performance are three very different tasks. During Music & Minds, we deliberately placed the three in a hierarchy, beginning with very structured improvisational activities or "experiences of spontaneity," then adding composition, and finally performance. The primary concern was first the person involved in the creative musical endeavor; then the process that individual needed to create music; and finally, the product that resulted from the creative efforts.

The use of improvisation as an instructional tool can be quite effective, but it also comes with problems and many different decision points. Working with persons with WS adds another instructional layer. It matters whether improvisation is approached from the point of structure and individuality of various improvisational types; or by ascertaining norms and boundaries, or it is approached through analyzing individual performer techniques or performances. Each of these cases requires different strategies and approaches. There is also the difficulty of trying to identify and discover processes of musical creativity and the question of intention. Taken together, the complexity may explain why there is a dearth of research on this subject in the "normal" population, let alone in a group of persons with Williams. In considering what is valued in making music, it is clear that precision and predictability are placed very high. Thus, we place great emphasis on honing skills that allow us to create music that is disciplined and predictable. These values, however, do not always take into account the types or range of abilities associated with special populations like WS.

The absence of a systematic strategic approach to the continued development of abilities in persons with WS, along with an absence of an awareness and acknowledgement of their unique strengths and limitations, has placed an entire group of exceptional people at an educational and occupational disadvantage. The focus of music teaching in schools, especially for special populations, is often guided by traditional, established rules and restrictions. More often than not, these lessons exclude the needs of people with WS partly because of scheduling, with the bulk of instructional time used to remediate deficit areas. Another issue is that functions of music (lessons, performances, etc.) are socially embedded and tend to be quite closed. They are dominated by societal and peer group expectations that typically exclude those who are different. This project focused on activities with the potential to keep musical options open for the participants, as well as encourage musical opportunities (in which these participants are in large part successful), from the background to the foreground of their lives.

A future model music and educational program for persons with WS should radically rethink how time and resources are used with those persons who are either musically talented or musically inclined. The musical pathways of each participant are many and varied. We must recognize this diversity, and plan programs that respect this individuality. Curriculum, therefore, would not be written in advance as formulaic. Rather, it should be broadly defined and then modified as required by class participants, based on their individual learning profiles, including interests and abilities.

Summary

All participants displayed what may be described as a romance with music and rhythm. The absence of music in their school experiences and sometimes in their home life resulted in the loss of opportunities to find and develop their potential talent areas, and also add joy in their lives. Music could become a powerful teaching tool throughout school years to help develop skills in deficit areas. Parents were generally realistic about the academic strengths and weaknesses of their children and were able to provide specific information about their abilities in content areas such as reading and math. Parental involvement played a key role in the development of musical talent. All participants displaying the highest levels of musical ability had received extensive home encouragement and were provided with lessons and instruments. Surveys focusing on learning styles, interests, and product style preferences, developed for general populations, were adapted and helpful in identifying the interests, learning styles, and product preferences for individuals with WS. Some deficits can be addressed and overcome through the use of strengths and interests. By engaging the love and appreciation for music in persons with WS, confidence levels increased along with their performance in math as well as music. Curriculum and learning experiences should not be rigidly planned in advance for this special population. While major themes need to be identified, a goal of educators working with this population would be to develop curriculum around the interests, learning preferences, and potential of each student.

Music & Minds was successful for both participants and faculty, but such experiences should extend beyond a 10-day summer program. The purposeful

development of musical skills and enhancement of musical interests and abilities was found to extend the talent potential and help enrich the lives of these exceptional persons. While some may believe that the use of this approach is only possible in a short summer program, the work described in this study continues, as the experiences of the participants in this study contributed to the creation of a full-time postsecondary school for persons with disabilities who also have musical talents and interests. The Berkshire Hills Music Academy uses the philosophy of Music & Minds, and provides talent development experiences based on the preferences, interests and styles of their residents. A faculty member from Music & Minds became the first Dean of Studies at the school.

