Children's use of personal, social and material resources to solve a music notational task:

A social constructivist perspective

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ABSTRACT

In this inquiry, I examined how young children use their personal, social and material resources to solve a music notational task. I asked 13 children, ages 5-9 to notate a song they learned the previous week, sing it back, explain what they did and then teach the song to a classmate the following week. I used Lightfoot and Davis' concept of portraiture as a qualitative research methodology to collect, code, analyze and interpret my data. Data included the children's invented notations and videotaped transcripts of their actions as they created their notations and taught the song to a classmate. Sociocultural Vygotskian developmental theory, activity theory and Bakhtin's dialogic theory provided the interpretive lens through which I examined how the children used their resources as mediational tools to complete the task.

Findings revealed that children who had no previous music training used increasingly sophisticated representational strategies to notate a song, and that they were able to refine their notations when singing the song from their notation, teaching the song or when prompted by an adult or a peer. I concluded that the peer-peer situation was a motivating force for triggering a recursive process of reflections-on-actions and knowingin-action. Classmates' questions, comments and their singing played a critical role in moving the children to modify their notations and their singing, verbal explanations and gesturing in ways they did not do alone or with me.

Analysis of the children's notations, verbal explanations and teaching strategies provided insights not only into what they knew about music, but also their appropriation of the cultural conventions of writing and their aesthetic sensibilities, as gleaned from their choice of symbols, colours and how they presented their symbols on the page. Interviews with parents, teachers and school principal provided contextual background for interpreting the children's notations and how they approached the task. This study shows the value of adopting a social constructivist approach to teaching the language of music. It also demonstrates that researching the products and processes of children's invented notations from a social constructivist perspective enables more detailed portraits of children's musical and meta-cognitive understandings.

RÉSUMÉ

Dans cette thèse, j'ai examiné le processus par lequel de jeunes enfants utilisent leurs ressources personnelles, sociales et matérielles pour résoudre une tâche de codification musicale. Treize enfants de 5 à 9 ans ont représenté une chanson apprise la semaine précédente. Je les ai invités par la suite à expliquer le système symbolique qu'ils ont inventé et à apprendre la chanson à un camarade de classe.

Je me suis inspirée du concept de « portraiture » de Lightfoot et Davis comme méthodologie de recherche qualitative pour recueillir, codifier, analyser et interpréter des données. Les données comprenaient des notations inventées par les enfants, les transcriptions filmées de leurs actions pendant la création de leurs représentations symboliques et les stratégies de leur enseignement de la chanson à un ami de classe. Les théories socioculturelles d'apprentissage de Vygotsky, la théorie d'activité et la théorie dialogique de Bakhtin ont servi de cadre à mon interprétation du rôle de médiateur des ressources utilisées par les enfants pour compléter la tâche.

Les résultats ont démontré que les enfants sans préalable de formation musicale, utilisaient des stratégies de plus en plus sophistiquées pour représenter graphiquement une chanson. De plus, après la réalisation de la chanson à l'aide de leurs notations ou suite aux commentaires d'un adulte ou d'un pair, les enfants pouvaient améliorer leur symboles pour mieux représenter la chanson. J'en déduis que l'interaction entre les pairs était une force motivante pour déclencher un processus de savoir-en-action. Les questions et les commentaires venant des amis de classe ont joué un rôle décisif pour inciter des enfants à modifier leurs notations et à perfectionner leur chant, leurs explications verbales et leurs gestes différemment qu'en ma présence.

L'analyse des notations des enfants, leurs explications et leurs stratégies pour enseigner la chanson révélaient non seulement leurs connaissances musicales mais aussi la façon dont ils s'appropriaient des conventions culturelles du langage écrit ainsi que leur sens esthétique démontré dans leur choix de symboles et couleurs, et dans l'organisation graphique sur la page. Les entrevues avec des parents, des enseignants et la directrice d'école ont fourni un fond contextuel permettant ainsi une meilleure interprétation des notations et de l'implication des enfants à effectuer la tâche. Cette étude illustre l'importance d'une approche socio-constructiviste pour enseigner le langage musical. De plus, cette recherche démontre que l'investigation d'une perspective socio-constructiviste des produits et des processus des notations inventées permet la création de « portraits » plus détaillés sur des connaissances musicales et metacognitives des enfants.

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This opus is dedicated to the memory of my dear father, Charles Carroll, who instilled in me the values of perseverance and play, and for whose spirit, integrity and wisdom, I am eternally grateful.

OVERVIEW OF THESIS

1

In the Prelude, I reflect on the teaching, clinical and research experiences that led me to the present inquiry. I identify my guiding epistemological assumptions and define key conceptual terms that I use thoughout this dissertation.

Chapter 1 sets the research stage. I present an overview of research on children's written representations of music, identify my research questions and provide a rationale for my inquiry. I examine research on children's written representations in art, math and language in order to situate my study and its potential contribution to the research on children's invented musical notations.

Chapter 2 provides a conceptual and philosophical frame for this inquiry. I explain the principal tenets of Vygotsky's sociocultural theory of development as it relates to my research questions. I highlight two key constructs of my inquiry: self-regulation and mediation. I then examine two theories that inform this inquiry: Activity theory and Bakhtin's dialogic theory.

In chapter 3, I describe the research methodology and methods. I show how the five features of 'portraiture': context, voice, relationship, emergent themes and aesthetic whole, provide the epistemological and methodological frame for this inquiry. I explain how I gained access to the research site and I introduce the research participants. I then provide details of my process for collecting, transcribing, coding, analyzing and interpreting the data.

In chapter 4, I analyze the children's notations in the form of descriptive portraits that accompany each notation. I then draw on videotaped data transcripts to illustrate the creative process by the children used available resources to notate the song and sing it back in the second visit and teach the song to a classmate in the third visit.

In chapter 5, I discuss my findings from a Vygotskian social constructivist perspective with a focus on the mediating qualities of the children's use of resources and the role of the social context in generating moments of change and *knowing-in-action*. I illustrate the ways in which the children's notations reveal or conceal their musical understandings. I highlight emerging themes that illuminate both the similarities and qualitative differences in the data as they relate to my research questions. In chapter 6, I discuss the implications of my inquiry for educational and research practice. I offer recommendations for classroom teachers and music educators that arise from this doctoral inquiry and I suggest possible directions for future research.

In the Postlude, I reflect on the research process and my challenge as researcher.

PRELUDE

MOTIVATION FOR THE STUDY





The 'sound' play that I illustrate in Figure 1 emerged from a music therapy session with a 7-year-old boy with language delay. We created this 'sound' play together as a way of improving his speech. My interest in children's invented notations and singing as a source of and resource for learning stems from my experiences as a piano teacher, music therapy educator, researcher and clinician (Carroll, 1986, 1989, 1996). Before teaching young piano students to read standard music notation, I would ask them to sing a song they knew and play it on the piano, using their singing to guide them to the corresponding notes on the keyboard. Later, I would invite them to create their own notations to represent the character and form of a piece of music they were learning, as another way of understanding and internalizing the music. These creative tasks often helped them play the music by memory, that is, by drawing on their sound image of the piece, as they represented it on paper, the children did not need to refer to the musical notes. As a music therapist in a short-term psychiatric treatment centre in Mannheim, Germany, I often invited the children and adolescents, with whom I worked, to draw while listening to music and then use their drawings as the starting point for a 'sound' exploration. The music, drawings and sound creations became objects for reflecting and sharing. In my clinical work with children having difficulties expressing themselves verbally, I used invented notations as a 'fun' way to help them discover or re-discover the joy of communicating verbally. Specifically, I guided them as they created their own music using lines or dots, and then played these invented notations on a kazoo or slide whistle as illustrated in Figure 1. Children seemed to be less self-conscious and more willing to take risks during this type of sound play. When words were added, the children's playful melodically intoned speech phrases often increased their willingness to speak.

My motivation to examine more closely how singing might serve as a mediator for speech was inspired by my extensive observations of children, who were able to imitate increasingly complex rhythmic patterns on a drum, but were unable to sequence more than two or three words together. Adding words to the rhythmic patterns enabled the children to gradually increase the length of the target speech phrases (e.g. play $drum \rightarrow I play drum \rightarrow I play drum with Debbie$). In my MA study (Carroll, 1996), I focused on young children with Down syndrome to examine the mediating role of music in the development of speech. I found that children who were exposed to melodically intoned target phrases during twelve-weekly individual play sessions with the researcher were able to complete phrases or respond to questions more quickly than children to whom the phrases were spoken. Children who sang the target phrases were more attentive, more self-regulated and played around with the speech patterns by modifying and extending them. These findings provided evidence of the mediating qualities of music in increasing the quality and quantity of children's verbal output. One explanation for these findings is that intrinsic to the melodic pattern is a sense of structure and expression.

