THE UNIVERSITY OF MANITOBA

THE RELATIONSHIP BETWEEN THE COMPUTER MUSIC COMPOSITION STAGES OF ELEMENTARY SCHOOL CHILDREN AND THEIR AGE, GENDER, MUSIC APTITUDE, SCHOOL MUSIC ACHIEVEMENT AND PRIVATE MUSIC LESSONS

by

ANNE L. GUDMUNDSON

A Thesis

Submitted to the Faculty of Graduate Studies

In Partial fulfillment of the Requirements for the Degree

of Master of Education

DEPARTMENT OF CURRICULUM: HUMANITIES AND SOCIAL SCIENCES

FACULTY OF EDUCATION

WINNIPEG, MANITOBA

OCTOBER 1986

ISBN 0-315-37255-9

THE RELATIONSHIP BETWEEN THE COMPUTER MUSIC COMPOSITION STAGES OF ELEMENTARY SCHOOL CHILDREN AND THEIR AGE, GENDER, MUSIC APTITUDE, SCHOOL MUSIC ACHIEVEMENT AND PRIVATE MUSIC LESSONS

BY

ANNE L. GUDMUNDSON

A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF EDUCATION

ABSTRACT

The purpose of this correlational study was to describe the developmental differences in the computer music compositions of elementary school children in Grades 1 to 5, and to investigate the relationships between computer music composition stages and age, gender, music aptitude, school music achievement, and private music lessons.

To achieve this purpose, an instrument was designed for the analysis of computer music compositions collected from 195 subjects (99 males and 96 females) attending Grades 1 to 5 in three suburban public schools. These compositions were categorized into one of three developmental stages of formal structure: (1) Sound Scribblings, (2) Patterned Fragments, and (3) Structured Composition. After this descriptive analysis phase, composition stages were then correlated with subjects' ages, gender, music aptitude test scores as measured by Gordon's "Primary Measures of Music Audiation", school music class achievement levels as assigned by their music teachers, and the presence or absence of private music lessons. Pearson product-moment correlations were calculated to determine the strength and direction of these relationships.

On the basis of the findings and the limitations imposed by the study, results indicated that:

1. Computer music compositions of elementary school children can be characterized according to developmental stages of formal structure.
2. There is a significant correlation between computer music composition stage and age, gender, tonal aptitude, a composite aptitude measure, school music achievement and private music lessons.
3. There is no significant correlation between computer music composition stage and rhythmic aptitude.

Conclusions made from these results were that, when given an opportunity to compose original music with the assistance of the Songwriter computer music composition program, female children ages 10 to 12 who have higher tonal aptitudes, who are regarded as higher achievers in public school music classes and who have had private music lessons, are more likely to create a higher-order Stage Three music composition than other children in elementary school, Grades 1 to 5.

Implications for education are that investigations into young children's creative music compositions can yield important information. The computer is a useful tool for illuminating children's musical understanding. As early music instruction is vital to the development of children's musicality, the application of computers in the music classroom needs further testing, and the involvement of children in creative music-making needs to be promoted.

ACKNOWLEDGEMENTS

I have learned an important lesson from the experience of producing a thesis - it is not a solo performance. Many players have contributed to this symphony of ideas and scores of paper.

Principal players include Professors Colin Walley, Larry Patterson and Denis Hlynka, and Instructor Owen Clark. Without my Thesis Committee, this could have been an unfinished symphony. Guidance, creative suggestions and sustaining encouragement from Colin and the others ensured a quality experience and a completed assignment for this graduate student. How fortunate I've been!

Research was possible with the co-operation and support of the Fort Garry and St. James-Assiniboia school divisions. My work with elementary teachers and students in their schools was a delight. Such enthusiasm for computer music-making! In addition, staff from the Fort Garry Instructional Media Centre and in particular the Coordinator of Computer Education, John Berestiansky, are to be recognized for providing technical assistance and expert advice upon every request.

Time went by quickly and generally comfortably due to the personal contributions of my husband Brian and my two sons, Aric and Kyle. Their loving support in and out of the household lifted my spirits and enabled me to devote full energy to my academic endeavors.

Thank you to all. I am grateful. Take a bow!

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

Introduction and Rationale

Greater attention is being given to the musical development of young children. A recent summary of research on musical learning in children ages 0 to 8 years found that the percentage of studies devoted to early childhood music, using the research modes of observation, testing and intervention, increased during the decade from 1971 to 1981 (Simons, 1984). The areas of music learning investigated within these three categories included performance, cognition and affection.

The purpose of this correlational study is to contribute further to our understanding of the musical development of young children through the description and analysis of their computer-assisted creative music compositions. Interest in the spontaneous music-making of children has been sparse in the history of music research. Formal observations of the emergent musicality in children began in the Pillsbury Foundation School in the 1930's under the direction of Pond (1980, 1981). He observed that children's musical creativity originated from a compulsion for being music-makers and inventors of sound shapes. Pond found that children had an inherent enjoyment in creating linear movement and sound patterns

with a variety of simple percussion, wind and string instruments. The frustrations he experienced in his research related to his inability to record the spontaneous melodic and rhythmic inventions of his young students due to the lack of audio- or videotape equipment at the time.

References to research of a similar nature are not cited again until the 1970's. Studies by Prevel (1973), Davidson (1979) and Flohr (1984) explored improvisational vocal and instrumental music-making in young children. The task of recording and analyzing spontaneous musical creations remained a frustration for these researchers, a fact which might help explain the limited number of investigations in this area. Recording techniques were confined to immediate notation or delayed transcription by hand. The relatively specific denotation of traditional notes complicated this process, as tonal and rhythmic sounds produced by children are more irregular and varied than staff notation allows. As well, observable behaviours confounded the collection of music compositions. The recent application of computer technology to the field of music education in the 1980's, offers new opportunities for research into the creative musical development of young children.

Statement of Significance

Concern over the assessment and description of the musical potential and abilities of children arises over and over again in the literature. Gordon (1981) has summarized the history of the nature/nurture debate among music psychologists and educators from the 1920's to the present, emphasizing the limitations inherent in the measurement of musical aptitude and achievement. There seems to be a lingering question of just what exactly was being measured by tests developed by such notables as Carl Seashore, Herbert Wing and others. The concern did not address itself to the integrity or expertise of those involved in the research and implementation of such tools, but rather in the interpretation of results. The question of what further understanding of children's musicality had been gained through testing procedures - a measure of their innate musical talents, or their acquired knowledge and skills - remained unanswered.

This concern can be taken one step further. In his book Frames of Mind, Gardner (1983) examined research that has explored the many ways in which children develop musically. Evidence suggests that music learning and performance occur in a territory or land distinct from others, in a "musicland", so to speak. He referred to the work of Jeanne Bamberger, a noted musician and

developmental psychologist at the Massachusetts Institute of Technology. She sought to analyze musical development along the lines of Piaget's studies on logical thought, but found that musical thinking involves its own rules and constraints. She determined that music cannot simply be assimilated by linguistic or logical-mathematical thinking. This presents a challenge for the direct study of musicality without the intervention of language.

Currently, a local concern regarding children's music achievement has surfaced in the jurisdiction of the investigator. The 1983 Manitoba Music Assessment Program (Province of Manitoba) sampled the musical skills, knowledge and attitudes of Grade 5 students through written and performance-based tests. Bamberger's challenge regarding the relevancy of language-based music assessment is addressed in one of the conclusions listed in the Final Report (Province of Manitoba, 1985), which states:

> While there is apparently attention being devoted to facts and information <u>about</u> music, relatively little of this information survives the quantum leap to the feelingful perception fundamental to thinking <u>in</u> music. It would appear that facts and activities are the primary components of musical instruction, rather than carefully selected and sequenced <u>experiences</u> with music which converge upon musical sensitivity or musical concepts (p. 37).

Perhaps this comment on music education in Manitoba highlights the limitations inherent in the educational institution: teachers seem to teach that which they can measure, most likely facts and information which are most amenable to written, objective evaluation as an indication of students' musicality. As well, public education is designed for large group instruction and performance, making individualized attention and creative music-making experiences difficult if not impossible for music specialists hindered by limited contact time.

The significance of this study lies in the fact that it attempts to assess and describe the creative musical compositions of young children without the intervening requirements of language skills or formal and technical musical knowledge. The interface of the Apple microcomputer, utilizing a commercial music software program, was used to facilitate the production of young children's music compositions. The intent was to eliminate or at least lessen the "middle-men" of language and technical expertise in order to provide a more direct outlet for musical expressions. Most importantly, the computer simultaneously provided a means for immediate interpersonal feedback and the recording of subjects' original compositions.

Statement of the Problem

The purpose of this correlational study was to contribute further to our understanding of young children's musical development through the description and analysis of their creative computer music compositions. What were the developmental differences in the music compositions of children from Grades 1 to 5? When the characteristics of these compositions were classified according to a Stage Theory model, how did these differences relate to age, gender, music aptitude, school music achievement and private music lessons?

Specific questions addressed in this investigation can be summarized in the following manner:

1. Can the computer music compositions of elementary school children be characterized according to developmental stages of formal structure?
2. What is the relationship between stage and age?
3. What is the relationship between stage and gender?
4. What is the relationship between stage and music aptitude: tonal, rhythmic and a composite measure?
5. What is the relationship between stage and school music achievement?
6. What is the relationship between stage and private music lessons?

Limitations

The actual study was only three months in duration. Therefore, time must be considered as a limiting factor in the technical training and collection of creative computer music compositions from young children. Generally speaking, all students were given standardized instructions, the same allotted time for practice with the computer music composition program, and similar time restrictions for producing a final composition. The treatment of subjects from Grade 1 to Grade 5 was identical in most respects, which is not the norm in graded elementary school instruction.

The sample in this study consisted of available students enrolled in three elementary schools in two suburban school divisions. The schools were selected on the basis of convenience rather than by established sampling techniques because of teacher interest and computer availability. Caution should be exercised in generalizing these findings to other students who may vary in socio-economic, academic and music backgrounds.

The research instrument used for analyzing and classifying computer music compositions into developmental stages was designed by the researcher specifically for this study. Only one evaluator, the researcher, classified the compositions. Categories were

developed according to previously outlined stage theory, and were characterized as: (1) Sound Scribblings, (2) Patterned Fragments, and (3) Structured Composition.

Three different research settings were used in the study due to the differences in computer availability in the three schools: (1) one computer for use by individual subjects in their homeroom, necessitating an in-class roster system for composing, (2) five computers for use by small groups, requiring an adjacent classroom pull-out system for music-making, and (3) seventeen computers located in a school computer lab, allowing whole-class composition sessions. Analysis of subjects' compositions under these three conditions was beyond the scope of this study, and was therefore not undertaken.

The most important limitation of the study was the use of Gordon's "Primary Measures of Music Audiation" music aptitude test (1979) for all subjects from Grade 1 to Grade 5. Designed for use in the primary grades, it was employed with subjects in Grades 4 and 5, as well, to enable direct comparisons. However, this also means that results are thus skewed for the intermediate grades. The PMMA was selected because of its theoretical foundation of "developmental music aptitudes", availability, ease of administration and scoring, usefulness with subjects in Grades 1 to 5, and citations in research literature.

Operational Definitions

For the purpose of this study, certain terms and operations are defined as follows:

Audiation takes place when one hears music through memory or creativity, the sound not being physically present except when one is engaging in performance. In order to perceive and conceive music aurally in a meaningful manner, one must audiate music, for referential and predictive purposes, heard at a previous time. Without audiation, even repetition and sequence could not exist and thus there could be no form in music. (Gordon, 1981, p.8)

Computer music compositions are created and saved on data disks with the use of the Songwriter music program, published by Scarborough Systems for the Apple II microcomputer (Wantman, 1984). This courseware was chosen because of its utility for use with children in the primary and intermediate grades.