Discussion and Implications

It seems clear that to develop programs with appropriate curriculum and instruction for individuals in this population, attention must be given to individual profiles. Having demonstrated that the love and affinity for music in this population can be used to help address other deficit areas, additional information about how music can be used to teach academic areas is crucial. By offering persons with WS a broad selection of music and enrichment experiences in a talent development model, educators may be able to increase the possibility that these individuals will engage in a wider variety of learning experiences. Teachers may enhance understanding of academic areas, even areas of deficit such as mathematics by using music as an entry point. While the results of this study cannot be generalized to others with WS or other special students, the implications can provide additional information for those who live and work with these students. In particular, six findings from Music & Minds program stand out.

1. The first was that the talent development approach based on the SEM proved to be successful; participants gained skills both in music and in math (an area of academic deficit), along with gains in social skills, and increased self-efficacy in dealing with novel experiences. The individual within-syndrome variability in the group of participants was large, and group-described traits provided in previous research (Dilts et al., 1990; MacDonald & Roy, 1988) were deceptive. Therefore, individual assessments of each student with WS proved important. Such descriptions would require periodic review by educators and parents to note changes and progress.

2. The second finding highlighted the unexpected progress can be made when the usual focus on pathology, disturbances, or negative symptoms in this population is avoided. While school psychologists and special education teachers must fully delineate deficits because of the Individual Education Plan (IEP) process, positive characteristics can and should be used to construct educational plans that include enrichment and talent development opportunities based on talents, strengths and interests, while also acknowledging deficits. For example, music enhanced mathematical learning helped reduce math deficits in these participants. Since teachers who interact with WS children daily are usually well aware of

deficiencies, they would also profit from knowledge of these students' strengths, preferences, and interests. Surveys focusing on learning styles, interests, and product style preferences, which had been developed for gifted and general populations, were easily adapted to help to identify and provide group profiles and individual insights about the WS participants. These instruments may prove useful with other students with disabilities.

3. The third finding of this study was that Music & Minds participants were sensitive to the perceptions of prior teachers, which often resulted in limiting and sometimes inaccurate beliefs about their potential to learn certain skills. Participants consistently told us what they could not do. Two thirds of our participants demonstrated difficulty when they tried to alter or break their prior patterns of working. "I have always done it this way and I can't change." This rigidity of style also appeared within music instruction in the first days of teaching, but positive changes did occur during the course of the enrichment program, perhaps because of the specific teaching strategies employed in instructors' efforts to better serve this unique population. In addition, while parents had a realistic view of academic strengths and deficits, the participants themselves had become so focused on their deficit areas, they were reluctant to both try to improve in these areas, as well as focus on their strengths. However, when academic learning was incorporated into an enriched strength-based talent development approach to teaching, achievement increased and enthusiasm for learning was enhanced.

4. Parental involvement played a key role in the development of music ability for the 5 participants in this study who had higher levels of demonstrated music skills.

5. There was a broad range of living skills among participants in this group, as some were already extremely capable and independent. Others required much more support and help but, when encouraged, began to extend their experience. Therefore, prior limiting expectations should be avoided in this area.

6. Last, and perhaps most important, was the joy the participants experienced when immersed in an environment based on a talent development philosophy. This joy may have a contributing factor to improvement in math, and musical skills, along with a demonstrated willingness to investigate new areas and ways of learning. In other words, when students enjoyed their academic and arts experiences, they developed talents and increased their skills.

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Appendix A

Music and Minds Application

Music & Mind Application

Name _____ (nickname)_____

Address _____

City/State_____ Zip _____ Phone _____

Date of Birth _____

Name of parents(s) _____

Address _____

City/State_____ Zip _____ Phone _____

Describe the applicant's previous music/arts lessons or classes, if any. Where? How long? (begin with most current):

_____

_____

_____

_____

_____

Describe general musical abilities (i.e., perfect pitch, rhythmic sense, musical memory, dance):

_____

_____

_____

_____

_____

What does the applicant hope to achieve in music?_____

_____

Will applicant bring an instrument? _____ What type? _____

Tell us about the applicant's prior camp or extra-curricular experiences away from home. When, where, for how long?