My interest in children's invented notations was revived when I read Davidson and Scripp's study (1988) during a graduate reading seminar on children's musical development. Davidson and Scripp drew on Bamberger's formative studies of children's drawing of simple rhythms (1978, 1982) to explore the developmental trajectory of children's musical thinking as seen through the 'window' of their written representations of melodic patterns. Their research was carried out at Harvard's Project Zero, a program of research dedicated to examining the processes involved in the production and understanding of the one or more of the arts. Co-founded in 1967 by Nelson Goodman and Howard Gardner, Project Zero's main objective is to use research findings to draw general principles for sound curriculum planning. Much of the project's studies involve problem-solving tasks. I decided to use the Davidson and Scripp study as a starting point for my own research project on children's invented notations of a song (Carroll, 1995). Findings from this study, which I describe in chapter 1, whetted my appetite to further explore the processes of children's musical thinking, specifically how children use available resources to invent notational symbols to represent a song and then teach the song to a classmate.

Epistemological assumptions

My guiding epistemological assumptions are that: 1) every individual has an inner drive to make sense of the world and to reach his potential, 2) there are many forms of knowing, and 3) music is an embodied source of knowing. These assumptions provide the philosophical and theoretical foundations for this doctoral inquiry into the processes and products of children's invented musical notations.

Every individual has an inner drive to make sense of the world and to reach his potential

My belief that individuals have an inner drive to make sense of the world leads me to adopt a humanistic stance from which I examine closely how childrenas-meaning-makers embrace the challenge of representing a song on paper and then teaching it to a classmate. Humanistic theory assumes that everyone has the potential for self-actualization (Maslow, 1968; Rogers, 1961, 1980). The need to know and to make sense of the world around is rooted in our "evolutionary past" (Bruner, 1990, p.71). Kenny's (1989) characterization of the person as a "self-organizing system that naturally moves towards wholeness and expansion, given the strengths and limitations of the conditions in the field" (p.84), reflects my own humanistic and situated view of human growth and development. I envision inner drive as a spark that needs to be fuelled through goal-oriented, resource-rich, culturally sensitive and socially-mediated activity. When individuals are engaged in meaningful activity in which there is as much freedom as possible and as much structure as necessary, they become self-regulated learners and develop a sense of agency as meaning-makers. Self-regulation occurs when an individual's previous experiences become a source and resource for future learning experiences (Vygotsky, 1962, 1978).

As a music therapist, I aim to create a playful therapeutic space, a *field of play* for my clients that mirrors the primary mother-infant nurturing relationship. In so doing, I help them access their inner resources and realize their potential. In Vygotskian terms, I help them move into their zone of proximal development (ZPD). As a researcher examining the processes and products of children's invented musical notations, I adopt a social constructivist stance with a focus on children's self-regulated actions within the context of a socially-mediated task.

There are many forms of knowing and music is a natural, embodied source of knowing

There are many pathways to knowing and multiple ways of revealing what one knows. As an embodied form of knowing, music can be a rich source and re-source for constructing new knowledge. Music therapists, Nordoff and Robbins (1977) refer to the "individualized musicality inborn in each child" (p.1). Robbins (1991) refers to our innate musicality as "a self-creating force within the self" (p.69).

The conviction that music is a natural and empowering resource for personal and interpersonal knowing has been shaped by my experiences as a pianist, piano teacher, music therapy clinician, educator and researcher. I have been particularly intrigued by my observations of children's innate musical abilities since I began practicing music therapy in 1978. Musical behaviours, be they expressed through singing, playing a musical instrument or symbolically representing the musical dimensions of a song on paper, including rhythm, pitch, duration and phrasing, often reveal children's musical understandings that are seemingly resistant to illness or handicapping condition, and that may otherwise be hidden and inaccessible. In my music therapy clinical work in adolescent psychiatry, I observed how adolescents listen to each other, maintain eye contact, follow the beat and even initiate rhythms and melodies during group improvisations. "Being in the music" (Aigen, 1996) revealed their interpersonal skills despite difficulties in sustaining these skills outside of the shared musical space. The experience of connecting with others while playing music enabled these troubled adolescents to gradually connect with others in their everyday life. "Being in the music" is a playful way of being and be-coming. Reflecting on the word "being", I note that it usually refers to an animate object, a living being. However, in the literal sense, 'being' is also an active verb happening in real time (e.g. note the suffix ing), which implies a process of 'coming into being' or 'be-coming'.

Vygotsky (1978) highlights the potential for growth and empowerment that is inherent in play: "In play it is as though he [the child] stands taller than himself. As in the focus of a magnifying glass, play contains all developmental tendencies and is itself a major source of development" (p.102). An underlying assumption that "play is a major source of development" is pertinent here, particularly if one considers that children's formative experiences of multiple literacies typically occur through singing, dancing, music-making, drawing and pretend play. Singing (language of sounds) often leads the way to story- telling (language of words); dancing (language of the body) leads to dramatic play; and drawings (language of images) lead to reading and writing (Winner, 1997). Play fosters flexibility and adaptability. In his book, "Free Play: The power of improvisation in life and the arts", Nachmanovitch (1990) contends that "play enables us to rearrange our capacities and our very identity so that they can be used in new and unforeseen ways" (p. 43).

I value play as a state of being that stimulates divergent thinking and seeing with new eyes. As a piano teacher, I would enliven technical exercises entitled "Walking", "Running", "Hopping" and so on by asking my students to demonstrate a movement that I could do while they played the exercise on the piano. I would then invite them to choose an exercise for me to play while they moved in the manner I suggested. As a music therapy educator, I often devise playful tasks to explore the effects of a musical interval, which refers to the distance between two musical sounds. I ask two students to improvise on a certain interval on their choice of instruments. At the same time, I ask two other students to move as their classmates explore the selected musical interval in as many ways as possible by varying the register (high/low), speed and character of their playing. These creative tasks offer opportunities for students to embody their experience of each interval, either by playing the interval on a musical instrument or by moving freely to it. The experience of moving together in close proximity in response to two notes that are close together on the keyboard, such as C and D, might feel tense or playful. Dancing further apart in response to a larger interval, such as C to G, might feel grounded on the one hand and liberated on the other hand. Through these playful, novel group experiences, music therapy students enhance their understandings of the potential therapeutic effects of musical intervals.

In my roles as music therapy researcher, clinician and educator, I have observed how involvement in music-based activity can make implicit, embodied knowing explicit and generate new ways of knowing about music and about oneself. In the case of this doctoral inquiry, I am interested in how children access embodied forms of knowing, such as singing and gestures (e.g. fingerpointing) in playful ways to generate new forms of knowing, such as creating a notational system to represent the 'Lulu' song and then teaching it to a classmate.

Definition of key conceptual terms

I use the following conceptual terms in this thesis and describe how I use them. Note that several terms end with 'ing'. These active verbs represent actions happening in real time, and, by their very nature, involve a process, as I described earlier.

Field of Play: This term refers to the interactive playspace where individuals learn. I envision the *field of play* as an expanding space, rich in resources and rich in possibilities for making meaning - a place where work and play are one and the same. As I explain in chapter 2, I situate my doctoral inquiry in a *field of play*, which I conceptualize to mean the same as Vygotsky's (1978) zone of proximal development and Gadamer's (1975) *fusion of horizons*.

Zone of proximal development (ZPD): Vygotsky (1978) defined the ZPD as "the distance between the actual developmental level as determined by independent problem-solving and the level of potential development as determined through problem-solving under adult guidance" (p. 86). Indeed, the notion of the ZPD as an intellectual space, or *field of play*, suggests an active child making meaning within the context of an active and supportive environment. The ZPD is a key concept of Vygotsky's sociocultural theory of development which I explain in chapter 2.

Fusion of horizons: This term refers to the hermeneutic notion that understanding is created through dialogue.

Resource: I use the word *resource* to mean the same as *tool*. From a Vygotskian social constructivist perspective, children's singing, gesturing and talking are tools, or semiotic resources that mediate their actions. The word *resource* also describes the idea of drawing from the source or drawing out the meaning that one has attributed to an object, concept or image and then using it as a *re-source* for the next act of meaning.

Act of meaning: is a conscious act; it is about making connections between a past experience, that is, knowledge already stored in the mind and a present action.

Knowing and knowledge: From a constructivist stance, I distinguish knowing and knowledge. Knowing refers to the process of using available resources to make meaning. The process of knowing or acquiring personal knowledge occurs in real time. I use this term to mean *knowing-in-action*. Knowledge appropriated in this way becomes a personal resource, which can be used to construct new knowledge. Knowledge refers to the accumulated acts of meaning that can serve as resources for constructing new knowledge.