Computer music composition stages were classified into three higher-order categories:

(1) Stage One: Sound Scribblings

Characteristics: random experimentation; motor energy; no motif, plan or purpose

(2) Stage Two: Patterned Fragments

Characteristics: melodic or rhythmic patterning; song fragments; motifs; phrasing

(3) Stage Three: Structured Composition

Characteristics: larger formal structures; themes; organized outline of a song

These theoretical categories are based on the work of Davidson et al., Fairholm, Flohr, and Prevel. The characteristics of these three stage classifications were used for the analysis of computer music compositions collected for this current study (see Appendix A).

Develop means: 1. to come into being or activity; grow. 2. to change in character through successive periods; evolve. 3. to come to have; display; show. 4. to become bigger, better, more useful, or improved. 5. (music) to elaborate (a theme or motive) by variation of rhythm, melody, harmony or texture.

Development means: 1. the process of developing; growth. 2. an outcome; result; new event. 3. a working out in greater and greater detail. . . 6. a more elaborate form. 7. stage of advancement. (Barnhart, 1984, p. 572)

Elementary school children are enrolled in Grades 1, 2, 3, 4 and 5 in public school.

Music achievement means the assignment of the student by the school music teacher into one of three categories according to demonstrated knowledge and skill in class: High Achievement, Average Achievement or Low Achievement.

Music aptitude is defined as the scores on Gordon's "Primary Measures of Music Audiation". These include subtest scores for a tonal auditory test, a rhythmic auditory test, plus a composite score (1979).

Private music lessons refer to the information contained in the questionnaire/ agreement form filled out by the parents of participating subjects. Questionnaire choices included music lessons provided by a Private Individual, the Suzuki Talent Education Institute, Yamaha Music School, Orff Music for Children or Other. Kinds of music instruction included keyboard, strings, voice, band, music theory, guitar, percussion, dance and other.

Stage is defined as one step or degree in a process; a period of development (Barnhart, p. 2035).

Stage theory, according to Piaget, asserts that development proceeds in a sequential, invariant order, and that each stage indicates a change in the quality of how a child thinks, not just what he knows (Sigel & Cocking, 1977).

CHAPTER II

REVIEW OF LITERATURE

Statement of Theoretical Assumptions

The concept of "computer music composition stages" used in this study was based upon the theoretical foundations of genetic epistemology first formulated by Jean Piaget during the 1920's. His studies of developmental differences in children led him to the description of four cognitive stages (Bigge, 1982):

Sensorimotor (birth-2 years),

Preoperational (2-7 years),

Concrete Operational (7-12 years), and

Formal Operations (12 years-adulthood).

This mental construct of "developmental stages" was later adapted to other fields of investigation, including social morality and artistic expression. In his 1958 doctoral dissertation, Lawrence Kohlberg built on Piaget's work (Travers, 1982) when he postulated three broad stages of moral development: Preconventional, Conventional, and Postconventional. In unrelated but concurrent research, Lowenfeld (1957), outlined four stages of artistic self-expression:

Scribbling (2-4 years),

Preschematic Representations (4-7 years),

Schematic Symbolism (7-9 years), and

Gang Age Realism (9-12 years).

In the field of music research, the concept of "developmental music aptitude" originated with the work of Gordon (1980). He cited evidence from his use of the "Primary Measures of Music Audiation" aptitude test indicating that the music aptitude of children from ages 5 through 8 is developmental; that is, young children are sensitive to and affected by informal and formal environmental music experiences before age nine, whereupon music aptitude stabilizes. The influence of instruction on children's music aptitudes during the early years illustrates the interactive process between innate ability and environment, or nature and nurture, as one's music potential is gradually realized.

The theoretical assumption made in this study, therefore, is that the concept of higher-order developmental stages can be applied to children's music compositions. These composition categories formulated for the purpose of data analysis adhere to the definitional constraints of Stage Theory: development proceeds in a sequential, invariant order, and each stage indicates a change in the quality of how a child thinks, not just what he knows (Sigel & Cocking, 1977). Three computer music composition stages are thus defined and characterized by qualitative differences in melodic or rhythmic patterns and structures.

Music Research Based on Piaget's Stage Theory

Piaget's theories of developmental stages have influenced music research during the past fifteen years. One study applied Piaget's principle of conservation laws to musical tasks. Zimmerman (1970) investigated the abilities of children ages 5 to 13 to recognize the musical elements of rhythm, instrumentation, harmony, contour, intervals, modes and tempo. Other researchers (Hawn, 1978; Schmitt, 1971; Smith, 1981; Warrener, 1985) have applied Piaget's theories on individual differences to the teaching of music to young children, or have examined cognitive processes in music (Serafine, 1980, 1983). The research undertaken to date has taken Piaget's concept of cognitive stages and applied it to music education. However, it is not yet clearly established whether stages of musical development might exist apart from, or in addition to, Piaget's cognitive stages.

This concept of stages in musical development is an intriguing one. One of the basic problems in promoting and studying the development of children's musical capabilities, and in determining their levels of understanding of musical concepts, lies in the fact that music is, in and of itself, a unique human experience. The elements of music are perceived and expressed in ways

that are distinct from language, which is considered to be human speech, spoken or written. Scott (1979), in her review of studies of pitch concept formation in the visual dimension, reported that although labels and words are useful in facilitating instruction or directing attention, they are not necessary for music concept formation. The assumption that language and music belong to the same cognitive and communication domains has been challenged, as well, by Brown, Deutsch, Benson and Day (1979), who postulated from study results that separate perceptual systems may exist for speech and music. This places aspects of "musicality" in a distinct and unique sphere of human intellectual functioning.

The idea of multiple intelligences has been explored most recently by Gardner (1983), who hypothesized that musical intelligence is in a domain separate from other forms of human intellect. He supported this contention with quotes from a variety of musicians and composers that seemed to agree that music-making is indeed a unique form of expression. Notables such as Aaron Copland and Igor Stravinsky described the process of composing as being "natural", that composing music is doing, not thinking. It is the manipulation of tones and rhythms in one's head, the controlled movement of sound in time.

If, as the Manitoba Music Assessment illustrated, the study of musical development in young children has been complicated by the necessity for involving language, how can children's musical expressions be examined to help determine the possibility of qualitatively different stages in their musical development?

Research on the Musical Compositions of Young Children

The research of Pond and others at the Pillsbury Foundation in the 1930's is perhaps the earliest exploration into the spontaneous musical expressions of children ages 2 to 6 years. His work compelled him to arrive at these conclusions:

1. that young children have an innate apprehension [understanding] of the function of formal procedures when sounds are being structured,
2. that the practice of improvisation (vocal as well as instrumental) is the heart of the matter in the development of the innate musicality they possess,
3. that their constructional predilections are proto-polyphonic,
4. that the free use of polyphony is the end that is most consonant with their musical instincts, and
5. that the conception of sound-structures based on organized harmonic procedures is completely alien to them. (1981, p. 11)

No further research concerning the musical improvisations of young children is mentioned in the literature until 1973, at which point an investigation was undertaken by Prevel to explore the ways in which the evolution of children's free music might be compared to the evolution of their drawings. Development in musical self-expression began in a fashion similar to that of artistic self-expression: random experimentation and free play. The concept of 'sound scribblings' emerged from his research as he discovered that children ages 4 to 10 years engaged in sound explorations in a manner similar to that of graphic scribblings.

However, the analogy stopped there, as Prevel observed that once having made their music, children were left with no substance upon which to build a higher level of understanding and performance. The ephemeral nature of sound yielded nothing concrete for further examination or revision, therefore impeding developmental progress. His research revealed that children's continuing interest in music-making with simple instruments was maintained and progress occured with the inclusion of tape-recorders which allowed the saving of musical creations for future reflection and growth. Children were then able to re-experience their creations and build upon them, as is the common course in the evolution of their drawings.

Young children's first music compositions reflected their motor energy. Their uncontrolled gestures were gradually replaced by controlled movements. Children could then begin to make conscious choices, with some resultant compositions being highly structured in form. He found a narrow correlation between their musical development and the main stages of their motor, emotional and mental development.

The method that Prevel used to record and analyze this evolutionary development in "emergent patterning" was through the transcriptions of trained observers. However, he found the observers were forced to concentrate their attention on the children's outward behaviour and approach, rather than on the objective analysis of their music. He mused, "It really would be ingenuous to evaluate children's compositions without taking into account the motives that prevailed when they were produced; it would be more serious than imprisoning them within the structures which formal analysis of adults' music leads to" (1974, p. 91). In other words, Prevel longed for a way in which children's creative music compositions could be analyzed more objectively, as an entity distinct and separate from the way in which they were produced. Traditional notation failed to capture the entire meaning and essence of children's free-flowing improvisations.

Davidson, McKernon and Gardner (1979), in a study with young children ages 1 to 3, sought to identify developmental changes in song acquisition. Without assigning titles to these changes, they described:

(1) an early period of random vocal experimentation,

(2) a period of rhythmic patterning and melodic organization of an improvisational nature, where unpredictable and unmemorable song fragments were spontaneously produced, followed by

(3) a period where songs demonstrated an awareness of melodic and rhythmic structures and sequences - a mastery of the outline of a song.

Similarly, a longitudinal study was completed in 1984 by Flohr which characterized stages of behavior of children ages 2 to 5 years engaged in improvisational musical tasks. Periodically during this four-year study, until the children ranged in age from 5 to 9 years, the subjects participated in private music-making sessions with the investigator. Children were first given free opportunities to explore a barred melodic instrument called a xylophone. They then engaged in directed explorations, followed by accompanied guided improvisations. Flohr concluded that his research results lend support to prior research findings that characteristics of children's improvisations change in relation to the child's chronological age, advancing from

Stage One to Stage Three as they grew older, and as interest began to be directed toward formal properties. The subjects' improvisations were grouped into stages:

(1) Stage One, which he described as "motor energy", was characterized by plodding and accented durations.

(2) In Stage Two, children experimented with many phrases and combinations.

(3) Stage Three, dubbed "formal properties", was characterized by repetition, larger formal structures, and decentered perception.

Flohr's work depended upon the constant presence of an observer, however, and involved the researcher as a participant in the music-making process by asking questions and posing challenges to the young subjects. The difficulty of data collection remained, as well, and analysis of musical expressions was limited to immediate researcher notation or tape recording for subsequent transcription.

The most recent work with student composers that is noteworthy of mention is in progress in the North Vancouver School District during the current schoolyear. Fairholm (1986) has developed a strategy for teaching a Computer Music Composition course in the intermediate grades. His unit on "Introduction to Melodic Design" is intended as a companion document to be used with any

commercially produced composition program currently available for microcomputers. He outlined a sequence of steps for presenting the concepts involved in melodic composition. In order to simplify the hierarchy in melodic design, he described three sequential levels in constructing melodies:

- A motif is a small melodic fragment which is used and developed in a piece of music. It is a basic musical idea on which a composition is built. A motif may be as short as two or three notes or as long as several bars, and may consist of a melodic or a rhythmic pattern. A composition begins with a motif.
- A theme is a larger structure formed by combining motifs, like building blocks, either through repetition, variation or contrast.
- A melody is formed by combining themes.

MOTIF - - -> THEME - - -> MELODY

This learning sequence was then used in his composition classes. Fairholm's application of computer technology to the area of music composition has demonstrated the practical effectiveness of this tool in music education. The possibilities for using microcomputers in music composition are apparently promising, as students can compose at the keyboard.

Computers in Music Research and Education

A new solution to this age-old problem of capturing the music made by young children exists in today's technology. Computers have proven to be accessible tools for word processing, budget management and skill building in a variety of areas. The use of computers for music processing and recording is now a reality, as well, due to ongoing research and published information.

Computer-assisted music instruction has been used in the United States during the past 20 years. However, research has been conducted mostly with secondary and college students, primarily in locations with access to large computer mainframe systems. Now that microcomputer technology and music software are available for public schools, the possiblities for using elementary-aged children as subjects in music research are more favorable (Rudolph, 1984).