_____

_____

_____

_____

Describe the applicant's math skills: _____

_____

_____

Describe the applicant's reading skills: _____

_____

_____

Describe secondary and postsecondary educational experiences: _____

_____

_____

_____

_____

_____

On a separate sheet, please give us a brief description of applicant's self-care skills, personality traits, habits, interests, and any other information that you think is important for us to know._____

Comments and/or questions? _____

_____

_____

We believe the applicant is behaviorally ready to participate in a supervised university learning experience.*

_____

Signature of applicant Date

_____

Signature of parent (if applicant is under 21) Date

**Note: The University reserves the right to ask any individual to withdraw who does not meet this description.*

DEADLINE: Application and deposit must be received by May 1, 1998
Enclose a check for $100.00 made payable to:
UNIVERSITY OF CONNECTICUT

Please note that parents and/or guardians will receive a number of questionnaires to complete about the applicant prior to their arrival. This is a research-based program which will involve the collection of information such as previous assessments of ability & achievement, and other information about interest, learning styles, abilities, and special talents. Members of the research group at the University of Connecticut will be contacting you and conducting brief interviews over the phone to ensure that instruction can be delivered in an appropriate, useful, and exciting manner.

MAIL TO: ***Music & Minds***
University of Connecticut
The National Research Center on the Gifted and Talented
Neag Center for Gifted Education & Talent Development
362 Fairfield Road, U-7
Storrs, Connecticut 06269-2007

THANK YOU FOR YOUR APPLICATION!

University of Connecticut
The National Research Center on the Gifted and Talented
Neag Center for Gifted Education and Talent Development
362 Fairfield Road, U-7
Storrs, Connecticut 06269-2007
(860) 486-4826 or email rms97001@uconnvm.uconn.edu

Appendix B

Music and Minds... A Talent Development Program (Williams Syndrome Research Study) Parent Telephone Interview Protocol, Parent Telephone Questionnaire (Reis et al., 1998a) (PTIP)

Music and Minds... A Talent Development Program (Williams Syndrome Research Study) Parent Telephone Interview Protocol, Parent Telephone Questionnaire (Reis et al., 1998a) (PTIP)

Music and Minds... A Talent Development Program
(Williams Syndrome Research Study)

Parent Telephone Interview Protocol

S. M. Reis, H. J. Milne, R. Schader, and L. Shute

Name: _____ Date: _____

Participant's Name: _____ Data Code Number: _____

Telephone Number: _____

Interviewer: _____ Start Time: _____ Finish: _____

Follow up interview required? _____ Date: _____ Time: _____

Completed by: _____ Date: _____

Comments:
_____

Demographics

Name in full

Date of birth

Place of birth

Number of siblings and ages s1 ___ s2 ___ s3 ___ s4 ___ s5 ___ s6 ___ s7 ___

place in siblings (Circle) s1 s2 s3 s4 s5 s6 s7

Marital status of parents

Parent's educational level

mother

father

Current occupation of parents

mother

father

Address

Telephone number

e-mail address

Developmental history

Gestation and birth history

problems in pregnancy

Childhood development history

how did you begin to know your child was different/special?

when first identified as having Williams syndrome

why referred treatment(s)

medical history of participant

hospitalization(s) reason(s) duration(s) treatment(s)

accidents

frequency

nature

treatment(s)

after effects

(on medical form) medications: for:

QUESTIONS

A. Educational program

1. Type/nature of program (self-contained, etc.)
    a. parents' evaluation of program
    b. student's attitude toward learning
2. Location (home, center, school, etc.)
3. Number of years in program
4. Academic skills - Math
    a. Current level of math functioning/knowledge
    b. Highest level of math achieved (overall, general)
    c. Practical math functioning
        (1) can count to 10 with understanding
        (2) can count to 100 with understanding
        (3) can count to 1,000 with understanding
        (4) can sort objects
            by color
            by shape
            by function (tacks vs. safety pins)
            into groups of 10
                12
                24
                30
                100