Knowing and understanding: There is a distinction between knowing about something, and knowing or understanding something. In his dictionary of qualitative inquiry, Schwandt (2001) notes that understanding literally means "to stand under, to grasp, hear, get, catch or comprehend the meaning of something" (p. 262). For example, one might know about something or know the facts about a subject matter. The German

word for the verb to know is *wissen*, which is associated with knowledge or expertise. This does not necessarily mean that one knows or understands the subject. Schwandt refers to the German word for understanding, *verstandnis*, which means comprehension, insight and appreciation (p. 262). Chemical scientist, Polanyi (1969) conceptualizes knowing as a process that moves between focal awareness, or a conscious understanding of a particular aspect of knowledge, and subsidiary awareness, or an intuitive understanding of a particular aspect of knowledge.

Musical understandings: I use the term musical understandings to refer to the children's awareness of the elements of sound - pitch, duration, intensity and timbre, or quality of sound, and music - rhythm, melody, harmony, form, character and style. In this inquiry, the children's musical understandings are manifested by their singing, talking, gesturing and invented musical notations.

Meta-cognitive understandings: I use the term meta-cognitive understandings to refer to the rational thought processes of perceiving, producing, reflecting and evaluating that underlie all areas of learning. In this inquiry, I examine the children's meta-cognitive understandings that are manifested by the ways they use their singing, invented notations, talking and gesturing to solve the multiple challenges embedded in the music notational task.

Knowing-in-action and reflections-on-actions: These terms were coined by Schon (1987) to describe an approach to educating reflective practitioners, including teachers, therapists and medical doctors. These terms capture a sense of movement associated with learning, a dynamic process of making implicit knowing explicit and symbolic. Knowing-in-action resonates with the term, mind-in-activity that Vygotsky (1962) used to describe the emergent nature of knowing that occurs during goal-oriented socially-mediated activity. Schon (1987) describes reflections-on-actions as "thinking back to, or back on, what we have done in order to discover how our knowing-in-action may have contributed to an unexpected outcome" (p.26). In the case of this doctoral inquiry, reflecting on actions may help children become aware of possible mismatches between the sounds as sung and the notational symbols as written, and take action to come up with a possible solution(s) to the problem. In turn, these actions may impact new knowing-in-action. I use these terms to describe the dynamic recursive process of doing, or knowing-in-action, and reflecting, or reflections-on-actions by which the children notated the song and then taught it to a classmate. Knowing-in-action and *reflections-on-actions* are essentially meta-cognitive processes.

Task: is what someone assigns to another. The music notational task I give the children includes a series of problem-solving challenges that range from learning a song, notating it and then teaching the song to a classmate.

Activity: is what someone does to make sense of a task. I use the word to refer to the children's actions in response to the music notational task.

Goal-oriented socially-mediated activity: I use this term to describe the actions that take place within a supportive space where support and guidance from me as the researcher and the children's classmates can help them complete the problem-solving music notational task. The notion of *knowing-in-action* within the context of sociallymediated activity is a useful way for understanding that knowledge is personally and socially constructed, a notion that is central to a social constructivist perspective.

Mediation: This term refers to the use of physical (material) tools and symbolic (psychological, cognitive) tools or resources to achieve certain ends. Vygotsky (1978) considered language in all its forms as the primary tool for mediating and regulating actions, which in turn leads to the development of higher mental functioning. I use the term to refer to the children's uses of personal, social and material resources to solve the music notational task.

Notational researchers: a term I used to describe researchers who study children's invented musical notations.

Fonts and formatting

The voices of the children, classmates and adults who participated in this inquiry appear in italics in the body of the text and in the narrative and descriptive vignettes that emerge from my videotaped data transcripts. Extended quotes or dialogues between participants are indented and written in script form, single-spaced and size 11-point. Extended scholarly quotes are indented, 1.5 spaced and size 11-point. Fieldnotes, reflective and methodological memos are indented, single-spaced and size 11-point. Certain terms are italicized throughout the text, such as *field of play, reflections-on-actions* and *knowing-in-action*.

CHAPTER ONE

INTRODUCTION: SETTING THE RESEARCH STAGE

Much of knowing, acting and understanding in the arts, the sciences, and life in general involve the use - the interpretation, application, invention and revision - of symbol systems. (Goodman, 1984, p. 152)

Goodman (1984) noted that far from being "matters of passive contemplation or pure inspiration" (p.157), symbolic systems involve constructive processes of discrimination and organization. Symbolic representations are "vehicles for the conception of objects" (Langer, 1957, p.61) and as such the products *and* processes of invented symbolic systems can reveal what people know and how they come to know the subject matter they are representing. Goodman (1978) succinctly stated that "comprehension and creation go together" (p. 22). Goodman and Langer, among others (e.g. Arnheim, 1974; Winner, 1997, Winner & Hetland, 2000), considered the arts as essentially cognitive domains. Perceiving and producing art requires the ability to process and manipulate symbols. The conscious rational thought processes involved in the creative, aesthetic process of symbolically representing the arts are problem-solving acts.

The products and processes of children's invented musical notations of a song are the focus of this inquiry. I adopt a social constructivist stance and draw on Lightfoot and Davis' (1997) concept of portraiture to examine the ways children with no formal music instruction negotiate a series of creative musical problem-solving tasks. I observed 13 children in kindergarten, grades 2 and 4 as they completed a multilevel notational task. In the first visit, I taught them the 'Lulu' song illustrated in Figure 2. The following week, during the second visit, I asked them to notate the song in any way they wished so that someone who did not know the song could sing it just by 'reading' the marks on their paper. I also asked them to sing the song from their notation and then tell me about the symbols they created. A week later, in the third visit, I invited them to teach the song to a classmate.



Figure 2. 'Lulu' song in standard musical notation

Through videotaped recordings of the children, textual analyses of their notations as well as audio-taped conversations with parents, teachers and principal, I sought to paint a textured portrait of children's musical and meta-cognitive understandings. Consider the notations created by 5-year-old Al and 9-year-old Earl, two of the 13 children ages 5-9 who participated in this inquiry. Figures 3 and 4 are the notations Al created.



Figure 3. Al's 1st notation

Figure 4. Al's 2nd notation

The two drawings consist of a series of colourful shapes and patterns that bear no discernible relationship to the 'Lulu' song, except for a hint of a link between the recurring 0000X patterns in line 3 in Figure 3 and the ascending 'a' pattern. Figure 5 illustrates the two notations that Earl created. The two upper lines of 'Lo's represent his first notation. The two lower lines represent his second attempt at notating the song.

ФĻ, Lu L. Earl

Figure 5. Earl's two notations

Earl's first notation does not provide many musical clues about the song except for the last three Loo's that he underlined in red; they represent the last three notes of the song, or the 'c' pattern, as I indicated in Figure 2. In contrast, Earl's second notation is more song-specific. He differentiated Part 1 (Line 1) from Part 2 (Line 2). He represented 'a' with a series of 'Lo's, the recurring 'b' patterns with 'Loo Lo Lo' and 'c' with Loo Loo Looo. According to Earl, "L-o is small and the L-o-o is a long one." For a long note, he added an 'o' and he underlined the 'Loo's to show that they were accentuated.

The notations that Al and Earl created do not reveal the full extent of their musical understandings or how they approached the task. The colourful shapes and patterns that Al created do not reveal the playful manner in which he created them, nor how he slid his finger rhythmically and gracefully across the shapes on his paper while singing variations of the song. Nor do his notations show how he stood up at each long 'Lu' when learning the song in the first visit or how he sang the song with a robust voice that could be heard above the others. Earl's notations do not reveal what he learned from doing the notational task, as illustrated in the next excerpt taken at the beginning of the third visit. Earl explains to his classmate, Kim, what he did in the previous two visits:

We sang the song and then the other time we came, we wrote the song down and we had to get it like -,. we had to <u>think</u> and then <u>write</u> it down as best as you can and <u>here's my</u> <u>mistake</u> (he points to the lines on top half of paper) and <u>here's my good one</u> (he points to lines on bottom half of paper)......It goes *Lo Lo Lo Lo Loo Loo Lo* (he points to each 'Lo' while singing the 'a b' pattern). You see these two (he points to the 6th & 7th Lo) and one with the <u>two</u> o's ? They go longer than the one with the one 'o' (he smiles and looks at Kim), it doesn't go long. And there's four here (he points to the first four Lo's in

line 2) and this is the ending (he points to the last three 'lo's on the page) so you know how to end it.