Computer music research has focused historically on measuring the acquisition of basic music skills and knowledge through the use of drill-and-practice or tutorial programs. Pioneer work done with computerized aural training (Hofstetter, 1981; Lamb, 1978; Lee, 1980), melodic dictation (Kuhn, 1974), basic musicianship (Vaughn, 1977) and music theory programs (Arenson, 1983) has paved the way for more sophisticated and novel uses

of the computer in music education. There now exist a variety of computer music programs for child and adult students that provide an environment where music composition is possible due to the assistance of technology. These programs include Songwriter by Scarborough Systems, Beginning Music by Silver Burdett, and Music Maker by the Sublogic Corporation (Rudolph, 1984, p. 125). Interactive music composition programs that allow for self-expression while simultaneously recording each child's creations now exist. What remains to be done is to systematically examine children's computer-assisted musical creations for progressive stages of development and to realize Prevel's dream of an objective analysis of their evolutionary nature. Developmental theory can be applied to technology in education with systematic, empirical research (Mitzel, 1981).

The use of the computer as an heuristic learning device has been used most recently in the realm of mathematics. Research during the late 1970's by Papert applied Piaget's cognitive development learning theories to the creation of an interactive computer language called "LOGO" which children use to actively learn geometric concepts. In his Brookline Project, Papert observed that the computer helped children problem-solve and understand complex concepts because it provided

experiential learning along with concrete and immediate visual feedback to subjects' explorations in "Mathland" (Papert, 1980). Now, due to the production of commercially available music software, the potential exists for a parallel application in music. Music composition programs can both facilitate children's efforts to make their own music, as well as provide music educators with recorded data of students' original compositions for research and analysis.

Summary

A summary of the literature on children's music compositions and improvisations reveals some common ground and similarities in research findings.

In the 1930's, Pond observed that children ages 2-6, when left to their own music-making with simple percussion instruments and voice, were predisposed to make musical patterns, shapes and structures whose elements are rhythmic figures and intervals. He concluded that children have an innate understanding of the function of formal procedures.

In 1973, Prevel noted that children ages 4-10 engage in "sound scribblings" and free music explorations with simple instruments, which develop into more formal structures over time if their compositions can be recorded, reexperienced, and refined through listening.

In 1979, Davidson et al., described the developmental process of song acquisition from ages 1 to 3 as progressing from random vocal experimentation to a mastery of the properties of overall form.

In 1984, Flohr concluded a four-year longitudinal study observing children ages 2 to 5 until they grew to ages 5 to 9. Their xylophone explorations and improvisations progressed from the expression of motor energy, to experimentation with phrasing and combinations, to the demonstration of an awareness of formal properties.

A review of the literature on the use of computer technology in education reveals that computer-assisted music instruction in music theory and ear-training has been effectively implemented with secondary and college students since the 1960's. The use of the computer as an heuristic learning device for young children has been aptly demonstrated by the success of Papert's "Math Logo" courseware.

Finally, in 1986, Fairholm has shown that computer technology could be applied to the intermediate school music composition classroom when the progression of concepts in composition is organized from "motif" to "theme" to "melody". His composition course focuses on the elements of melodic and rhythmic form and design.

Implications

The implications from this chronology of research are that children's creative musical expressions follow a progression from random exploration, to an emergent patterning and experimentation with melodic and rhythmic fragments, to a mastery of larger thematic structures and formal properties. Analysis of children's computer music compositions could result in a variable distribution into three stages: (1) Sound Scribblings, (2) Patterned Fragments, and (3) Structured Composition.

As well, the evidence appears to support the contention that as development occurs over time, there will be a correlation between age and composition stage. Gordon's concept of "developmental music aptitude" takes into account an interaction between innate musical ability and environmental experiences, thereby presuming that private music lessons and school music achievement would relate to one's music composition stage. Scores on Gordon's PMMA music aptitude test, which measures one's ability to audiate tonal and rhythmic patterns, might also be associated with one's ability to produce music compositions of varying quality.

There is no evidence to suggest that composition stage would be related in any way to gender.

CHAPTER III

PROCEDURES AND METHODOLOGY

The purpose of this correlational study was to contribute further to our understanding of young children's musical development through the description and analysis of their compositions created through guided play with a computer music composition program.

Subjects

This study was conducted with over 30 students from each of Grades 1 to 5, ranging in age from six to twelve years old. There was a total of 195 students (99 males, 96 females) selected from three Winnipeg suburban schools. Representation from each grade level included: Grade 1 (41 subjects), Grade 2 (43), Grade 3 (44), Grade 4 (34) and Grade 5 (33).

Of the total number of students, 41% reported having taken private music lessons, while 59% reported having taken none. Twice as many females as males were enrolled in private lessons previous to or during this study.

The subjects were selected on the basis of teacher volunteers due to the limitations involved in meeting the following requirements:

(1) the availability of Apple II microcomputers for research during the regular school term when equipment is normally booked for in-school instructional purposes,

(2) the time restrictions of involving an adequate sample size (30 per group) resulting in the use of whole classrooms for orientation, music aptitude testing, and computer timetabling in each school,
(3) the interest demonstrated by classroom and music teachers to be involved in a study that necessitated weekly sessions with students, and
(4) the cost involved in obtaining computer software.

Instruments

Two instruments were used for gathering data: a music aptitude test and a commercially available computer music composition program.

First, finding a suitable research instrument for use with young children was difficult, as most music tests listed in Buros' Tests in Print III were designed for upper elementary, secondary or college students, rendering them inappropriate for Grades 1-3 (Mitchell, 1983, p. 527). It was therefore necessary to review the literature for an appropriate instrument designed for use with primary children. Gordon's "Primary Measures of Music Audiation" (PMMA) appeared to be promising because of its apparent advantages: (1) a theoretical foundation of "developmental music aptitudes", (2) usefulness with subjects in Grades 1 to 5, (3) availability, (4) ease of administration and scoring, and (5) citations in published research. As well, it was described as a music aptitude test, rather than a music achievement test (Mitchell, 1985, p. 1205-1207). The purpose for using Gordon's standardized PMMA was to assess subjects'

audiation abilities and to compare these results with their music compositions. Although standardized for children ages 5 to 9, the PMMA was used with the total research population that included children ages 10 to 12, as well, to enable direct comparisons. It was chosen because of its noted advantages.

Second, the decision to record subjects' music compositions with the aid of Apple computers was based on the existence of a variety of appropriate computer music composition programs coupled with the increasing use of computers in Manitoba's public schools. The 1985 Survey of Educational Computing in Manitoba (Province of Manitoba) reported that the 1985 student/computer ratio was 36:1, whereas it had been 60:1 in 1984 and 125:1 in 1983 (p.8). The specific Songwriter music composition courseware was selected for two main reasons. First, it is relatively inexpensive and readily available. Second, it has been developed and promoted for use with populations ranging in age from 5-year-olds to adults. The investigator has used Songwriter informally in private settings with children from Grades 1 to 7, and was personally convinced of its usefulness and age-appropriateness for a variety of age levels prior to the data collection phase.

Gordon's Music Aptitude Test

The "Primary Measures of Music Audiation" is a tape recorded group music aptitude test of short music phrases. The test is in two parts: Tonal and Rhythm. Each part is recorded on a separate cassette tape and each tape includes practice examples with forty test questions. A child does not need to know how to read a language or music, or to know numbers, in order to use the answer sheet for either test. The child answers the questions presented on the tape by making circles around pictures of faces on the answer sheet. No formal music achievement is required to answer the questions. The child simply draws a circle around the pair of faces which are the same on the answer sheet if the two phrases heard on the tape sound the same; if the two phrases heard on the tape sound different, the child draws a circle around the pair of faces which are different on the answer sheet. Each test tape includes approximately 12 minutes of listening time, and each test requires 20 minutes of administration time. The "Tonal" test should be administered on one day and the "Rhythm" test on another. The verbal directions are standardized.

As reported in the test manual, test-retest reliability coefficients range from .60 to .76. Most of

the split-halves reliability coefficients for the first administration of the tests are approximately .86 for the "Tonal" and "Rhythm" subtests and .92 for the Composite test score for grades K-3. Content validity was determined on the basis of the results from three cross-sectional studies in 1974, 1976 and 1978. Tests for concurrent validity indicated that practice effects in taking the tests are negligible. (Gordon, 1979)

Computer Music Composition Program

The description for the Songwriter program in the manual states: "Songwriter is designed for fun and learning. It can be used by children and adults alike, by novices or experts. It is an easy to use yet powerful tool for anyone who wants to create music" (Wantman, p. 5).

Subjects created their musical compositions with the aid of the Apple II microcomputer and the Songwriter computer program. Songwriter allows subjects to choose sounds generated by the computer speaker which are simultaneously represented visually on the monitor by blocks released from a graphic piano keyboard. Music compositions can be saved and recorded on a data disk and played back either as individual notes or in a melodic sequence.

Design and Procedure

The purpose of this correlational study was to describe and analyze the computer music compositions of elementary school children. Data were collected on subjects' ages, gender, music aptitude, school music achievement level and private music lessons along with their computer music compositions in order to explore the relationships between these variables.

In January 1986, final arrangements were made with the participating school division superintendents, principals, music and classroom teachers prior to commencement of the data collection. Intact Grade 1-5 classroom groupings were used for reasons previously outlined. Letters of Introduction and Computer Music Project Agreement Forms were sent home with participating students to obtain parents' written consent plus detailed information on Private Music Lessons (see Appendix B).

Throughout February and March, similar procedures were used for data collection from all subjects. The three different schools allowed for an informal study of alternate settings for student use of computers: (1) the participation of whole classroom groupings in a computer lab, (2) a small-group "pull-out" program to use five available computers in an adjacent empty classroom, and (3) a "live-in" computer in the regular classroom where

each student worked individually with the Songwriter program on a roster system. However, it was beyond the scope of this study to compare the research results based on the different settings.

Four sessions were spent with each classroom grouping of subjects. An extra session was needed with some individual subjects due to computer mechanical failures or to scheduling difficulties. Each classroom session lasted for approximately one 30-minute period.

Session 1: Introduction and orientation to the design and procedures of the research project, plus an introduction to the Songwriter computer program. Data on student ages and gender were collected from classroom teachers.

Session 2: Administration of Gordon's "Primary Measures of Music Audiation" music aptitude test by the researcher in all instances. Although the PMMA was designed to be given on two separate occasions, timeline constraints required it to be administered in one sitting with a movement and refreshment break between the two 12-minute subtests for each intact classroom grouping. Standardized procedures were followed in administering the test.

Session 3: Review and hands-on practice sessions with the Songwriter program. Subjects worked alone or in pairs with Apple computers to explore the possibilities of composing their own music with the aid of this tool. The researcher was available at all times for assistance and instruction.

Session 4: Subjects individually created a final composition that was saved on a data disk with a title recorded for future reference. The researcher was in attendance at all times in the computer lab or small-group settings, but not in the closed classroom where students composed their final songs using a roster system where the classroom teacher recorded titles along with saving songs to computer data disks (see Appendix C).

Session 5. Final debriefing sessions with participating teachers enabled the researcher to collect any outstanding information, such as the music teachers' Music Class Achievement Level Forms (see Appendix D). Data on the presence or absence of Private Music Lessons was recorded.

Treatment of Data

Scoring the music aptitude test answer sheets included two processes: counting the number of items answered correctly to obtain the raw scores for the Tonal and Rhythm subtests, and converting the raw scores to percentile ranks. Composite scores for the two sub-tests were treated in the same manner. Scores from the Grade 4 and Grade 5 tests were converted to percentile norms from the Grade 3 Table. Percentile rank norms were recorded for each of the 181 subjects who completed the music aptitude tests.