(5) can add numbers on paper with understanding

single digit (3+4)

double digit (12+14)

series (2+4+3)

(6) can do similar subtractions

single digit (4-3)

double digit (17-14)

series (15-4-3)

(7) can multiply

single digit (6x3)

with double digit (12x4)

double digit (12x11)

(8) can do similar division

single digit (6÷3)

with double digit (12÷4)

(9) has knowledge of fractions

can explain and demonstrate 1/8, 1/4, 1/2

can add and subtract fractions

(10) can tell time

using single clock face format

using a range of clock faces

(11) can measure solids (such as a cup of oatmeal)

(12) can measure liquids (such as a cup of milk)

confidence in math functioning

parents' perception of participants attitude toward math

f. Memory of past math skills

g. Transfer of math skills to real world situations

h. Types of math programs used in school & tutoring

(1) teachers

(a) favorite

(b) why

i. Home support of math skills

(1) homework help

(2) mentorship

(3) encouragement

(4) games

5. Academic skills - Reading

a. General reading level

(1) can read newspapers

(2) can read road signs

(3) can read comics

(4) can read books (type & complexity)

chooses to read

reads for enjoyment

(5) can read and interpret graphics (symbols, etc.)

6. Talent development - Music

a. History

(1) talent first identified by

who?

how noticed?

when?

circumstances (how manifest)

(2) what was done

by whom?

role of mother
father
siblings
relatives (specify)

(3) other musically talented family members

immediate family

relatives

neighbors

(4) special experiences provided

home environment

-has piano, instruments

-play records, tapes, etc.

at school

-by whom?

-what?

-where?

-how?

with relatives, neighbors

-by whom?

-what?

-where?

-how?

in the community

-by whom?

-what?

-where?

-how?

b. Instruction

(1) which instruments

-level of performance (repertoire, etc.)

-age began

-how many years studied

(2) can read music notation

(3) has musical memory

(4) has perfect pitch

(5) can beat rhythm with hand or foot

-has rhythmic memory

(6) types of teachers

-most successful teacher

why?

-favorite teacher

why?

(7) how much music played per day on average?

c. Music/math relationship

(1) has connection been established

-notation

counting in measures/beats

d. Music technology

(1) has computer skills

-level of proficiency?

-which programs?

B. Enrichment Opportunities

1. (Type I) Exploring experiences (concerts, trips, videos, visitors, etc.)

a. what?

b. when?

c. where?

d. how long?

e. how often?

f. with whom/what?

g. organized by?

h. outcomes?

2. (Type II) Methodologies/learning how-to's (summer camps, auxiliary courses, lessons, training experiences, etc.)

    a. what?

    b. when?

    c. where?

    d. how long?

    e. how often?

    f. with whom/what?

    g. organized by?

    h. outcomes?

3. (Type III) Created/produced performances (concerts, tapes, performances, songs, literature, etc.)

    a. what?

    b. when?

    c. where?

    d. how long?

    e. how often?

    f. with whom/what?

    g. organized by?

    h. outcomes?

C. Social Skills

1. can get along well with other people

    a. is sought out by other people

    b. can greet a person appropriately

c. can maintain appropriate eye contact

d. can start and carry on a conversation

e. can maintain topic of conversation

f. can respond appropriately to questions

g. has friends

(1) receives phone calls

(2) initiates phone calls

2. Is friendly, cheerful

a. controls negative behavior

3. Finds things to do on own

a. entertains self on own

4. Has appropriate public behavior

5. Displays appropriate sense of humor for situation

D. Self-organizational skills

1. Can manage own time

a. can wake up to an alarm

b. gets self to meals on time

c, can organize day

2. Has adult level care skills

a. assists with meal preparation

can cook own meals

clears up and washes dishes

b. manages own possessions appropriately

cleans and organizes own room

washes own clothes

c. can get self to shopping center, work place, entertainment center once they have been shown how to get there

uses public transportation

E. Hobbies/Recreational Interests

1. Is curious about things, events

a. likes to do things, is active

b. like to collect, sort, organize, store things

c. likes to be actively involved with others

2. Clubs, lessons, activities

a. Home based

(1) what?