Earl's 'good' notation (second notation) does not show what he learned from his 'mistake' (first notation). Earl's knowing-in-action (Schon, 1987) was illustrated by his attention to musical detail and his speed of actions as he confidently engaged in a recursive process of drawing and verifying 'Lo's whilst providing an ongoing critique of his actions: "This one should go away"; "This one's supposed to have an extra 'o'". By examining the processes by which Al and Earl invented their notations, I was able to observe them as agents of their own meaning-making processes; Al used his drawing to shape his singing in playful and creative ways while Earl used his singing and talking to shape his notations. I also examined the manner in which my comments and Kim's questions prompted Earl to construct and reconstruct his notation numerous times in the third visit. This included adding musical notes above each 'Lo' in order to refine the 'fit' between the sounds of the song and the symbols on his paper. Clearly, a study of the product of children's invented notations alone would limit knowledge of children's musical and meta-cognitive understandings. The overview of research on children's invented notations in the next section provides a context for situating my inquiry and for understanding its contribution to music notational research.

Research on children's invented notations

Notations as windows on musical thinking

Based on the premise that children's symbolic representations of music are critical 'windows' for revealing their intuitive musical understandings, an increasing number of researchers have examined the nature and developmental course of children's musical thinking through analysis of their invented notations. Table 1 presents an overview of the research literature on children's invented musical notations from 1975. The researchers' names appear in the first column followed by the year(s) of publication. The musical sources of the children's notations are listed in the third column. They include short rhythmic sequences, melodic phrases, familiar and unfamiliar tunes, children's original instrumental or vocal compositions, as well as excerpts from the classical music repertoire.

Table 1

Overview of Research on Children's Notations

RESEARCHER	YEAR OF PUBLICATION	MUSICAL SOURCES FOR NOTATIONS
Bamberger	1975, 1978, 1982, 1991, 1998, 2004	Rhythm sequences clapped, familiar tune
Upitis	1987b, 1990a, 1992, 1993	Rhythm sequences clapped, short melodic phrases, unfamiliar tune
Davidson & Colley	1987	Rhythm sequences clapped,, familiar tune (Row, row) and unfamiliar tune from a taped recording
Davidson & Scripp	1988, 1989	Rhythm sequences and melodic phrases, familiar (Row, row) and unfamiliar tunes
Davidson, Scripp & Welsh	1988	Familiar tune
Upitis	1987b, 1990a, 1992, 1993	Familiar, unfamiliar and original * tunes
Hair	1993	Familiar tune (Twinkle, twinkle)
Gromko	1994	Unfamiliar tunes
Carroll	1995	Familiar tune sung to 'Lu' (Oh when the saints)
Gromko	1996	Familiar tune (Rain, rain go away) and original rhythmic clapping sequence
Domer & Gromko	1996	Familiar tunes
Gromko & Poorman	1998	Unfamiliar 3-note musical phrase
Auh & Walker	1999	Original tunes- vocal or instrumental
Brand	1999	Unfamiliar Zulu tune from a taped recording
Kerchner	1999	Excerpts from classical music repertoire
Barrett	1997, 1999, 2000, 2001, 2002	Familiar and original tunes, original compositions vocal or instrumental
Barrett	1999/2001	Excerpts from classical music repertoire
McCusker	1999, 2001	Familiar chant and tune, original composition
Elkoshi	2004a, 2004	Musical phrase played on wooden block, cowbell and drum

*original tunes refer to children's own compositions

While these notational studies have reported that children represented the music they heard through unique and increasingly refined notational systems, and that notations of unfamiliar tunes yielded a greater variety of symbols (Upitis, 1990a), little is known about how children use available resources, such as singing and verbal explanations, to create their notations. Examining the resources children use to create their written representations of music can illuminate their *knowing-in-action* and the processes by which implicit, intuitive knowledge becomes explicit and symbolic.

Bamberger was the first to study the children's symbolic representations of rhythmic patterns. She noted that children without prior music training tend to first represent the "figural" features of the rhythm (grouping slow and fast notes), which she describes as action-drawings or playing-drawings. Children then create more formal or metric representations with attention to the underlying beat. Bamberger also examined the intuitive strategies that children use to build familiar tunes with Montessori bells, which are bells of different musical pitches that are mounted on a wooden base. She observed that at first, children placed the bells according to the order of occurrence of the sounds of the tune (action-path). When they realized there was a discrepancy between the action-path and the unfolding of the tune, or the tune-path, they used one of two strategies. They adopted an adaptive stance by continually re-assigning the musical function of certain bells, or they adopted a corrective stance by re-ordering the bells according to pitch, from the lowest sounding bell to the highest. In this way, children created a fixed frame of reference. Bamberger's studies of children's written representations of music are pertinent to my inquiry in three important ways. First, Bamberger draws attention to how children develop strategies to represent rhythmic patterns on paper. Second, she addresses the role of the researcher and teacher in helping children refine their representations. Third, Bamberger indirectly invited children to teach the song to another person by asking him to "put some instructions on paper so someone else can play the tune on the bells" (1978, p.191).

While some researchers (Davidson & Scripp, 1988; Gromko, 1994; Carroll, 1995, Gromko & Poorman, 1998, Brand, 1999; McCusker, 1999/2001) have examined the relationships among various forms of musical expression including children's singing, perceiving, reading and notating, only three studies (Carroll, 1995; Brand, 1999; McCusker, 1999/2001) have examined children's use of these resources as they notated a song on paper. In my 1995 notational study, I observed the interaction among children's singing of a song, their verbal explanations and their invented notations of the song. These findings roused my curiosity to examine more closely how children use their singing to create their notations and how their verbal explanations might lead them to a more refined understanding of the musical dimensions of the song.

In their three-year study of 39 children aged 5-7, Davidson and Scripp (1988) asked the children in two individual sessions each spring to do the following: 1) reproduce short rhythmic and melodic patterns, then notate them; 2) sing "Row, row, row your boat", 3) write the song down so that someone who doesn't know the song can sing it back, and 4) read back your notations and explain your drawings. Findings from this study revealed that,

at age 5, children with no previous notational instruction/training use pictures and shapes to represent the unfolding of the sounds of the song. At age 6, they begin to organize these units to show rhythmic groupings or melodic contours. By age 7, children are able to represent multiple features of the music, including the units of sound, groupings of units by rhythm or shape of the melody. Davidson and Scripp also analyzed the children's singing and notations, and reported that by the age of seven, the gap was closing between their ability to sing the song and represent it on paper. They concluded that the ability to sing a song with increasing rhythmic and pitch accuracy could predict notational accuracy. However, they did not consider the interplay between the children's singing and their invented notations as they solved the task. Moreover, although Davidson and Scripp asked children to describe their invented notations, these descriptions were not presented in the study. Nor did the authors write about how the children might have used their verbal explanations as a resource to modify or enhance their notations to more clearly represent the song.

Brand (1999) examined children, aged 6, 9, and 12 years, as they learned a song by singing along with a taped recording of it and playing the tune on an instrument, and then notated the song and explained what they did. She concluded that children would benefit from more opportunities to regulate their learning by using all available resources. This study is significant for the moment-to-moment documentation of the children's actions. However, Brand paid no attention to the interactions between these actions, namely, how actions in one mode of expression shaped and were shaped by actions in another.

McCusker's study (1999/2001) is noteworthy for its attention to children's *emerging literacy* and to the possible influences of gender, language literacy and out-of-school experiences. McCusker defines emerging literacy as "the process of becoming literate - what researchers refer to as emergent literacy - that is as important as the product of literacy achieved" (p.1). McCusker was referring to Gunn, Simmons and Kameenui's (2000) synthesis of the research on emergent literacy, which focuses on the relation between individual literacy productions and the experiences that precede them. Gunn et al explained that "the term emergent denotes the developmental process of literacy acquisition and recognizes numerous forms of early literacy behaviour" (p.3). McCusker asked children, aged 5-7 years, who were enrolled in a university-sponsored music program, to notate a familiar rhythmic chant, a familiar song and an original piece of music. Findings revealed that the children would sing or chant during the notational activity, and even move to the underlying beat. However, McCusker did not discuss how

the children used embodied rhythmic responses as a resource in shaping their notations. McCusker also asked classroom teachers to comment on the children's strengths and needs regarding their language literacy. As well, she designed a questionnaire to elicit information from parents about their children's musical and language literacy experiences. To my knowledge, McCusker is the first notational researcher to go beyond the children's notational activity to examine the possible influences of children's home and school literacy-related experiences on their notations.