Final computer music compositions were analyzed with the use of the Computer Music Composition Stage Analysis Form developed by the researcher (see Appendix A). The design of this instrument was based on Piaget's Stage Theory and the work of Davidson et al., Fairholm, Flohr, Pond and Prevel regarding the formal characteristics of young children's music compositions. Results from the studies conducted by these researchers, previously detailed in this study, showed that improvisational vocal and instrumental music-making in young children follows a progression from random exploration, to an emergent patterning and experimentation with melodic and rhythmic fragments, to a mastery of larger thematic structures and formal properties. Thus, the three higher-order composition stages used for analysis were determined to

be: (1) Sound Scribblings, (2) Patterned Fragments, and (3) Structured Composition. The researcher listened to and simultaneously watched the graphic representation of each computer music composition created by 188 of the subjects using the Songwriter courseware with an Apple II computer (7 compositions were lost due to mechanical failure). Notes were taken on each composition, and a rating of Stage 1, 2 or 3 was assigned and recorded.

In addition to this data, the two respective music teachers responsible for roughly half of the population from Grades 1 to 5, each rated their students' music achievement in class into a Low, Average or High level of achievement. Information gathered from subjects regarding previous or current private music lessons was recorded as simply being present or absent. The remaining data concerning subject's age, gender, school, and grade were added to each summary sheet.

Statistical Analysis

The analysis of the computer music composition stages was descriptive.

The statistical technique applied to the data was correlational. Pearson product-moment correlation coefficients were calculated to determine the relationship between computer music composition stages of elementary school children and their age, gender, music aptitude, school music achievement and private lessons.

CHAPTER IV

RESULTS AND DISCUSSION

Analysis of the Data

The major purpose of this correlational study was to describe the developmental differences in the computer music compositions of elementary school children in Grades 1 to 5, and to investigate the relationships between music composition stages and a variety of selected variables. To achieve this purpose, data on ten items were recorded for each subject:

(1) School
(2) Grade
(3) Age
(4) Tonal Aptitude Percentile Score
(5) Rhythmic Aptitude Percentile Score
(6) Composite Percentile Score
(7) Music Composition Stage
(8) Gender
(9) Music Achievement Level, and
(10) Private Lessons.

Data obtained in this investigation was processed by the researcher with the aid of the University of Manitoba Amdahl Computer, using the Mantes Statistical Analysis System package.

The initial phase involved a descriptive analysis of the data, including the classification of compositions into stages, the arrangement of music composition stages into frequency distributions and the calculation of means and standard deviations for each aptitude test and ages.

In the second phase of the analysis, Pearson product-moment correlation coefficients were calculated in order to determine the relationships between:

(1) stage and age

(2) stage and gender

(3) stage and tonal aptitude

(4) stage and rhythmic aptitude

(5) stage and a composite aptitude measure

(6) stage and school music achievement, and

(7) stage and private music lessons.

Results

The main findings of this study are that computer music compositions can be categorized as belonging to one of the three developmental stages: (1) Sound Scribblings, (2) Patterned Fragments, and (3) Structured Composition. Results show that these music composition stages are related to age, gender, tonal aptitude, a composite aptitude measure, school music achievement and private music lessons but not to rhythmic aptitude.

This investigation examined whether the computer music compositions of elementary school children in Grades 1 to 5 could be characterized according to developmental stages of formal structure and, if so, how these stages relate to age, gender, music aptitude, school music achievement and private music lessons.

The specific questions to be reviewed in this investigation were examined separately.

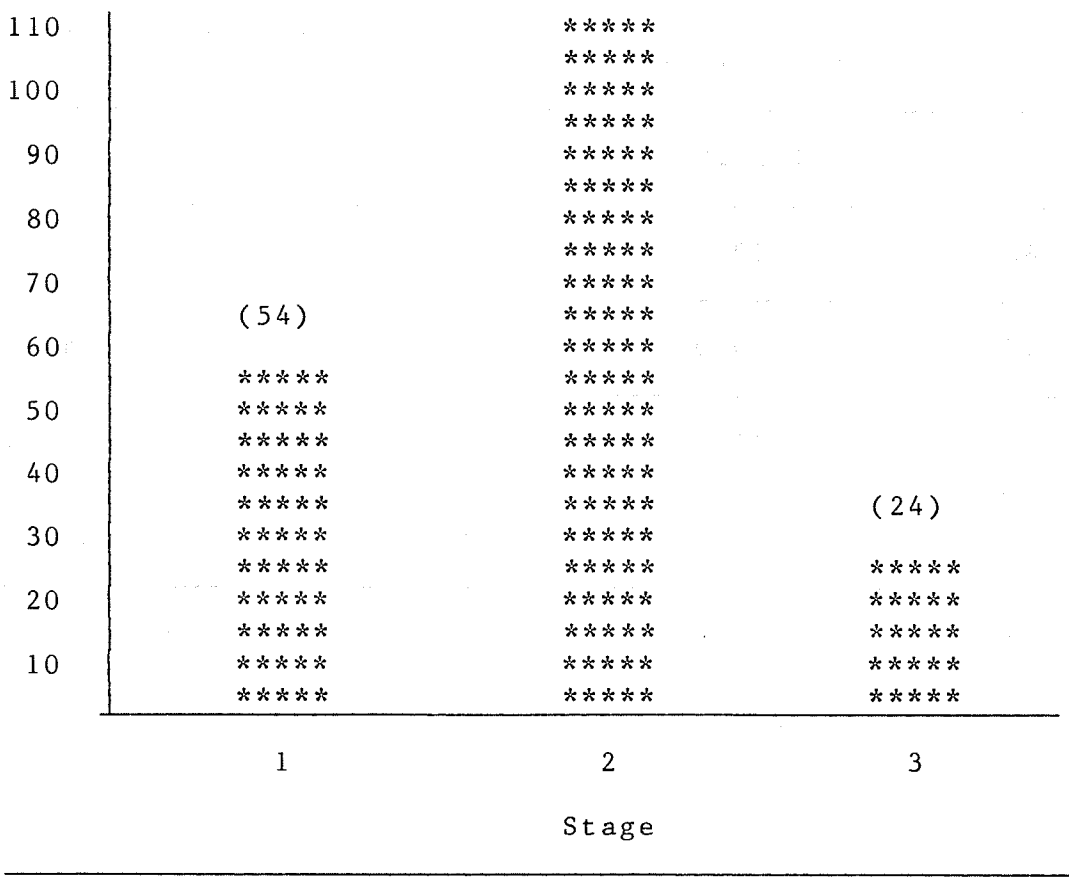
Question 1. Can the computer music compositions of elementary school children can be characterized according to developmental stages of formal structure?

Results from the analysis of 188 computer music compositions using the Computer Music Composition Stage Analysis Form designed for this study (see Appendix A) show a distribution of compositions into the three categories. This distribution supports the assumption that computer music compositions can be characterized and classified into three developmental stages of formal structure: (1) Sound Scribblings, (2) Patterned Fragments and (3) Structured Composition. The preponderence of Stage 2 and Stage 3 compositions from these subjects (71%) indicates an interest in sound patterns and an ability to structure sounds melodically or rhythmically.

Figure 4.1 graphically illustrates the distribution of the three music composition stages. Results show that 29% of the compositions are described as being Stage One "Sound Scribblings", 58% of the compositions are Stage Two "Patterned Fragments", and 13% of the compositions are Stage Three "Structured Composition".

Figure 4.1

Distribution of Computer Music Composition Stages



Results from the remaining examinations are shown in Table 4.1. Pearson product-moment correlations between computer music composition stage and the seven other variables were calculated to test the direction and significance of the relationships.

Table 4.1

Correlations between Computer Music Composition Stage and Age, Gender, Tonal Aptitude, Rhythmic Aptitude, Composite Aptitude Scores, School Music Achievement and Private Music Lessons

Correlation Between Stage and	r	Significance	n
Age	0.31*	0.0001	187
Gender	0.19*	0.0100	188
Tonal Aptitude	0.27*	0.0003	177
Rhythmic Aptitude	0.11	0.1277	177
Composite Aptitude	0.20*	0.0087	174
Music Achievement	0.20*	0.0060	188
Private Lessons	0.30*	0.0001	185

* $p < .01$

Question 2. What is the relationship between stage and age?

The correlation coefficient of 0.31 is significant at the .01 level, which establishes a relationship between Stage and Age. The direction of the relationship is positive: the greater the age, the higher the stage. Table 4.2 gives the mean ages, standard deviations and age ranges for each computer music stage. The mean ages for each stage are 8.1 years for Stage One, 8.5 years for Stage Two and 9.9 years for Stage Three.

Because of this low correlation between stage and age, these results suggest that development in creative music compositions and awareness of form are not simply a function of maturation alone.

Table 4.2

Mean Ages for Music Composition Stages

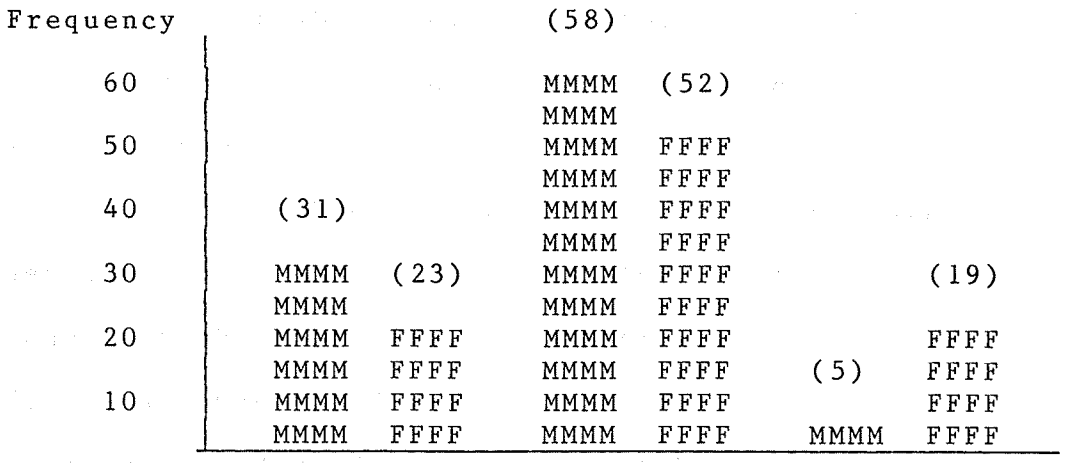
Stage	n	Mean Age	Standard Deviation	Age Range
1	53	8.1	1.5	6.2 - 12.2
2	110	8.5	1.4	6.1 - 11.6
3	24	9.9	1.2	6.0 - 11.8

Question 3. What is the relationship between stage and gender?

The correlation between Stage and Gender is 0.19, which is significant at the .01 level. These results indicate a relationship between stage and gender. As Figure 4.2 illustrates, 79% of Stage Three compositions were composed by females. Other factors, such as the presence of private lessons, might affect these results. Additional information gathered in this study shows that twice as many females as males were enrolled in private music lessons previous to or during this study.

Figure 4.2

Distribution of Music Composition Stages by Gender



Question 4. What is the relationship between stage and music aptitude?

(a) tonal aptitude

(b) rhythmic aptitude

(c) a composite measure of tonal and rhythmic aptitudes.

Correlation results are given in Table 4.1 for all three measures of music aptitude: tonal, rhythmic and a composite measure of these two subtests. It appears that Stage and Music Aptitude are positively related when correlations are calculated for Tonal Aptitude and a Composite Aptitude score, as is shown by the coefficients of 0.27 and 0.20, respectively, which are significant at the .01 level. The correlation between Stage and Rhythmic Aptitude is 0.11, which is not significant at the .01 or the .05 level. Therefore, there is no demonstrated relationship between music composition stage and rhythmic aptitude.

Table 4.3 shows the mean scores and standard deviations for each music composition stage. The mean Tonal, Rhythmic and Composite Aptitude scores increase from Stage One, to Stage Two to Stage Three. However, when the standard deviations are taken into consideration upon an examination of this data, there is virtually no difference in aptitude scores for any of the three composition stages. It appears that the variable of

music aptitude alone cannot account for the developmental differences in creative computer music composition ability in young children. It must be noted, as well, that the aptitude test results are skewed due to the inclusion of Grade 4 and 5 subjects using Grade 3 norms.