(2) at what age?

(3) how long?

b. School based

(1) what?

(2) at what age?

(3) how long?

c. Community based

(1) what?

(2) at what age?

(3) how long?

F. Employment Skills

1. Work experience history
    a. As a volunteer
        (1) what?
        (2) at what age?
        (3) how long?
    b. As paid employee
        (1) what?
        (2) at what age?
        (3) how long?
2. Work aspirations
    a. Believes could get and hold paid employment
    b. Sorts of jobs desired
    c. Ambitions to gain qualifications
    d. Concerns for the future
3. Additional employment questions, if appropriate

G. Documentation

1. Types of aptitude tests administered
    a. Results (photocopies available?)
        (1) most recent (including overall, performance, verbal, etc.)
        (2) five years ago
2. Types of achievement tests administered
    a. Results for math and reading (photocopies available?)

(1) most recent (overall, performance, verbal, etc.)

(2) five years ago

3. Any nonverbal instruments administered

a. motor skills, hand-eye coordination

b. vocational aptitude

H. Is there anything else you would like to discuss which we have not mentioned?

Appendix C

Music and Minds... A Talent Development Program and Williams Syndrome Study Participant Interview Protocol (Reis et al., 1998b) (PIP)

Music and Minds... A Talent Development Program and Williams Syndrome Study Participant Interview Protocol (Reis et al. 1998b) (PIP)

Music and Minds… A Talent Development Program

and Williams Syndrome Research Study

Participant Interview Protocol
(c) June 1998

Reis, S. M., Milne, H. J., Schader, R., and Shute, L.

Participant's Name: _____ Date: _____

Telephone Number: _____ Data Code Number: _____

e-mail Address: _____ Fax Number: _____

Interviewer: _____ Start Time: _____ Finish: _____

Follow up interview required?: _____ Date: _____ Time: _____

Completed by: _____ Date: _____

Comments: _____

Introduction

1. Tell me about the kind of person you are.

2. What is best about being you?

A. Experiences of being different, and the same:

1. What makes you different/special?

2. What is different about having WS?

3. How did you feel about having WS?

4. Did people treat you as if you were special when you were young (because of WS)?

5. Do people treat you as if you were different because of WS?

6. In what ways are you the same of different to other people your age?

B. Medical and health:

1. Have you ever been to hospital?

hospitalization(s) reason(s) duration(s) treatment(s)

2. Have you had any accidents?

i. accidents

ii. frequency

iii. nature

iv. treatment(s)

v. after effects

3. Do you take medications?

medications: for: when:

4. Are you allergic to anything?

5. Do you have to take special care, or avoid any foods or activities…? Why?

C. Education history

1. What do you remember about how you learned before you went to school?

2. When did you learn to Read? How? What did you like reading?

3. Did you go to special schools all the time you were at school?

i. IF NO, OR WITH SPECIAL CLASSES FOR PART OF THE TIME - **go to question 4**.

ii. IF YES - what do you remember about the:

---

a. Special Preschool(s) you attended?

---

0 to 2 years	3 to 4 years	5 to 6 years

---

0 to 2 years	3 to 4 years	5 to 6 years

---

1. favorite teacher(s)

2. favorite activity(s)?

3. least favorite teacher(s)?

4. least favorite activity(s)?

---

b. special School(s) you attended?

---

7 to 9 years	10 to 12 years	13 to final years

---

1. favorite teacher(s)

2. favorite activity(s)?

3. least favorite teacher(s)?

4. least favorite activity(s)?

---

4. What do you remember about elementary school?

a. special times?

b. favorite subject areas?

c. favorite teachers? Why?

d. special education classes?

5. What do you remember about the middle school(s) you attended?

a. special times?

b. favorite subject areas?

c. favorite teachers? Why?

d. special education classes?

6. What do you remember about the high schools you attended?

a. special times?

b. favorite subject areas?

c. favorite teachers? Why?

d. special education classes?