My doctoral inquiry into the processes and products of children's musical notations builds upon my 1995 study that, as I indicated earlier, was based on procedures carried out by Davidson and Scripp (1988). An unexpected finding of my 1995 study emerged from my observations of the children's actions as they completed the notational task. I noticed that they increasingly used their singing, fingerpointing and verbal explanations to create their written symbolic representations. Indeed, the percentage of these children who drew on their singing to make their notations fit the song increased from 40% at age 5 to 80% at age 7 and finally to 100% at age 9. Children negotiated the sound/symbol 'fit' by adding, deleting, replacing symbols or by articulating the rhythm of the melodic patterns with their index finger as they pointed to each symbol while singing back their notations. At age 5, there was a considerable gap between the children's ability to sing the song and notate it on paper. Yet, in creative and playful ways, as I illustrated in the case of Al, children in my 1995 study made the song fit the drawing by repeating or modifying the song. By age 7, they were increasingly able to represent the sounds they were singing. There was a growing sense of involvement and purpose in trying to make the drawing fit the song, as seen in the case of Earl. Three of the five 7-year-old children in my 1995 study realized that their singing did not match their notation and quickly modified it. Two children made a second drawing that more accurately represented the musical dimensions of the song. In contrast, all the 9-year-old children modified their drawings in various ways to make them correspond with the song as they sang it. I also observed that some children had difficulty singing back their notations. This difficulty might have been due to an emerging realization that their singing did not correspond with their notation, yet they had not reached the stage where they might have considered modifying their notation to match their singing.

Golomb (1974, 2002) observed that young children often expressed dissatisfaction with their works of art but did not attempt to 'correct' them. My 1995 study also highlighted possible situational influences on the children's capacity to represent a song on paper, including the specific musical dimensions of the given song (e.g. rhythm, pitch,

duration and phrasing), the presence of a generic text rather than the song lyrics and the nature and content of the verbal protocol. For example, there were higher rhythm scores in my study as compared to higher pitch scores in the Davidson and Scripp study (1988). Perhaps, the use of the generic text 'Lu' helped to direct the children's attention in my study to the rhythmic features of the song rather than to the melodic features, thereby accounting for the higher notational levels in rhythm as compared to those in the Davidson and Scripp study. This explanation might be considered in light of their claim that 7-year-old children represented isolated rhythmic patterns by grouping their symbols together. However, as soon as the dimension of pitch and lyrics were introduced, rhythmic features appeared less often as they competed with pitch and song lyrics. Barrett (1999) also found that when the song text is present, children's notational focus shifts from the musical dimensions of the song to the lyric content, masking their capacity to represent on paper what they know about the musical features of the song. My decision to use the generic text 'Lu' was motivated by these findings. A second factor that might have accounted for higher pitch scores in Davidson and Scripp's study was the structure of the song itself. For example, children might have given more attention to the prominent descending melodic pattern, "Merrily, merrily, merrily, merrily...", thus accounting for significant improvement in pitch both in their singing and in their notations across the age groups. In contrast, the song I used in my study, "Oh when the saints go marching in" contains a relatively equal number of ascending and descending melodic patterns that never exceeds a range of six notes between the lowest and high ones.

A third factor that might have accounted for differences in the children's notations was the way in which the task instructions were given, namely guided versus unguided. Davidson and Scripp (1988) directed children's attention to specific musical features by asking them to "use any mark they wished to write down the music if it helped them remember the sounds of the rhythms or the melodies". I asked the children to "write down the song you just sang, in any way you want so that someone who doesn't know the song can sing it, just by looking at the marks on your paper." Tan and Kelly (2004) noted how the researcher's verbal protocol might draw attention to specific aspects of the task at hand, thereby masking other dimensions of the children's musical understandings. For example, Domer and Gromko (1996) suggested the musical dimension of pitch in their instructions to "draw the song on your high-low chart." Barrett (2000) found that, when asked to "find a way of writing down the sounds of the song so that you can remember it" (p.48), several children said there was no need for them to notate the song because they already remembered it. Consequently, she added the following instruction: "and/or someone else could work out how to sing it if you weren't here" (p.48). By shifting the

intended reader from the child to someone who did not know the song, Barrett aimed to elicit a notation that was song-specific. Similarly, in one of the earliest studies of children's written representations of music, Bamberger (1978) asked children to listen to a clapped rhythm pattern, clap back the rhythm and then "draw a picture of your claps so you can remember them next week or so someone else could play them" (p.181).

Opening the window to get a better view

As I illustrated in this literature review, there were certain factors, such as the nature of the sound source, the presence of lyrics versus a generic text, as well as the manner in which the task instructions were presented, that influenced the children's written representations of a specific sound source. Several researchers have questioned the metaphor of the "window" to conceptualize notational research on children's musical thinking. In Barrett's (2000) view, windows can obscure our vision; or at the very best, offer us only a partial view of the phenomena, concealing as much as revealing. Tan and Kelly's (2004) examination of college students' graphic representations of short orchestral compositions revealed that musically trained participants were more likely to create symbolic representations while most of the musically untrained participants drew images or a series of images that told a story. According to Tan and Kelly, "representations may not necessarily serve as an accurate record of listeners' perceptual abilities but can be taken to reflect what they find important to capture in the music" (p.207). When viewed as reflections of their musical understandings, children's invented notations may be incomplete, selective and might even be distorted (or misrepresented).

The data excerpts from Al's and Earl's representations of the 'Lulu' song illustrate that children's notations do not tell the whole story about what they understand about music; children's notations need to be examined together with their singing, gesturing and talking. At first sight, Al's notations look more like an elaborate patterned drawing of colours and shapes, which bear no resemblance to the 'Lulu' song. However, upon closer scrutiny, Al's understanding of the song is revealed by the ways he accounted for all the shapes on his paper through his inventive singing of the song and playful fingerpointing.

In her study of the invented tunes and notations of 5-year-old Gemma, Barrett (2000) found a discrepancy between Gemma's notations and her singing. Her simple pictorial notations revealed little about the musical intricacy of her invented tunes. These findings led Barrett to state that, "to rely on the evidence of her notation alone would present less than a partial view of her musical thinking." (p.58). Elkoshi (2004) found

that children's notations of selected rhythmic patterns revealed little about what they knew about music. She pointed out that children's verbal explanations as well as their playing of the rhythmic patterns on percussion instruments demonstrated a fuller view of children's musical understandings. Hair (1993) also observed that children's verbal explanations of what they did revealed a wealth of their knowledge about music. This knowledge however was not visibly evident in their primarily pictorial representations of "Twinkle, twinkle, little star". Hair cautioned researchers about making adult interpretations of children's drawings without listening to the children's points of view. Likewise, literacy researcher Dyson (1993) contended that children's writings cannot be separated from their talking and their drawings. She argued that to separate media is to separate form and sensibility; in short, it is "to destroy children's symbolic worlds" (p.79). Surprisingly, only a handful of notational studies have examined children's explanations of what they did (Bamberger, 1978; Hair, 1993; Carroll, 1995; Kerchner, 1999; Brand, 1999; McCusker, 1999/2001; Elkoshi, 2004a).

This review of the research literature on children's invented musical notations reveals that further research is needed to portray "more of the landscape of children's musical thinking" (Barrett, 2000, p.58). Children's notations must be studied in conjunction with the resources they use to create their notations of a song. Product and process must be seen as mutually shaping each other.

Statement of purpose and claim to originality

I aim to illustrate children's understandings by examining both the *products* of their understandings, that is, their invented musical notations of the 'Lulu' song and the *processes* of their understandings, that is, how children use available resources to complete the multilevel music notational task. While researchers have examined the nature and developmental path of children's musical thinking through the "window" of their written representations of music, no studies, to my knowledge, have examined how children use their singing, verbal explanations and body gestures to notate a song, nor how their use of these resources might reveal their *knowing-in-action*, or the ways implicit knowing is made explicit. I also observe the ways in which children teach the song to their classmates. Notational researchers have not yet shed light on this dimension of children's musical and meta-cognitive understandings. I could not find any notational studies that examine peer-peer collaborative problem-solving as, for instance, in the case of several studies of children's learning in math (Klein, 1999; Zack, 1994, 1995; Zack & Graves, 2001). I discuss these studies in my review of

literature on children's written representations in different disciplines. I also examine the factors that might influence how children make sense of a music notational task, including the nature of the task, child/researcher and peer/peer interactions as well as home and school-related literacy experiences. Furthermore, by adopting a social constructivist perspective to examine children's use of resources to notate and teach a song, and by framing my inquiry with the methodology and methods of 'portraiture' (Lightfoot & Davis, 1997), which I explain in detail in chapter 3, I hope to make a unique contribution to music educational research and to neo-Vygotskian research on young children's problem-solving.