Table 4.3

Mean Aptitude Scores for Music Composition Stages

Music Aptitude Score	Stage 1	Stage 2	Stage 3
Tonal			
n	52	104	21
Mean	62.2	71.5	83.9
SD	26.5	22.4	15.5
Rhythmic			
n	51	105	21
Mean	69.6	73.5	77.0
SD	22.8	19.8	13.7
Composite			
n	49	104	21
Mean	66.7	72.9	80.8
SD	24.0	20.4	13.6

Question 5. What is the relationship between stage and school music achievement?

Table 4.1 shows a correlation of 0.20 between Stage and School Music Achievement, which establishes a relationship between these two variables. Subjects were assigned to one of three achievement categories by their school music teachers. The distribution of subjects from Grades 1 to 5 was: (1) Low Achievers 15%, (2) Average Achievers 54%, and (3) High Achievers 30%. Fifty percent of the Stage Three composers were classified as High Achievers, and 8% were classified as Low Achievers.

Table 4.4

Distribution of Composition Stage by Music Achievement

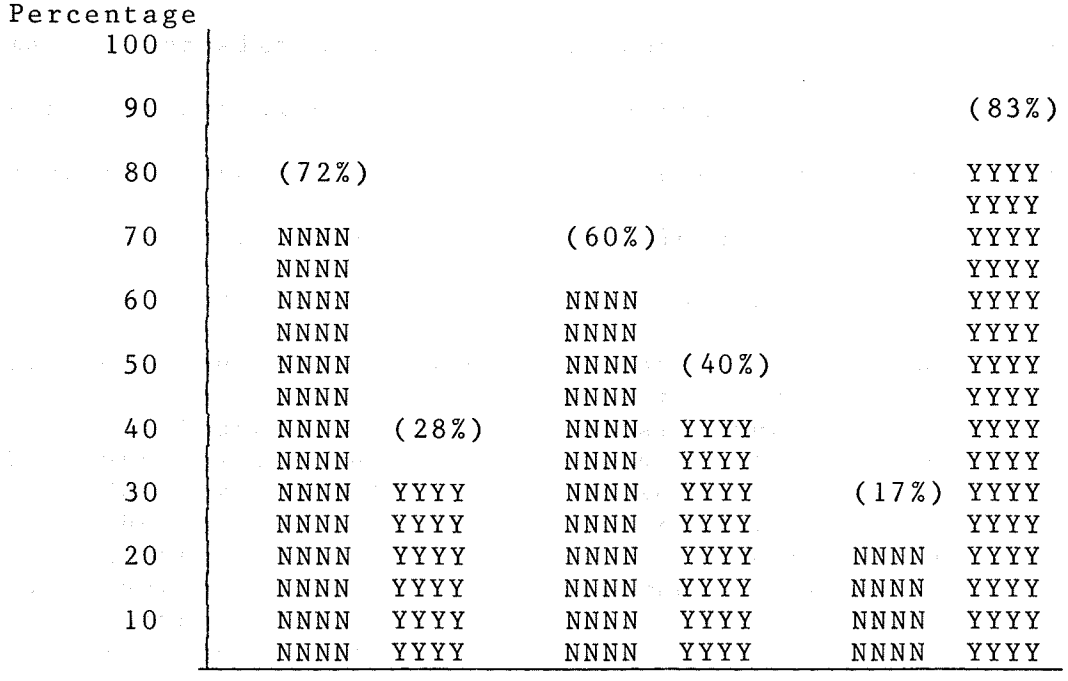
Stage	Achievement Level			Total
frequency row percent	1	2	3	
1	13 24.07	29 53.70	12 22.22	54
2	14 12.73	63 57.27	33 30.00	110
3	2 8.33	10 41.67	12 50.00	24
Total	29 15.43	102 54.26	57 30.32	188

Question 6. What is the relationship between stage and private music lessons?

The correlation between Stage and Private Music Lessons is 0.30, which is significant at the .01 level. Figure 4.3 illustrates a comparison of the presence or absence of private music lessons for each composition stage. Stage is related to private lessons. Results show that 83% of Stage Three composers had taken private music lessons, while 72% of Stage One composers had not.

Figure 4.3

Presence or Absence of Private Music Lessons by Stage



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings and Discussion

The purpose of this correlational study was twofold: to describe the developmental differences in the computer music compositions of elementary school children in Grades 1 to 5, and to examine those differences as they relate to age, gender, music aptitude, school music achievement and private music lessons.

The procedure for collecting data from 195 subjects enrolled in Grades 1 to 5 in three suburban schools included: (1) acquiring details on private music lessons through questionnaires, (2) administering the PMMA music aptitude test, (3) training subjects to use a computer music composition program, (4) storing final compositions for future analysis, and (5) gathering information from classroom and music teachers regarding such variables as age, gender and music achievement levels.

The six main questions for study were:

1. Can the computer music compositions of elementary school children be characterized according to developmental stages of formal structure?
2. What is the relationship between stage and age?
3. What is the relationship between stage and gender?
4. What is the relationship between stage and music aptitude: tonal, rhythmic, and a composite measure?
5. What is the relationship between stage and school music achievement?
6. What is the relationship between stage and private music lessons?

Question 1. Can the computer music compositions of elementary school children be characterized according to developmental stages of formal structure?

Subjects' creative computer music compositions were successfully analyzed and classified according to three developmental stages of formal structure: Stage One: Sound Scribblings, Stage Two: Patterned Fragments, and Stage Three: Structured Composition. As the result of analysis, there was a distribution of compositions into these three categories.

Stage One compositions were characterized by random experimentation, without apparent plan or purpose. Stage Two compositions showed the development of motifs, phrasing, and rhythmic or tonal patterning. The structure of Stage Three compositions demonstrated an overall mastery of the outline of a melody and adherence to established properties of form.

Although results appear to indicate that creative computer music compositions can be characterized according to developmental stages of formal structure, these findings must be accepted with a degree of caution. The theoretical foundation for the concept of "developmental stages of computer music compositions" is newly formulated and the research instrument designed and used for the analysis of compositions in this study has not been validated. However, the impact of these results is noteworthy for music educators. The successful

description and classification of individually produced computer-assisted creative music compositions can provide a foundation for the classroom study of melodic design and formal properties. Music teachers could incorporate a computer music composition unit into an existing elementary curriculum, thus enabling students to experience music through their own invention. This could lay the groundwork needed for the formal study of music fundamentals. If the developmental stages of composition outlined in this study were employed for the teaching and analysis of formal properties, higher levels of musical understanding might be achieved by young children.

This study has demonstrated that all levels of music aptitude and compositional ability are represented in students from Grades 1 to 5. Therefore, effective planning and instruction could be the key in promoting musical development and progress. The classroom or lab computer, when used as a music composition tool, might make a substantial difference to the public school teacher wishing to guide students in learning musical concepts through an individualized, interactive approach.

This exploratory study provides a model for replication in future studies that employ other research methods used in causal-comparative or experimental designs. Further research could help establish the validity and reliability of the analytical tool.

Question 2. What is the relationship between stage and age?

Composition stage and age did significantly covary in a positive direction. Apparently, the greater the age, the higher the stage.

Although the coefficient of 0.31 was statistically significant, showing a positive correlation between computer music composition stage and age, this result must be examined closely for its meaning. In terms of practical significance, this means that only 10% of the variability in composition stage is accounted for by the linear relationship between stage and age. The proportion of variance not accounted for, or not held in common between stage and age, is 90%. A higher correlation coefficient than 0.31 would have resulted in a higher degree of confidence in accepting the strength of this relationship.

It should be noted that the age ranges for each composition stage were almost identical, extending from 6-year-olds to 11-year-olds for each of Stages One, Two and Three. Indeed, the top of the age range for Stage One was the greatest, at 12.2 years. It is therefore difficult to conclude that the greater the age, the higher the stage, as all levels of compositions were produced at all ages. In addition, if Grades 1 to 3 only had been investigated in this study, it is doubtful

whether there would have been any significant results as only 10% of the compositions produced by these younger subjects were classified as Stage Three (see Appendix E).

It is important to consider the results from the examination of private music lessons in this analysis. Comparisons revealed that 83% of Stage Three composers reported having taken music lessons privately, while 72% of the Stage One composers reported having taken none. This latter observation, combined with the knowledge that in Grades 4 and 5 over two-thirds of the students had taken private lessons while the reverse was true in Grades 1 to 3 (see Appendix F), might show a more complex relationship among the variables of composition stage, age and private lessons. Do older students produce higher-order music compositions because of the virtue of greater age alone, or is it connected to the fact that more of them have had more opportunities for and more direct experience with private music instruction by the time they are in Grades 4 and 5? The evidence seems to suggest support for the explanation that compositional ability develops due to an interaction between maturation and music experience. Available research indicates that informal and formal music experiences contribute significantly to developmental progress in music ability.

Question 3. What is the relationship between stage and gender?

There was a significant although low correlation of 0.19 between stage and gender. An inspection of Stage Three composers reveals that 79% were female. The remaining compositions were almost equally divided between males (57%) and females (43%) for Stage One, and males (53%) and females (47%) for Stage Two. In addition to this information pertaining to gender, other results from this investigation indicated that twice as many females as males reported having taken private music lessons, and twice as many females as males were regarded by their school music teachers as high achievers. There were, therefore, more females composing music at a Stage Three level, more female high achievers in school music, and more females involved in private music lessons, at a ratio of 2:1 or greater, comparing females to males.

The interaction among the variables of age, private music lessons and school music achievement suggests that the relationship between music composition stage and gender is more complex than it first appears. The nature of these results warrant further investigation into the question of whether musicality is gender-specific.

Question 4. What is the relationship between stage and music aptitude:

(a) tonal aptitude?

(b) rhythmic aptitude?

(c) a composite measure of tonal and rhythmic aptitudes?

Results showed a significant positive correlation of 0.27 between stage and tonal aptitude, and a significant positive correlation of 0.20 between stage and the composite measure of tonal and rhythmic aptitudes. However, the practical significance of these correlations was once again low, explaining only 7% and 4% of the variance in music composition stages, respectively. The correlation of 0.11 between stage and rhythmic aptitude was not significant.

The fact that Gordon's PMMA was normed for Grades K-3 and not Grades 4 and 5 skews these results. The music aptitude scores for subjects in the intermediate grades were compared generously to those of the subjects in the primary grades, resulting in mean scores that were higher than if they would have been compared to Grade 4 and 5 peers. Even with that being the case, the Table of Mean Aptitude Test Scores by Grade (see Appendix G) shows that when standard deviations are applied to the means for all grades, there are no differences in measures of tonal, rhythmic or composite aptitude from Grades 1 to 5.

Question 5. What is the relationship between stage and school music achievement?

The correlation coefficient of 0.20 demonstrated a low but significant relationship between stage and school music achievement. A closer look at the data reveals some important details. School music teachers assigned students in Grades 1 to 5 to one of three achievement categories according to demonstrated knowledge and skills in class (see Appendix D). The distribution of the entire population of 195 students into the three achievement categories, (1) Low 15%, (2) Average 54%, and (3) High 30%, is especially interesting in that it parallels the distribution of Stage Two compositions. These were produced by (1) Low Achievers 13%, (2) Average Achievers 57%, and (3) High Achievers 30% of the time. The relationship between Stage Three and school music achievement is the strongest with High Achievers composing 50% and Low Achievers producing only 8% of the Stage Three compositions.

Question 6. What is the relationship between stage and private music lessons?

Research findings indicated a significant positive correlation of 0.30 between stage and private music lessons. Results showed that 83% of Stage Three composers had taken private music lessons, while 72% of Stage One composers had not.

Conclusions

The major conclusions to be drawn from this exploratory study are that there are developmental differences in the characteristics of computer music compositions of children in Grades 1 to 5, and that these differences are related to tonal aptitude, a composite measure of music aptitude, age, gender, school music achievement and private music lessons but not to rhythmic music aptitude.