7. What schools or classes have you been involved with since high school?

i. courses attempted

ii. courses completed and grades

iii. training for what?

iv. involvement in extra-curricular activities

v. what are your career plans?

D. Talent development history

1. When did you first realize you liked music/singing, and music making?

2. What sorts of musicals activities did you do?

3. What lessons have been taken?

4. What musical instruments have you played?

5. What singing skills do you have?

6. Who has helped you develop these skills?

7. What musical instruments do you still play?

8. What musical instruments would you like to play?

9. What singing skills would you like to develop?

10. What dance and drama skills do you have?

11. What dance and drama skills would you like to develop?

12. What other skills would you like to develop while you are here?

13. What musical skills do members of your family, your relations, and people who are your family's friends have?

14. What musical instruments do you have at home?

15. What special musical experiences do you remember? (Type I enrichment activities, i.e., concerts, organized visits, visitors, …)?

16. What special training program and experiences do you remember? (Type II training activities/programs (summer camps, evening/weekend training, college courses, community courses, …))?

17. What have you created in music, song, drama, dance, and other things (etc.) that you remember? (Type III enrichment experience?)

E. What are your hobbies and recreational interests?

1. home based

2. school board

3. community based

4. What are you curious about?

5. What do you collect?

6. How do you organize and score your collections?

7. Do you like to be actively involved with others, who? Doing what?

F. Academic achievement

1. What do you like or dislike about reading?

2. What kinds of books do you like to read?

fiction novels
non-fiction - true stuff
newspapers
road signs
comics
books (type and complexity)
music
graphic (e.g., cartoons;
"women," "men's" outside bathrooms, …)
other?

3. What do you like or dislike about math?
    - counting
    - beat a rhythm with hand or foot
    - relate math to music
    - sort by color
        - shape
        - function
        - into groups (10, 12, 24, …)
    - addition
    - subtraction
    - multiplication
    - fractions
    - time
    - money
    - measure weights
    - liquids

G. Social skills

1. How do you get along with other people?

2. Do you enjoy talking with other people? Do you run out of things to say?

3. What are your favorite topics?

4. Do you like to start a conversation with other people? Why?

5. What do you usually do when you get angry, or someone annoys you?

6. What do you do when you have spare time?

7. Tell me about your friend (try to elicit whether they have friends)?

8. Are people always fair and kind when you go out to shows, shopping, or other activities with them?

H. Organizational skills

i. wake up to an alarm?
ii. take care of yourself outside of home?
iii. cook and prepare meals for yourself?
vi. clear up and wash dishes after meals?
v. do your laundry?
vi. keep your room and stuff tidy?
vii. get to places on time?
viii. travel by plane, bus, train?
ix. organize what you will be doing each day?
x. go to a shopping center and buy stuff?
xi. take stuff with you without losing it?

I. Employment skills

1. What volunteer work have you done? How did you like it?

2. Have you ever been paid for work? How did you like it?

3. What do you think about working?

4. What work skills do you have?
   musical/singing entertainer
   kitchen hand
   storeperson
   can use a telephone
   can use a computer
   can use the Internet
   can use e-mail
   can do other clerical tasks?
   e.g., collect mail
   post mail
   other?

Appendix D

Sample Page: Learning Styles Inventory (Renzulli, Smith, & Rizza, 1997) (LSI)

Learning Styles Inventory

by Joseph S. Renzulli
Linda H. Smith
Mary G. Rizza

Name: _____ Date: _____

Teacher: _____ Grade: _____

Directions: Read each sentence and decide if it describes an activity that you would like to do in school. For each sentence circle the number that goes with how well you like or dislike each activity. Remember this is not about what you get to do in school, but what you would like to do. Be sure to mark an answer for each of the sentences.