Research Questions

Two principal research questions guide my inquiry. The first question addresses the products of children's invented notations of a song by focusing on their written symbolic representations of a song they have learned the previous week. The overarching question asks:

What are the features of the notational systems that children invent to represent the sounds of a song they have learned to sing?

The sub-question is:

What musical dimensions of the song do children represent on paper (e.g. pitch, duration, phrase groupings)?

The second question addresses the processes of children's invented notations of a song by focusing on the resources they use to complete a music notational task. The overarching question asks:

How do children use the resources available to them to complete a music notational task?

The sub-questions are:

What resources do children use to notate a song on paper?

What resources do children use while singing back their notation of the song?

What resources do children use to explain their invented notational system to me as the researcher?

What resources do children use to teach the song to a classmate?

Rationale for the task

The rationale for the music notational task I selected is rooted in my epistemological assumptions about how children learn. It centers around two interlocking principles that stress the educational value of tasks involving a series of novel problemsolving challenges. First, tasks have the potential to elicit multimodal forms of representation; and second, music notational tasks have the potential to enhance children's musical and meta-cognitive understandings. These principles highlight the value of problem-solving tasks as educational and research tools for generating multidimensional data on children's understandings.

Potential to elicit multimodal forms of understandings

The task is non-routine and builds on what children know, namely the 'Lulu' song that I teach them a week before they do the task. Its premise is based on a 'pretend' stance with an intended 'reader', which renders the challenge to notate a song on paper more realistic and therefore meaningful. I ask children to imagine someone who does not know the song and write it down on paper, so that the person can sing the song just by reading the symbols on their paper. I then ask them to pretend to be the person who does not know the song as they sing the song back from their notational symbols. I also ask them to pretend to be the teacher and teach the song to their classmate. By designing a task in the form of pretend play situations, I expect children to enter a field of play where, in the act of pretending, they draw on previously acquired knowledge, such as singing the 'Lulu' song, to create something new, such as a notational system to represent the 'Lulu' song.

There are no right or wrong answers; rather this type of task brings with it a challenge based on the notion that one begins with an entity that is fixed, namely a series of pitches that make up a melody. As a problem to be solved, this task invites divergent thinking, independent and collaborative actions, reflection and analysis. It is open-ended and creative in the sense that children can choose how to represent the sounds they sing and the manner in which they teach the song to a classmate. Children experience dealing with ambiguity and uncertainty as they negotiate and re-negotiate the 'fit' between the sounds of the song as they sing them and the written symbols they invent to represent the sounds. In this respect, the 'fit' is relative to the frames of reference that each child establishes and/or is attempting to construct. Establishing the sound:symbol 'fit' is a dynamic act and requires shifting perspectives if either the sounds of the song or the notational symbols are modified.
Goodman (1978) describes frames of reference as "systems of description" (p.3). He rejects, as I do, a reductionist view that all frames of reference be reduced to one system; rather "a reduction from one system to another can make a genuine contribution to understanding the interrelationships among world-versions" (p.4). From his relativist perspective, there are as many worlds, or ways of knowing, as there are ways of describing them. I am interested in how each child re-presents the song symbolically on a piece of paper. The accuracy of 'fit' is individual; it is 'right' if it fits with the child's own frame of reference, namely the song as he sings it. Accuracy of 'fit' is not to be compared against a norm of what is correct or incorrect; rather, the nature of the task allows children to take risks and make mistakes as they establish and re-establish the 'fit' between the sounds of the song and their notational symbols with guidance from a classmate or me. Recall how Al playfully adapted the many versions of his singing of the song to fit his shapes and patterns on his paper, whereas Earl adapted his notation to fit the song.

Gardner (1999) defines intelligence as the biological potential to make meaning in different ways to solve a problem or create products that are valued in a culture or community. The music notational task I designed invites children to bring into play and interplay their multiple intelligences, including:

- *musical intelligence*, namely singing the song and representing its musical dimensions on paper
- *syntactic and linguistic intelligence*, namely explaining their invented notational symbols to someone else
- *spatial-visual intelligence*, namely 'picturing' a song on paper
- *bodily kinesthetic intelligence*, namely pointing to the notational symbols on their paper while singing the song and using gestures (e.g. hand and/or body) to explain musical concepts like high/low, fast/slow
- *intrapersonal and emotional intelligence*, namely using their singing, speaking, gesturing and reading to invent a notational system to represent the 'Lulu' song
- *logical-mathematical intelligence*, namely showing the relationships among the symbols in terms of the musical dimensions of the song such as phrasing, duration, pitch and intensity
- *interpersonal intelligence*, namely demonstrating caring and empathy while teaching the song to a classmate

Potential to enhance musical and meta-cognitive understandings

The strength of the task lies in its potential to make implicit knowledge explicit. With access to different resources, children can discover what they know about music but did not know they knew. Singing a song is an embodied, temporal experience that can guide children in establishing a 1:1 correspondence between the sounds of the song and the notational symbols. Cox (2001) stresses the bodily basis of musical meaning, that is, we understand musical sounds by comparing them to sounds we have made ourselves.

Through their singing, children might *hear* what they know, for to sing is to make inner sound images audible. Through their writing, children might *see* what they know, because to write is to make thinking visible. Writing transforms speech and thought into an object of analysis (Vygotsky, 1962). The question posed by Bruner (1979), "How can I know what I think until I represent what I do?" (p.101) highlights the critical role of writing, or any other mode of representation, as a valuable tool for learning. Meek (1991) states, "In writing, it is like watching your own thinking, because we learn to order it" (p.48). As objects of reflection, children's invented musical notations can enhance their musical and meta-cognitive understandings.

From a researcher's point of view, the task allows for a closer examination of the "mind-as-action" (Wertsch, 1998). In the case of Earl, when he told me at the beginning of the third visit that he forgot how to sing the 'Lulu' song, I suggested he look at his notation. Upon reading his symbols that he created the previous week, he exclaimed, "I found the tune!" He re-discovered the song by reading what he wrote. Inventing musical notations before learning traditional notation can offer meaningful and playful experiences. These creative activities can also nurture musical understandings and develop a heightened sensitivity to music and its elements. It can whet children's appetite for other creative musical activities, such as composing, much like invented spelling has for young children's writing (Brasacchio, 2001; Ferreiro & Teberosky, 1982).

In the next section, I present a review of the literature on children's written representations in different disciplines. I begin with an overview of the evolution of children's symbolic representations of art, music, language and math. I then discuss relevant problem-solving research in each of these disciplines from an historical perspective. I critically discuss research that focuses on children's representations. I then turn to studies that examine children's problem-solving strategies within social and cultural contexts. I address methodological and theoretical issues and highlight the ways in which particular studies inform my research. In so doing, I continue to articulate the ways in which my inquiry aims to contribute to notational research and neo-Vygotskian research.

Research on children's written representations in different disciplines

Evolution of children written symbolic representations

Motivated by the idea that invented symbolic representations can provide a window on human cognition, many researchers have examined children's written symbolic representations of music, art, math and spoken language. Findings from these studies reveal that children are increasingly able to represent specific dimensions of a song, visual object, math computation or sentence. Research on early song development (McKernon, 1979; Hargreaves, 1986) indicates that children move from spontaneous singing, which is characterized by continuous sounds and experimenting with pitch, to singing a melodic outline followed by fragments of the tune and finally to increasingly more stable melodic and rhythmic patterns. Children's early representations of music and speech both rely on phonetic awareness, which is the ability to associate a sound with a written symbol. Studies of invented spellings (Clay, 1975; Ferreiro & Teberosky, 1982; Read, 1986; Wilde, 1997; Sipe, 2001) provide evidence of children's increasing capacity to master the conventional forms of writing. Sipe (2001) compares the process to a camera lens slowly coming into focus. Scribbles that bear little or no resemblance to the word to which it refers, gradually give way to graphic symbols that bear some similarity to conventional letters.