It can be inferred from this study that when given an opportunity to compose original music with the assistance of the Songwriter computer program, female children ages 10 to 12 who have higher tonal music aptitudes, who are regarded as higher achievers in public school music classes and who have had private music lessons, are more likely to create a higher-order Stage Three music composition than other children in elementary school, Grades 1 to 5.

It can also be inferred that children in the primary grades of 1 to 3 display few differences in music aptitude or music composition stage. However, with more students Grades 1 to 5 producing Stage Two compositions (110) than Stage One compositions (54), it also appears as though the majority of these young subjects have a

growing interest in melodic and rhythmic patterns and the potential for increasing their awareness of formal properties and structures through guided instruction. The evidence supports the observations made by Pond in the 1930's that young children's musical creativity originates from a compulsion for being music-makers and inventors of sound shapes. Using the computer as a tool for creating and recording original compositions, students are able to share their musical ideas without a dependency upon literacy or technical expertise. Formal instruction in music education can follow the direct experience of improvising music, thus enhancing knowledge and skills in a meaningful, playful environment.

Although the findings were statistically significant in establishing relationships between computer music composition stages and all variables except rhythmic aptitude, these results must be examined closely.

First, correlation coefficients were statistically low, ranging from 0.19 to 0.31. Caution should be exercised in accepting these results as an unquestionable description of young children's musicality.

Second, consideration must be made for the study limitations outlined in Chapter I. These included the short duration of time for the data collection phase, the use of a convenient sample, the design and use of an untested research instrument for analyzing computer music

composition stages, the variety of computer settings, and the administration of an aptitude test to Grades 1 to 5 that was designed for only the primary grades, K to 3.

With these cautionary statements and study limitations clearly in mind, an examination of the educational meaning and significance of the results is in order. Findings determined that music composition stage was related to age and gender, as the majority of Stage Three compositions were created by female children in Grades 4 and 5. This might reflect music background rather than maturation alone. Considering the additional evidence that these subjects were involved in private music lessons, combined with an accumulation of school music classes over a five-year period, this result might possibly be due to the greater opportunities for musical experiences available to older students.

Previously mentioned longitudinal studies reported by Davidson et al., Flohr, Pond and Prevel, documented the developing musicality in young children over long periods of time ranging from months to years. Subjects were observed in musical environments where music-making was an ongoing activity. Changes in competency took place over time, so it is difficult to separate the effects of maturation and experience. Results of a study by Young (1971) suggested that a structured program effectively raises the level of musical ability of both

disadvantaged and advantaged children. Research by Hedden (1982) investigated predictors of music achievement for general music students in the upper elementary grades. He found that attitude toward music, self-concept in music, music background, academic achievement and gender were all interrelated.

The relationship between music composition stage and tonal aptitude is complex, as well. A study by Hobbs (1985) comparing the music aptitude, scholastic aptitude, and academic achievement of young children concluded that Gordon's PMMA music aptitude test may indicate some bias toward young pupils with high academic achievement. In contrast to this finding, she also concluded that at the levels of Grades 1 to 3, "the results generally supported the inference that music aptitude and scholastic aptitude tests measure dissimilar forms of mental processing. PMMA scores do not appear to demonstrate bias toward young pupils with high scholastic aptitude" (p. 97). Research by Karma (1973, 1975, 1980) suggested that many abilities measured by musical aptitude tests are effects of musical experience rather than musical aptitude. Her study, designed to construct a test for measuring musical aptitude of subjects from various age groups, examined acoustical structure as a measure of musical aptitude. A major conclusion was that a subject's age affects his music aptitude test results very little, which seems to

support the theory that musical aptitude develops at an early age. There were additional indications that factors such as sensory capacity and rote memory may interfere with the validity of aptitude tests, but on the whole, those who can't perceive structures are likely to score lower. This supports the observation by Gordon (1981), that:

> Music aptitude is a product of both nature and nurture. A child may be born with a high degree of music aptitude, but unless he receives appropriate early informal environmental influences, the potential he was born with will atrophy. On the other hand, a young child will profit from early exposure to music no more than his level of innate music aptitude will allow. The interaction between capacity and environment continues probably from birth through age eight, although the effect of environment on a child's music aptitude decreases substantially with age. The greatest gain from environmental music influences is observed at age five. It rapidly decreases until the child reaches age nine, give or take a few months. At age nine, music aptitude becomes stabilized; it is no longer increased or decreased by environment. Thus the music aptitude of students nine years old and older is stabilized and the music aptitude of children from five through eight years old (and most probably younger, though no valid test is yet available to prove this assumption) is developmental (pp. 6-7).

Therefore, the results of this study are related to previous research findings insofar as they address the question of the balance between innate ability and music experience in assessing or describing the musicality of young children. The analysis of creative computer music compositions undertaken in this study has sought to contribute further to our knowledge and understanding of

young children's musicality. The reliability and validity of the analytical tool require further testing. This research instrument may need revisions, but its design and use could provide researchers and educators with a new focus for examining the musical improvisations of young children.

The strengths of this investigation lie in its innovative approach to the measurement of creative music expression and its concern with developmental music aptitudes. Given a dearth of studies in music research examining the spontaneous music-making of young children, this study can contribute significantly to the literature and to the methodology necessary for such investigations. The computer, due to its increased availability and the continuing development of new music composition software, can facilitate the creative music requirements of the student and classroom teacher as well as the scientific requirements of the educational researcher.

The weaknesses of the study are inherent in the design which lacked controls for the selection of subjects, which employed untested composition stage analysis instrumentation, and which included incidental measures of private music lessons and school music achievement, leaving the reliability and validity of the results open to question.

Implications for Music Education

The significance of this research touches on many aspects and levels of music education in the elementary school. The investigator contends that this study presents a fresh approach to the assessment and description of the creative musical potential and abilities of young children. Study results suggest that it is possible to collect original compositions from elementary school children in Grades 1 to 5 during a three-month school term and characterize them according to developmental stages of formal structure, thus supplying the music educator with additional information regarding each student's musicality.

Improvisation in the classroom can have beneficial effects for students, as well. Studies by O'Brien (1972), Reese (1973) and Lillemyr (1980), have reported positive results from the exploration of musical creativity in the school music classroom. Bradley (1973) summed up the implications of using creative activities in music education by stating, "If in fact greater competence can be developed in students for both the aural and visual areas of musical learning through the use and encouragement of the creative potential, music educators should seriously consider developing and testing suitable pedagogical routines to further aid the

classroom teacher in the pursuit of effective and efficient methodology" (pp. 31-32). Indeed, Dodson (1980) found that the inclusion of composition activities in basic music learning at the college level resulted in positive changes in musical self-confidence. Suitable pedagogical routines have been successfully developed by Fairholm (1986), as has been previously mentioned. He has demonstrated the effectiveness of using computers in assisting aural composition with visual representations at the intermediate level.

Walker (1984) put forth a cogent argument for experimental music in schools when he asserted that:

> . . . music is not just a crystallised art form approached through the intellect alone but is a form of thinking and reasoning in sound - living, ever-changing and growing, and that to be educated in it requires initially a personal experience of the sensation of sound and a personal manipulation of its components (p. 81).

The need for including improvisational activities in Manitoba music classrooms was defined by Warren when he expressed his opinion that, ". . .[schools need] a program which allows creative experiences . . . supports experimentation, allows for solo and ensemble music making and acknowledges that students will progress at their own speed" (1985, p. 14). The computer, through its music composition programs, might fulfill this need.

The implications for music education from this current study are that creative music experiences can be implemented in the elementary classroom. The positive effects of instruction on music aptitude postulated by Gordon, and the apparently positive effects of experience on composition ability as evidenced by the significant correlations between composition stage and age, private music lessons and music achievement in this current study, indicate that childhood is an important time for music instruction, research, funding and deployment of resources. Music education often lacks support. The Final Report on the Manitoba Art & Music Assessment Program 1983 (Province of Manitoba, 1985) concluded that:

> For the majority of Manitoba's elementary students, school Music is their only musical involvement. On the whole, teachers teaching Music . . . are not meeting the curriculum objectives. Among the possible contributing factors are: specialist status by assignment rather than by qualification, lack of adequate time allocation, lack of continuity and sequence in the primary grades, scarcity of inservice opportunities . . . (pp. 36-37).

With early music instruction being vital to the development of children's musicality, the application of computers in the music classroom needs further testing, and the involvement of children in creative music-making needs to be promoted. According to Leonhard (1982), "We must realize that the appropriate subject matter of music study is music itself. We must select music for study that is expressive and appealing to students and

emphasize its expressive import" (p. 24). Leonhard recommends greater allotments of time for music students to use their imaginations, to play by ear tunes they know and like, and to improvise. Schafer (1976) has written an entire book on creative music education, which gives concrete ideas on exploring the impact of auditory sensory input plus a philosophical rationale for a four-year curriculum in music at the college level.

Such endeavors are possible for the elementary levels, as has been demonstrated by the Manhattanville Music Curriculum Program (Thomas, 1970). This document addressed three areas of concern in music education: (1) the identification and achievement of artistic relevance, (2) attention to the personal relevance of music for student involvement, and (3) the social relevance of music, including the relationship of the musical experience to the student's immediate social environment, thus supplementing the traditional focus on music in its historical context. Computer-assisted music composition programs have the potential for meeting all three of these concerns. Composition programs can provide students with the creative experiences vital to their personal and social musical development during their formative schoolyears, plus can be a springboard for artistic and historical music instruction and analysis.

Recommendations for Further Research

Further research is suggested by the results of this study. The most apparent need is for continuing applied research that tests the value of using computers in music education, especially in the elementary schools. Investigations into the musical creativity of our youth are a necessity, as well, to provide more information on the possibilities and benefits of a more personally inventive, emotional and sensuous approach to music education. This study combined these two concerns, but there are a variety of problems that need to be examined in either area. A survey undertaken by the newly formed Canadian Music Research Council in 1974 (Vaughan) probing the dimensions of music research in Canada reported that Canadian Music and Creativity were two of the most often mentioned topics of concern regarding subject matter in music education. However, the number of controlled studies involving these topics were few at that time. Involvement in Electronic Music was listed as a potential model for action, along with Ethnomusicology and Interdiscipinary Studies. With the development of more music courseware since that time, the potential for more studies in Electronic Music has increased significantly.

The history of technological contributions in music education (e.g., films, videotapes, television, tape and phonograph recordings, amplification systems) leads us to

believe that the computer could play an important role as yet another instructional tool. Perkins (1985) has written about the "fingertip effect" of information-processing technology. He states, "The computer serves as a surrogate companion, a metaphor for mind, a symbol of involvement in modern society. It seems most of all a locus of projection, a remarkably plastic symbol that people assimilate to their predilections, rather than a rigid presence to which people accommodate" (p. 15). This places the computer in the promising position of being a medium for further music composition research.

The topic of composition in music education research is a fruitful one, based on the results of studies already cited. A longitudinal study examining the developmental changes in the computer music compositions of children in elementary school could answer some of the questions remaining in this current correlational study. Does guided music instruction make a difference in composition stage achievement? What percentage of primary students could produce higher-level compositions if they received more practice time with the computer? Other computer music composition programs should be used, as well, such as Bamberger's newly released Terrapin Music Logo, Silver Burdett's Beginning Music series, or other high quality courseware.

The variables of private music lessons and school music achievement were pertinent to this study, and yielded interesting results. A follow-up study needs to be conducted that specifically examines these factors. Such a study should use a reliable questionnaire for private lessons, and should use an achievement test designed for the primary grades such as the Silver Burdett Music Competency Tests (Grades 1-6) or the Simons Measurements of Music Listening Skills (Grades K-3) (Mitchell, 1985, p. 1379). As well, stratified sampling techniques should be employed to ensure equal representation from groups of children involved in taking private music lessons as well as those who are not.