		Really Like	Like	Not Sure	Dislike	Really Dislike
1.	Going to the library with a committee to look up information.	4	3	2	1	0
2.	Studying on your own to learn new information.					
3.	Having the teacher ask the class questions on work that was assigned to be studied.	4	3	2	1	0
4.	Having a class discussion on a topic suggested by the teacher.					
5.	Having other students who are experts on a topic present their ideas to the class.	4	3	2	1	0
6.	Working on assignments where the questions are arranged in an order that helps you get them right.					
7.	Being a member of a panel that is discussing current events.	4	3	2	1	0
8.	Having a friend help you learn material you are finding difficult to understand.					
9.	Playing a board game that helps you practice one of your school subjects.	4	3	2	1	0
10.	Working with other students on a project with little help from the teacher.					
11.	Planning a project you will work on by yourself.	4	3	2	1	0
12.	Giving answers out loud to questions asked by the teacher.					
13.	Hearing the ideas of other students during a class discussion of some topic.	4	3	2	1	0
14.	Hearing the teacher explain new information.					
15.	Answering questions in writing on material that you have just read.	4	3	2	1	0
16.	Learning about an event such as the signing of the Declaration of Independence by acting it out in class.					

Appendix E

Sample Pages: Secondary Interest-A-Lyzer (Hébert, Sorenson, & Renzulli, 1997) (Modified) (SIAL-M)

Secondary Interest-A-Lyzer

Thomas P. Hébert
The University of Alabama

Michele F. Sorensen
Farmington, Connecticut Public Schools

Joseph S. Renzulli
The University of Connecticut

This is an informal interest inventory which will serve as a foundation for developing your specific areas of interest throughout the school year. The information you provide is completely confidential. As a result of this survey, we hope to provide you with meaningful educational experiences that will further develop your interests, nurture your talents, and challenge your learning potential.

Read each question carefully and provide us with as much detailed information as possible so we may obtain a clear understanding of your interests.

Name _____

Grade _____ **Date** _____

School _____

1

You are fed up with the course offerings at your high school. Your principal has asked you to design the perfect course for people with your same interests. What would the course be called? What would be taught?

2

Rather than provide money for a class trip, the board of education has decided to give money to each individual student for a trip of his or her choice! Where would you go? List three (3) places you would visit and explain what you would do while visiting there. Why?

3

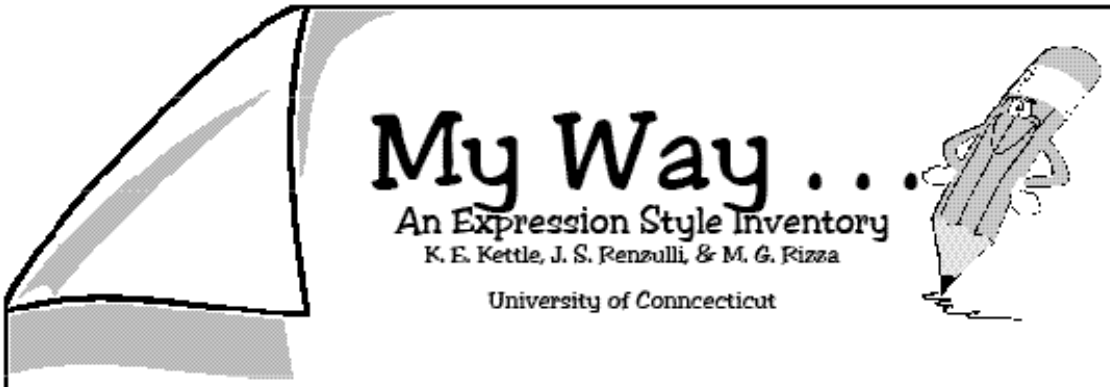
You have written your first book which you are ready to submit for publication. What is the title? What is the book about?

4

You have been asked to plan a concert for your high school. You have an unlimited budget! List three (3) choices of musical performances that you would schedule for that evening's program.

Appendix F

Sample Page: My Way... An Expression Style Inventory (Kettle, Renzulli, & Rizza, 1998) (MYESI)



My Way . . .

An Expression Style Inventory

K. E. Kettle, J. S. Renzulli, & M. G. Rizza

University of Conncecticut

Products provide students and professionals with a way to express what they have learned to an audience. This survey will help determine the kinds of products YOU are interested in creating.