Children's ability to sing their first song, invent a notational system to represent a song or write a sentence, is the culmination of a long process of approximation that resembles early artistic development, in which a simple outline of a figure becomes increasingly detailed and object-specific. Klein and Starkey (1988) proposed a model of early arithmetic cognition that traces a parallel path - enumerative (1-1 correspondence), computational (sets of objects) and symbolic (formal numerical system). Children's evolving representational abilities in music, art and math can be traced back to Bruner's (1973) categories of representational thought, which he describes as enactive (motor actions), iconic (pictorial/images) and symbolic (emergence of a formal language system), and further back to Piaget's stage theory (1963). Piaget observed that during the preoperational phase, which is characterized by intuitive thought (2 to 7 / 8 years), there is a 1-1 correspondence between children's drawings and their original experience, with no evidence of organization or coding. During the concrete-operational stage, which is characterized by the beginnings of logical reasoning (7 / 8 to 11 / 12 years), children's representations are more detailed and organized according to the original experience. Most researchers agree that the evolution from simple non-representational forms to increasingly differentiated complex forms is a universal pattern, regardless of mode of expression. However, some researchers, among them Langer (1957); Vygotsky (1962, 1978), Arnheim (1969, 1974), Gardner (1980), Bamberger (1982, 1991, 1999), Hargreaves (1986), Winner (1997) and Golomb (2002, 2004) challenged Piaget's theory of artistic development. They argued that the developmental process is not strictly agerelated, nor is it a "unidirectional progression toward optical realism, a theory that ignores the diversity of cultural models" (Golomb, 2002, p.18). Rather it is a nonlinear, complex trajectory that involves the interplay of multiple factors, such as the role of language, motivation, available drawing materials, previous experiences with the medium and aesthetic sensitivity.

Arnheim challenged Piagetian thought that visual realism was the desired goal. He argued that copying reality is impossible because of the inherent differences between two-dimensional and three-dimensional worlds. Langer (1957 noted that the only dimension that a drawing shares with the actual three-dimensional object is the proportion of its parts. Take for example a pencil drawing of a rabbit. It might be recognizable as a rabbit with its long ears and short tail, but in reality, rabbits are not "flat and white, with a papery texture and a black outline round them" (p.69). She argues that "the picture is essentially a symbol, not a duplicate of what it represents" (p.68). Symbols are "vehicles for the conception of objects" (p.61). Lines, curves, sounds, have no fixed meaning apart from its context and the creator's explanations of what he did.

Vygotsky (1978) eloquently describes the evolution of children's written representations:

Make-believe play, drawing and writing can be viewed as different moments in an essentially unified process of development of written language (...) however erratic, disjointed or confused it may appear superficially, there is in fact a unified historical line that leads to the highest forms of written language. (p.116)

Gardner (1980) underlines the need to understand what drives the unfolding of children's drawings, but after that, one should not delineate stages in such a non-critical and so broad a fashion. He argued that once children have acquired a basic repertoire of symbols, they move easily between different media, even engaging in more than one at the same time - singing while playing an instrument, dancing or drawing; storytelling while playing with figures. There is a "delight in colour and form for their own sake" (p. 148). Consider Al, who pointed to his coloured patterns in creative and musical ways while singing an invented

version of the 'Lulu' song. Gardner further notes that when children enter school, their free, idiosyncratic expression declines in favour of increased technical competence (doing it the 'right' way) and socially accepted ways of thinking and doing.

Hargreaves (1986) describes early song development as a recursive movement between the child's own idiosyncratic construction of a song that he hears from others, and the formal properties of the song that he draws from his increasingly stable "sound" mental image of it. Similarly, Bamberger (1978, 1982, 1991) and other music notational researchers (Upitis, 1987b, 1993; Smith, Cuddy & Upitis, 1994) suggest that the movement from figural to formal representational strategies is not a unidirectional process and the ability to maintain a transaction between these two ways of knowing is crucial to musical development. I visualize this process as occuring on two planes simultaneously. On the horizontal plane, there is an ongoing negotiation between the imitation (or appropriation) of the symbolic systems of others (*social convention*) and the creation and re-creation of one's own symbolic systems (*personal invention*). On the vertical plane, I envision an upwards-expanding spiral movement towards increasingly sophisticated and detailed representations that retain personal expression to a greater or lesser degree.

In the next sections, I review selected relevant studies of children's written representations in art, language and math. These studies have not only challenged traditional, linear models of representational thought; they have also raised methodological and theoretical issues regarding the nature and characteristics of problemsolving tasks and the need to understand children's representations from a socio-cultural perspective and from the perspectives of children.

Written representations of art

Historical perspective

Two important events marked the beginning of the study of children's drawings growing interest in understanding children's minds and the availability of cheap paper and pencils. Kellogg's (1969) quest for understanding the roots of children's representational processes led the pre-school educator on a mission to collect children's scribbles. Kellogg identified twenty basic scribbles produced by children between the ages of two and three years from thirty countries. The scribbles included dots, lines (e.g. vertical, horizontal, diagonal, curved, zigzag, looped, spiral) and circles (e.g. multiple –line overlaid, multiple-line circumference, single crossed, imperfect). Although Kellogg contended that children's early scribble-pictures were meaningful productions and served as building blocks that underlie all symbolic representations, she did not study the children's own interpretations of their scribbles. Kellogg stressed the "self-reinforcing" and "selfteaching" processes inherent in scribbling. She might have been referring to the pleasure that children derive from making marks on paper, which is a natural expression of their explorative play. However, given the monumental scope of her research, Kellogg might not have been thinking of the way children's spontaneous speech and make-believe play helped to shape their drawing, nor how their drawings in turn helped them to make sense of their words.

In contrast, Matthews' (1984, 1999 as cited in Golomb, 2004) longitudinal observations of his three children yielded rich data on how children make sense of the marks they make, what Matthews refers to as action-verbalizations and actionrepresentations. For example, an ascending and descending melodic line can trigger a story about a boy climbing a mountain and coming down, accompanied by matching vocalizations, rising and falling in pitch. Consider the case of 5-year-old Eddie, who participated in my 1995 notational study. When I asked Eddie to explain what he just drew, he began to tell me a story about the boy from a faraway country. It went like this: The boy was walking along the dots to reach a plane to travel to an island. In a quick and articulate manner, he told me that he used dots so that the "little boy can remember how to sing the song". The dots moved to the right, then down "cause he had to walk all the way up here (points to the ascending dots) and then walk all the way down here" (points to the descending dots). When singing back the song, Eddie pointed to each dot and was only halfway across the page when the song ended. I asked him whether the boy kept on singing the song and, without missing a beat, he said, "three times", whereupon he sang the song a second, third and fourth time until he reached the final dot.



Figure 6. Eddie's notation

Motivated by the issues of universals and cultural influences, Golomb (2004) reported that vast numbers of children's drawings were collected by Kerschensteiner (1905), Paget (1932) and Golomb (1992). These drawings not only revealed children's increasing ability to depict features of an object ~ from simple schematic presentations of general features, such as tadpole drawings with arms emanating from circular forms, to more detailed representational forms and the relationships among them (e.g. appropriate proportions of limbs, head and trunk); they also highlighted the influence of the cultural setting. Paget developed a two-factor theory of development. He posited that children not only spontaneously produce figures that increasingly resemble the human form; they pass on their graphic styles from one generation of children to the next. Based on his collection of 60, 000 drawings made mostly by children living in non-Western countries, Paget concluded that drawing styles evolve somewhat independently from adult models and are the product of children's idiosyncratic problem-solving strategies, that is, children's drawings are both culturally and personally situated.

Golomb (1974, 2002, 2004) examined the influence of children's internal mental images on their drawings. She observed that children, ranging in age from six to nine years, produced more detailed representations of the human figure when parts were dictated as they completed the drawing task. Children also tended to draw figures with more careful attention to detail after they had done a series of movement exercises highlighting different body parts. In the case of my inquiry, when I taught the 'Lulu' song to the children, I told them how the song was constructed. I pointed out the recurring patterns by tapping the rhythm on my lap and moving my head slightly forward to emphasize longer 'Lu's. These verbal and gestural cues helped to reinforce the children's mental 'sound' image of the song. Researchers also considered the enabling or constraining influences of the material resources on the artwork of preschool and kindergarten children. Litt (1977) found that children drew more decorative drawings when using coloured markers as compared to using a pencil. Bassett (1977) noted that children produced more graphic representations when using cardboard cutouts and Golomb (1774, 2002) observed that the three-dimensional clay figures of children were more detailed than their figure drawings on paper. Results from these studies highlight the relations between the nature of the task, available resources and the children's graphic productions.

Drawing as meaning-making and problem-solving

Observing children in the process of creating their drawings enabled researchers to consider the interplay between children's words, gestures and drawings as well as

the multiple influencing factors on children's drawings. Some researchers, including Vygotsky (1978), documented the shift in thinking when children's scribbles come to mean something beyond themselves. These first drawings are embodied gestures and gesturing is often how children "complete" a picture to make sense of it. Vygotsky describes an 1895 study by Sully as an example of how children move from making seemingly meaningless lines on a piece of paper to using symbols intentionally to represent something else. A child spontaneously draws a spiral line and then shouts, "smoke, smoke!" Sully points out that, at first, children do not set out to draw something that is meaningful. However, by *naming* a drawing, children begin to understand that a drawing can have meaning, that is, meaning that they have injected into their drawings. Watson (2004) writes that "reading is an interpretive process" (p.89); the reader 'activates' the text to make sense of it in his own way. For example, 5-year-old Al made sense of his colourful shapes and patterns by 'singing' them in different and creative ways. In 'reading' his symbols, Al 'named' them, that is, he derived meaning from the experience.