Subjects participating in this study displayed enthusiasm and excitement during each session. The prospect and reality of free play and individual composition appeared to be highly motivating. Research into students' affective responses to compositional activities could yield more insights into the value of this area of music involvement. Ethnographic research could provide information not available through the design of the current study.

In addition to further investigations involving computers, creativity, private music lessons and music achievement as they relate to composition levels, the final recommendation is for continuing research into

musical development during the childhood years. Musical experiences from birth to the teen years lay important foundations for the expression and enjoyment of the musical heritage that belongs to us all.

Concluding Summary

The purpose of this correlational study was to describe the developmental differences in the computer music compositions of elementary school children in Grades 1 to 5, and to investigate the relationships between computer music composition stages and age, gender, music aptitude, school music achievement, and private music lessons.

To achieve this purpose, an instrument was designed for the analysis of computer music compositions collected from 195 subjects (99 males and 96 females) attending three suburban public schools. These compositions were categorized into one of three developmental stages of formal structure: (1) Sound Scribblings, (2) Patterned Fragments, and (3) Structured Composition. After this descriptive analysis phase, composition stages were then correlated with subjects' ages, gender, music aptitude test scores as measured by Gordon's "Primary Measures of Music Audiation", school music achievement levels and the presence or absence of private music lessons. Pearson product-moment correlations were calculated to determine the strength and direction of these relationships.

On the basis of the findings and the limitations imposed by the study, results indicated that computer music compositions of elementary school children Grades 1 to 5 can be characterized according to developmental stages of formal structure. These composition stages were related to age, gender, tonal aptitude, a composite music aptitude measure, school music achievement and private music lessons. Composition stages were not related to rhythmic aptitude. When given an opportunity to compose original music with the assistance of the Songwriter computer music composition program, female children ages 10 to 12 who have higher tonal music aptitudes, who are regarded as higher achievers in public school music classes and who have had private music lessons, are more likely to create a higher-order Stage Three music composition than other children in elementary school, Grades 1 to 5.

Implications for education are that investigations into young children's creative music compositions can yield important information. The computer is a useful tool for illuminating children's musical understanding. As early music instruction is vital to the development of children's musicality, the application of computers in the music classroom needs further testing, and the involvement of children in creative music-making needs to be promoted.

REFERENCES

Arenson, M. & Hofstetter, F.T. (1983). The GUIDO system and the PLATO project. Music Educators Journal. 69(5), 46-51.

Barnhart, C. & R. (Eds). (1984). World Book Dictionary. Toronto: World Book, 2.

Bigge, M.L. (1982). Learning Theories for Teachers. New York: Harper & Row, 19-20.

Bradley, I.L. (1973). Creative processes in the development of aural and visual discrimination. Canadian Music Educators Association. 15(3), 26-32.

Brown, R., Deutsch, D., Benson, W., & Day, R. (1979). Language and music as communication: a discussion. Music Educators Journal. 65(6), 69-71.

Davidson, L., McKernon, P., & Gardner, H. (1979). The acquisition of song: a developmental approach. Unpublished manuscript. Harvard Project Zero and Boston Veterans Hospital.

Dodson, T.A. (1980). The effects of a creative-comprehensive approach and a performance approach on acquisition of music fundamentals by college students. Journal of Research in Music Education, 28, (1), 103-109.

Fairholm, B. (1986, February). Introduction to melodic design. (Available from the North Vancouver School District, 721 Chesterfield St., North Vancouver, British Columbia).

Flohr, J. W. (1984, March). Young children's improvisations: A longitudinal study. Paper presented at the Music Educators 49th National In-Service Conference, Chicago, IL.(No. 255 318)

Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. New York:Basic Books, 99-127.

Gordon, E. E. (1979). Primary Measures of Music Audiation Test Manual. Chicago: G.I.A. Pub., 2.

Gordon, E. E. (1980). The assessment of music aptitudes of very young children. Gifted Child Quarterly, 24(3), 107-112.

Gordon, E. E. (1981). The manifestation of developmental music aptitude in the audiation of "Same" and "Different" as sound in music. Chicago: G.I.A. Publications, 3-5.

Hawn, C. (1978). Implications and adaptations of Piaget's theory of play for the preschool music curriculum. Council for Research in Music Education, 56, 21-24.

Hedden, S.K. (1982). Prediction of music achievement in the elementary school. Journal of Research in Music Education, 30(1), 61-68.

Hobbs, C. (1985). A comparison of the music aptitude, scholastic aptitude, and academic achievement of young children. Psychology of Music, 13(2), 93-98.

Hofstetter, F. T. (1981). Computer-based aural training: the Guido System. Journal of Computer Based Instruction, 7(3), 84-92.

Karma, K. (1973). The ability to structure acoustic material as a measure of musical aptitude: I. Background Theory and Pilot Studies. Research Bulletin 38. (Report No. SO-007-541). Finland: Helsinki University. (ERIC Document Reproduction No. ED 092 440)

Karma, K. (1975). The ability to structure acoustic material as a measure of musical aptitude: Part 2. Test construction and results. Research Bulletin 43. (Report No. SO-008-547). Finland: Helsinki University. (ERIC Document Reproduction Service No. ED 110 402)

Karma, K. (1980). The ability to structure acoustic material as a measure of musical aptitude: 5. Summary and Conclusions. Research Bulletin (Report No. SO-012-971). Finland: Helsinki University. (ERIC Document Reproduction Service No. ED 196 743)

Kuhn, W. (1974). Computer assisted instruction in music: Drill and practice in dictation. College Music Symposium: Journal of the College Music Society. State University of New York, Binghampton, 14, 89-101.

Lamb, M. R. & Bates, R.H.T. (1978). Computerized aural training: An interactive system designed to help both teachers and students. Journal of Computer-Based Instruction, 5(1-2), 30-37.

Lee, J. L. (1980). The effectiveness of a computer-assisted program designed to teach verbal-descriptive skills upon an aural sensation of music. Council for Research in Music Education Bulletin, 62, 43-44.

Leonhard, C. (1982). Humanizing music in a mechanized society. Music Educators Journal, 68(9), 23-24.

Lillemyr, O.F. (1980). A 'new' music education program field experiments in the first and fourth grade of the Norwegian Comprehensive School. Scandinavian Journal of Educational Research, 24(3), 132-156.

Lowenfeld, Viktor & Brittain, W.L. (1957). Creative and Mental Growth. New York: Macmillan.

Mitchell, J.V. Jr. (1983). Tests in Print III. Lincoln: University of Nebraska Press, 527.

Mitchel, J.V. Jr. (1985). The Ninth Mental Measurements Yearbook, Vol. II. Lincoln: University of Nebraska Press, 1205-1207, 1379-1382.

Mitzel, H. E. (1981). On the importance of theory in applying technology to education. Journal of Computer-Based Instruction, 7(4), 93-98.

O'Brien, J.P. (1972). Stop the conveyor belt -- The kids want to get off. Music Educators Journal, 58(9), 25-29.

Papert, S. (1980). Mindstorms: Children, computers, and powerful ideas. New York: Basic Books.

Perkins, D.N. ((1985). The fingertip effect: How information-processing technology shapes thinking. Educational Researcher, 11-17.

Pond, Donald. (1980). The young child's playful world of sound. Music Educators Journal, 66(7), 38-41.

Pond, Donald. (1981). A composer's study of young children's innate musicality. Council for Research in Music Education Bulletin, 68, 1-12.

Prevel, M. (1973). Emergent patterning in children's musical improvisations. Canadian Music Educator, 15, 13-15.

Prevel, M. (1974). Helping children build their own music. In F. Callaway (Ed.), Challenges in music education (pp. 88-93). University of Western Australia: Department of Music.

Province of Manitoba. (1983). Manitoba music assessment program 1983: Preliminary report. Department of Education: Curriculum Development and Implementation Branch.

Province of Manitoba. (1985). Manitoba art & music assessment program 1983: Final report. Department of Education: Curriculum Development and Implementation Branch.

Province of Manitoba. (1985). Summary of the 1985 survey of educational computing in Manitoba. Educational Technology Program.

Reese, S. (1973). New music breeds creators, not repeaters. Music Educators Journal, 59(5), 65-67, 107-109.

Rudolph, T. E. (1984). Music and the Apple II: Applications for music education composition and performance. Pennsylvania: Unsinn Publications.

Schafer, R.M. (1976). Creative music education. New York: Schirmer Books.

Schmitt, Sister Cecelia. (December, 1971). The thought-life of the young child: Jean Piaget and the teaching of music. Music Educators Journal, 58, 22-26.

Scott, C. R. (1979). Pitch concept formation in preschool children. Council for Research in Music Education 59, 87-93.

Serafine, M. L. (1980). Piagetian research in music. Council for Research in Music Education Bulletin, 62, 1-21.

Serafine, M. L. (1983). Cognitive processes in music: discoveries vs. definitions. Council for Research in Music Education Bulletin, 73, 1-14.

Sigel, I.E. & Cocking, R.R. (1977). Cognitive development from childhood to adolescence: A constructivist perspective. Toronto: Holt, Rinehart and Winston.

Simons, G. (1984). Modes and areas of research in early childhood musical development, 1971-1981. Canadian Music Educator, 26(1), 31-36.

Smith, Allen. (1981). Piaget's model of child development: Implications for educators. Clearing House 55, 24-26.

Thomas, R.B. (1970). Manhattanville Music Curriculum Program Synthesis. Elnora, New York: Media, Inc.

Travers, R. (1982). Essentials of Learning. New York: Macmillan, 410-413.

Vaughan, Margery M. (1974). Dimensions of music research in Canada. Canadian Music Educators Association, 16(1), 9-12.

Vaughn, A.C. (1977). A study of the contrast between computer assisted instruction and the traditional teacher/learner method of instruction in basic musicianship. Dissertation Abstracts International, 38, 3357A.

Walker, R. (1984). Innovation in the music curriculum: III. Experimental music in schools and the separation of sense from reason. Psychology of music, 12(2), 75-82.

Wantman, S., & Bardige, A. (1984). Songwriter [Computer program]. Tarrytown, NY: Scarborough Systems. (ISBN Apple 0-916377-10-5)

APPENDICES

****

COMPUTER MUSIC COMPOSITION STAGE
ANALYSIS FORM

SONG TITLE _____ SCHOOL _____

CHILD'S NAME _____ GRADE _____

COMPOSITION DATE _____ ANALYSIS DATE _____ STAGE _____

****

STAGE 1 CHARACTERISITICS SOUND SCRIBBLINGS

Random experimentation
No motif (repeated or contrasted)
Motor energy
No apparent plan or purpose

STAGE 2 CHARACTERISTICS PATTERNED FRAGMENTS

Rhythmic patterning
Improvisational melodic organization
Song fragments
Experimental phrases and combinations
Motif: 1 or 2 measures
Repetition, variation or contrast of motif
More than one distinct motif
Phrase: group of notes making a coherent unit

STAGE 3 CHARACTERISTICS STRUCTURED COMPOSITION

Melodic and rhythmic structures and sequences
Mastery of outline of song
Larger formal structures
Theme: combined motifs and their variations
Melody: combined themes
Repetition, variation or contrast of themes
Formal properties:
  Binary form: AA AB AABB AAB
  Strophic form: AAAA (repetition)
  Processive form: A A1 A2 A3 (repetition with variation)
  Ternary form: ABA (return) AABA (song) ABACA (rondo)
  Additive form: ABCD (nothing repeats, new ideas added)
Unity