My Name is: _____

Instructions:

Read each statement and circle the number that shows to what extent YOU are interested in creating that type of product. (Do not worry if you are unsure of how to make the product.)

		Not At All Interested	Of Little Interest	Moderately Interested	Interested	Very Interested
	Example: writing song lyrics	1	2	3	(4)	5
1.	writing stories	1	2	3	4	5
2.	discussing what I have learned	1	2	3	4	5
3.	painting a picture	1	2	3	4	5
4.	designing a computer software project	1	2	3	4	5
5.	filming & editing a video	1	2	3	4	5
6.	creating a company	1	2	3	4	5

Appendix G

Daily Journal Reflection

University of Connecticut

Music & Minds

Daily Journal Reflection

Student _____ Date: _____

1. Today I was trying to…

2. I was surprised to learn…

3. How I am feeling about what I am doing is …

4. The part of today I liked best was…

5. The part of today I liked least was…

6. Tomorrow I would like to…

University of Connecticut

Music & Minds

Daily Journal Reflection

Student _____ Date _____

1. Today I was trying to...
   Learn Fraction
2. I was surprised to learn...
   that fractions are good to learn
3. How I am feeling about what I am doing is...
   very exciting
4. The part of today I liked best was...
   My Breakfast
5. The part of today I liked least was...
   the weather
6. Tomorrow I would like to...
   Learn more in classes.

Research Monograph

The National Research Center on the Gifted and Talented
University of Connecticut
2131 Hillside Road Unit 3007
Storrs, CT 06269-3007
www.gifted.uconn.edu

Also of Interest

State Policies Regarding Education of the Gifted as Reflected in Legislation and Regulation
A. Harry Passow and Rose A. Rudnitski

Residential Schools of Mathematics and Science for Academically Talented Youth: An Analysis of Admission Programs
Fathi A. Jarwan and John F. Feldhusen

The Status of Programs for High Ability Students
Jeanne H. Purcell

Recognizing Talent: Cross-Case Study of Two High Potential Students With Cerebral Palsy
Colleen Willard-Holt

The Prism Metaphor: A New Paradigm for Reversing Underachievement
Susan M. Baum, Joseph S. Renzulli, and Thomas P. Hébert

Attention Deficit Disorders and Gifted Students: What Do We Really Know?
Felice Kaufmann, M. Layne Kalbfleisch, and F. Xavier Castellanos

Gifted African American Male College Students: A Phenomenological Study
Fred A. Bonner, II

Also of interest from the

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The Effects of Grouping and Curricular Practices on Intermediate Students' Math Achievement
Carol L. Tieso

Developing the Talents and Abilities of Linguistically Gifted Bilingual Students: Guidelines for Developing Curriculum at the High School Level
Claudia Angelelli, Kerry Enright, and Guadalupe Valdés

Development of Differentiated Performance Assessment Tasks for Middle School Classrooms
Tonya R. Moon, Carolyn M. Callahan, Catherine M. Brighton, and Carol A. Tomlinson

Society's Role in Educating Gifted Students: The Role of Public Policy
James J. Gallagher

Middle School Classrooms: Teachers' Reported Practices and Student Perceptions
Tonya R. Moon, Carolyn M. Callahan, Carol A. Tomlinson, and Erin M. Miller

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Nancy M. Robinson

Giftedness and High School Dropouts: Personal, Family, and School Related Factors
Joseph S. Renzulli and Sunghee Park

Assessing Creativity: A Guide for Educators
Donald J. Treffinger, Grover C. Young, Edwin C. Selby, and Cindy Shepardson

Implementing a Professional Development Model Using Gifted Education Strategies With All Students
E. Jean Gubbins, Karen L. Westberg, Sally M. Reis, Susan T. Dinnocenti, Carol L. Tieso, Lisa M. Muller, Sunghee Park, Linda J. Emerick, Lori R. Maxfield, and Deborah E. Burns

NRC G/T

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