NUMBER	TITLE	STAGE
1	SLIDING	2
2	R.M. SPECIAL	2
3	MADONNA	3
4	SAILING SHIPS	1
5	ONE NOTE REST SONG	3
6	SINGING BLOCKS	3
7	NOTES	1
8	BOOGY MAN BAND	2
9	THE BEST	1
10	MIX-UP SCALE	2
11	STAR	3
12	FLYING NOTE	1
13	FANCY SONG	2
14	HAPPY DAYS	2
15	HAPPY SONG	3
16	LONG SONG	1
17	JUMPING BOX	3
18	WONDER BOX	2
19	GIGGOLO	3
20	OZZY	2
21	NARLEY	3
22	PURPLE SEA	2
23	TWIDDLING THUMBS	2
24	UPS	1
25	MUSIC INSTRUMENT	2
26	SUNSHINE	2
27	SWEET SONG	1
28	MASTERPIECE	2
29	ABC	2
30	PRETTY SONG	2
31	POPPIES	3
32	FUNNY SONG	1
33	HEART ARROWS	2
34	CLOUD NINE	2
35	MINT	1
36	SOLO SOLO	1
37	THE BAND	2
38	JUNGLE	2
39	THE TOY	2
40	CLOWN SONG	2
41	FUNSHINE	2
42	RAMBO	2
43	DOLCE	3
44	SHORT	1
45	DO IT WRONG	1
46	SILLY LITTLE SONG	2
47	LOVE SONG	2
48	RAINBOW NILE	3
49	COUGAR & RABBIT	3
50	SPINAL TAP	1

NUMBER	TITLE	STAGE
51	HIGH & LOW	1
52	FAMILY	1
53	SPRING	2
54	DO RE MI FA SO LA	2
55	HAPPY	2
56	APPLE PLAYER	2
57	FERRIS WHEEL	2
58	POWER SONG	1
59	BLUE FLOWERS	2
60	COMPUTER SCOOTER	2
61	SAILING BOAT	2
62	TUNES	1
63	RETURN TO OZ	2
64	HUGABEAR	2
65	FRUIT BERRY	1
66	TRANSFORMERS	2
67	FOOTBALL	2
68	SNOWFALL	1
69	SUPER COMPUTER	1
70	MASTERSONG	1
71	BADGER	2
72	CIRCUS	2
73	ELECTRIC COMPUTER	2
74	SUPER	1
75	MUSIC SONG	2
76	STAR WARS	2
77	CLASSICAL	1
78	VIVE	1
79	EAGLE	2
80	RUMPELSTILTSKIN	1
81	DANGER	2
82	SUPER MICHAEL	1
83	A FRIEND	1
84	RAINBOW SONG	2
85	GLORIA	3
86	SNAKES & SPIDERS	2
87	FIRE ENGINE	2
88	STAIRS LINE	1
89	HAPPY WEEKS	1
90	DIRT BIKE SPEED	2
91	IT IS THE RIVER	2
92	WHITE LACE	3
93	DEBORAH	2
94	FUN TIMES	2
95	MISSING TEETH	2
96	CABBAGE PATCH	2
97	HAPPY BIRTHDAY	1
98	A GRASSY MEADOW	1
99	DOMINO	2
100	HAUNTED HOUSE	2

NUMBER	TITLE	STAGE
101	PONY TAILS	2
102	SCALES	2
103	SINGING BOX	2
104	DO RE MI	3
105	MUSIC BOX	2
106	BLUE	2
107	GINGER	1
108	BEAT IT	2
109	FRECKLES	2
110	DO RE MI FA	1
111	CRAZY SONG	2
112	GARFIELD	2
113	TOY BOX	2
114	WEIRD SONG	2
115	TERRIBLE SONG	1
116	RIDICULOUS	1
117	MUSICAL STEPS	2
118	GLAD & SAD	2
119	SUNGLASSES	1
120	ODIE	2
121	MUSICAL SONG	2
122	HEATHCLIFFE	3
123	THE WAVES	2
124	THE SCALE	1
125	JINGLE BELLS	1
126	ZOMBIE	2
127	LITTLE SONG	1
128	PERFECT SONG	1
129	PRETTY SONG	2
130	TWIDDLE	2
131	TWIDDLE-DEE	1
132	GO DOG FUN	1
133	GHOST HOUSE	2
134	ORANGE HOUSE	2
135	TWILIGHT ZONE	2
136	VAMPIRES	2
137	CRYSTAL SKY	2
138	SPACEBOARD	1
139	CATS	2
140	HOCKEY PUCK	2
141	THE FLOWERS	3
142	FLOWERS GROW	1
143	CURIING	2
144	THE BIRD	1
145	TWINKLE BAT	2
146	SUNFLOWER	2
147	SPACESHIP	1
148	ELEPHANTS	2
149	THE LAMB	2
150	THE DIRTY CAT	2

NUMBER	TITLE	STAGE
151	TOY	2
152	DOWN & UP	1
153	LOVE SONG	1
154	BLUE	2
155	ZOO	1
156	TONE SONG	1
157	TWISTED SONG	1
158	UP & DOWN	1
159	A PRETTY SONG	2
160	RED	1
161	T-BAR	2
162	SILENT WRITER	2
163	SAD TEDDYBEARS	3
164	ANYTHING	2
165	ADVENTURE	2
166	MIXED MELODIES	3
167	SUNI	3
168	LIGHT SONG	3
169	INDIAN DANCE	3
170	MONKEY	3
171	E.T.	2
172	ROARING LIONS	2
173	ROCK & ROLL JAZZ	2
174	NEAT SONG	1
175	NAIL POLISH	2
176	FAST BREAK	3
177	TWILIGHT ZONE II	2
178	ZIP-ZAP	2
179	LONGEST SONG	2
180	KEYBOARD	2
181	MYSTERY SONG	2
182	I WANNA ROCK	2
183	COREY HART SONG	2
184	ZIG-ZAG	2
185	CAROUSEL	2
186	AMADEUS	2
187	SLATE	2

APPENDIX B

LETTER OF INTRODUCTION

AGREEMENT FORM AND QUESTIONNAIRE

COMPUTER MUSIC PROJECT

CRANE SCHOOL
AGREEMENT FORM

CHILD'S NAME _____ GRADE_____

QUESTIONNAIRE ON PRIVATE (NOT SCHOOL) MUSIC LESSONS

****

(Please do not write answers on this next line. Research Use Only.)

SC ___ GR ___ # _____ A _____ FMMA ____ T ____ R ____ C ST ____ M F

****

PLEASE ANSWER THE FOLLOWING QUESTIONS BY PLACING CHECKS IN THE BLANKS.

1) WHERE has your child taken private music lessons?

____ Private Individual
____ Suzuki Talent Education Institute
____ Yamaha Music School
____ Orff Music for Children
____ Other _____

2) WHAT KIND of private music instruction has your child had?

____ keyboard (piano, organ, accordian)
____ strings (violin, cello)
____ voice / choir
____ band instrument
____ music theory
____ guitar / ukelele
____ percussion / rhythm instruments
____ dance
____ other _____

____ group
____ individual

3) During WHICH YEARS has your child had private music lessons?

____ 1975 - 1976
____ 1976 - 1977
____ 1977 - 1978
____ 1978 - 1979
____ 1979 - 1980
____ 1980 - 1981
____ 1981 - 1982
____ 1982 - 1983
____ 1983 - 1984
____ 1984 - 1985
____ 1985 - 1986

****

My child has permission to participate in this computer music project.

Date _____ Parent's Signature _____

PLEASE RETURN THIS FORM TO YOUR CHILD'S SCHOOL AS SOON AS POSSIBLE.

THANK YOU.

THE UNIVERSITY OF MANITOBA

FACULTY OF EDUCATION
Department of Curriculum
Humanities and Social Sciences

Winnipeg, Manitoba
Canada R3T 2N2

February 11, 1986

Dear Parents,

Your son or daughter is enrolled in an elementary school classroom which will be participating in a University of Manitoba computer music project during the next few weeks. In order for your child to be eligible, the attached Agreement Form must be filled out and returned to school as soon as possible. Your permission is needed for your child to take part in the following activities:

1) Complete the Gordon Aptitude Test of "Primary Measures of Music Audiation", requiring 30 minutes of time.

2) Use an Apple microcomputer music composition program called "Songwriter" during the regular schoolday, requiring 15 minutes per week for one month. Music compositions will be recorded.

The cooperating teacher in your child's school will be either the regular classroom teacher, or the music teacher. The graduate student carrying out this research is a music educator with special training in the application of computers in early childhood and elementary music education.

All of the information gathered during this study will be confidential. Assigned student numbers, rather than names, will be used. Results, which will be available in the fall of 1986, will be reported on a group basis. There will be approximately 150 students from four schools involved in this research project on music development in elementary school children.

Please indicate your consent by your signature on the attached Agreement Form, and return it with the requested information to school as soon as possible. You are invited to inquire about procedures if you wish more detail by telephoning 475-3048. Thank you for your interest and your prompt reply.

Mrs. Anne Gudmundson
Graduate Student
University of Manitoba

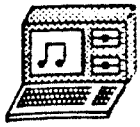
Cooperating Teacher

APPENDIX C

COMPUTER MUSIC COMPOSITION RECORD SHEETS

COMPUTER MUSIC PROJECT

SONGWRITER
COMPUTER PRACTICE CHECKLIST

APPENDIX D

MUSIC CLASS ACHIEVEMENT LEVEL FORM

COMPUTER MUSIC COMPOSITION PROJECT

STUDENT CLASSROOM MUSIC ACHIEVEMENT EVALUATIONS

SCHOOL _____ TEACHER _____ GRADE ____

DIRECTIONS: The school music teacher will assign students to one of each of the following three music achievement categories according to demonstrated knowledge and skills in class:

HIGH ACHIEVEMENT

AVERAGE ACHIEVEMENT

LOW ACHIEVEMENT

APPENDIX E

TABLE OF MUSIC COMPOSITION STAGE BY GRADE

SAS

TABLE OF G BY S

GRADE STAGE

FREQUENCY PERCENT ROW PCT COL PCT	.	1	2	3	TOTAL
1	0	18	22	1	41
	.	9.57	11.70	0.53	21.81
	.	43.90	53.66	2.44	
	.	33.33	20.00	4.17	
2	0	17	25	1	43
	.	9.04	13.30	0.53	22.87
	.	39.53	58.14	2.33	
	.	31.48	22.73	4.17	
3	7	8	27	2	37
	.	4.26	14.36	1.06	19.68
	.	21.62	72.97	5.41	
	.	14.81	24.55	8.33	
4	0	6	20	8	34
	.	3.19	10.64	4.26	18.09
	.	17.65	58.82	23.53	
	.	11.11	18.18	33.33	
5	0	5	16	12	33
	.	2.66	8.51	6.38	17.55
	.	15.15	48.48	36.36	
	.	9.26	14.55	50.00	
TOTAL	.	54	110	24	188
	.	28.72	58.51	12.77	100.00

SAS

TABLE OF G BY P

GRADE PRIVATE MUSIC LESSONS

FREQUENCY PERCENT ROW PCT COL PCT	.	0 No	1 Yes	TOTAL
1	0	28	13	41
		14.58	6.77	21.35
		68.29	31.71	
		24.78	16.46	
2	1	31	11	42
		16.15	5.73	21.88
		73.81	26.19	
		27.43	13.92	
3	0	29	15	44
		15.10	7.81	22.92
		65.91	34.09	
		25.66	18.99	
4	2	12	20	32
		6.25	10.42	16.67
		37.50	62.50	
		10.62	25.32	
5	0	13	20	33
		6.77	10.42	17.19
		39.39	60.61	
		11.50	25.32	
TOTAL	.	113	79	192
		58.85	41.15	100.00

APPENDIX G

TABLE OF MEAN APTITUDE TEST SCORES

Table of Mean Aptitude Test Scores by Grade

Aptitude Test Scores	Grade 1	2	3	4 *	5 *
Tonal					
n	40	41	42	28	33
Mean	69.2	65.9	67.4	77.8	75.3
Std	29.4	24.9	21.5	20.2	17.7
Rhythmic					
n	40	41	41	29	33
Mean	71.8	69.9	69.8	77.4	76.5
Std	20.7	24.5	21.1	15.3	17.0
Composite					
n	39	40	41	28	33
Mean	70.2	70.8	67.9	78.0	76.2
Std	23.8	23.9	21.0	16.8	16.6

* Note: Grade 4 and 5 percentile scores were based on the Grade 3 norms.