As researchers began to pay more attention to children in the act of drawing, they realized that by watching what children do, hearing what they say *and* being sensitive to the manner in which they approached the task, they were able to paint a better picture of children's cognition. Golomb was particularly interested in the problem-solving strategies that children used to draw or sculpt a human figure. Whereas older children tended to adopt a corrective stance by modifying their creation to better fit the chosen model, she observed that younger children tended to adopt an adaptive stance by making sense of their drawings and sculptures in playful and creative ways through the use of verbal aids or pseudo-representational devices, such as "romancing", or making up a story. Like Al, Eddie made the *song fit his drawing*. While Al repeated parts of the 'Lulu' song up to five times to account for all the coloured shapes on his paper, Eddie made up a story about a boy who sang the song four times, as he walked with his finger along the dots just like the boy was doing in his story; in so doing he accounted for all the dots on his paper. Both Al and Earl made sense of the task in their own creative and playful ways, bringing into play and interplay their singing, talking and fingerpointing.

Golomb also noted that children often used words and gestures to identify the parts of the figure they were drawing or sculpting. They sometimes announced what they were going to do and how they would do it, which highlighted the gap between what they knew and what they produced. As I mentioned earlier, children might express dissatisfaction with their drawing, but they are either not yet able to or interested in correcting what they do not like.

Written representations of spoken language

Children's first written representations are expressions of their active exploration of the world. The playful "marks" or scribbles of a 2-year-old child often serve as starting points for a story about an object or imaginary situation. By 5 years of age, if not sooner, children begin to 'read' linguistic messages into their 'scribble-writing'. "That children grasp the representational nature of writing so quickly testifies to the fundamental place of representation in the schema through which they interpret their world." (Read, 1986, p.118). While there has been considerable research on children's emergent literacy from scribbling to understanding the sound-symbol relationship to writing letters and journals, I discuss several studies of children's invented spelling. I then review research on children's writing within a sociocultural constructivist framework (Maguire, 1997; Maguire & Graves, 2001; Maguire et al, 2005). I note how these studies are pertinent to my inquiry theoretically and methodologically.

Invented spelling

The ability to represent individual sound units of speech on paper that could be understood by others marks the beginning of written language. Children gradually begin to represent speech sounds by letters or graphic symbols, each one corresponding to a syllable (e.g. unit of sound). This is known as syllabic spelling, as illustrated in the example of a young child who wrote the following letters "ACDRPRWRENBTS" above his drawing of "A CATERPILLAR WEARING BOOTS" (Wilde, 1997).

The transition from using letters, or graphic symbols, to represent a unit of sound, to using the letters, each one corresponding to a letter of the alphabet (otherwise known as alphabetic spelling) becomes evident when children begin to ask how to spell a *word* rather than how to spell a *sound* (Read, 1986). Read provides an example of an invented spelling by a 5-year-old boy:

DOT MAK NOYS MY DADAAY WRX HIR THIS SI WER MI DADAA WRX

B KWIYIT

The boy's message reads: *Don't make noise*. *My Daddy works here*. *This is where my Daddy works*. *Be quiet*. Wilde (1997) notes that the spacing between sound groupings or individual words develop early on (e.g. ONES A BONUTIME = Once upon a time or AVRE WAR = everywhere).

Researchers of children's invented spellings view writing as a conceptual and a psycho-motor task. Writing is not about copying a model, but rather it is an "active interpretation of the models of the adult world" (Ferreiro & Teberosky, 1982, p.21); in short, writing is a discovery-oriented, problem-solving task. In their quest to "unveil the mysteries" of the evolution of children's writing, Ferreiro and Teberosky observed preschool children individually for 20-30 minutes as they completed a series of tasks and explained to the researchers what they did. The studies involved 4 to 6-year-old Latin American children from different social classes, who were asked to: a) write their name, b) write the name of a friend or family member, c) draw, then write something about the drawing, d) write familiar words, like mama and papa, e) write unfamiliar words and f) write a short sentence (my little girl sits in the sun). This research is pertinent for generating a developmental understanding of children's written language abilities. Noteworthy are the detailed *descriptions* of children as they completed the tasks and the *transcriptions* of the child-researcher conversations, specifically in the way they highlighted the researcher's role in guiding the children through the tasks and encouraging them to reflect on their actions. Sipe (2001) underlines the critical role of the teacher in supporting children's early attempts to spell:

Accentuating the positive qualities of children's attempts at meaning-making and communication, whether in reading of writing, is another of the major legacies of the paradigm shift from a readiness model to an emergent model of literacy. Researchers and teachers let children show what they could do and what they did know rather than what they had not mastered. (p. 265)

Clarke (1988) compared the effects of traditional spelling and invented spelling on the reading, writing and spelling ability of a hundred children. She found that the invented spellers wrote longer stories and had superior spelling skills. In a more recent study, Brasacchio (2001) did not find any difference in children's conventional spelling development whether they were encouraged to use invented spelling or conventional spelling in their own writing. However, as with Clarke, Brasacchio observed a difference in the quantity and quality of content. Children who used invented spelling wrote longer and more expressive texts than those who were expected to use conventional spelling. One logical explanation is that invented spellers were more at liberty to play with ideas and words when free of adults' expectations and norms. Kress (1982) suggests that instead of imitating a model, children should be encouraged to express themselves in writing so that a reader can understand what they are trying to convey. Similarly, I asked children to write the 'Lulu' song using any symbols so that a child from the faraway country could sing the song just by 'reading' their paper.

Writing from a Vygotskian constructivist perspective

Studies of children's writings from a sociocultural constructivist perspective are grounded in the belief that the word cannot be separated from the world (Freire & Macedo, 1987) or texts from contexts (Hicks, 1996; Maguire, 1997; 1999; Maguire & Graves, 2001; Maguire, Beer, Attarian, Baygin, Curdt-Christiansen & Yoshida, 2005). Maguire et al (2005) refer to the multiple contexts for examining children's literacies as "language places and spaces". The multiple spaces are where "locations of possibility are open for children to 'speak' and 'be'" (p.141). Space is a place for the creation of new worlds and for the discovery of new possibilities for 'selfhood' and for identity construction. From this perspective, children's written texts are seen as a reflection not only of what they know, but also of who they are and how they perceive themselves and others. I understand children's texts in the broadest sense to include the written representations of math, art and music (e.g. invented notations). Therefore I use the terms 'text' and 'notation' interchangeably in this paper.

Maguire (1997, 1999) examined the letters that 8-year-old Heddie wrote to a research assistant during a six-month visit to her native Iran. Maguire also examined Heddie's English and French texts from grades 1-4. In addition, she asked Heddie about her first experiences of coming to a new country. What I found interesting was the researcher's methodological shift from focusing at first exclusively on Heddie's letters to widening the lens to include her verbal reflections. In another study, Maguire and Graves (2001) examined the journal writing and patterns of language from children in grades 1-4. More recently, Maguire et al (2005) re-searched multilingual children's literacy practices and identity construction as they are expressed within the context of multiple interacting social and cultural "spaces" in which they live. These studies reaffirm the notion that children's texts not only reveal *what* children know or *how* they come to know, but *who* they are and how they present themselves (e.g. voice, sense of personal agency, evolving sense of self) in multiple language "spaces" and "places".

There are three important ways in which these studies resonate with my inquiry. First, the notion that written texts can reveal "multiple expressive modes" (Maguire & Graves, 2001, p.565) resonates with the notion that there are multiple forms of knowing. Second, the notion that texts cannot be separated from contexts provides a frame for understanding children's invented musical notations as inseparable from the social and cultural dimensions of their actions and embedded in "multiple, interacting spheres of influences" (Maguire & Graves, 2001, p.564). Third, these researchers embrace certain theoretical constructs, such as self-agency, situated activity and voice that are central to my inquiry. I would also broaden my inquiry to include an investigation of the manner in which children navigate between social and cultural conventions of writing and their own idiosyncratic ways of encoding musical dimensions of the 'Lulu' song. When viewed as an act of problem-solving, writing presents the overriding challenge of finding one's own voice that is unavoidably rooted in the voices of others (Maguire, 2001).

Written representations of math

Historical overview

Since the 1970s, mathematical research has focused on problem-solving largely because of the recommendation in 1980 by the National Council for Teachers of Mathematics. In the 1970s, educators and researchers were particularly interested in improving student's problem-solving abilities. To this end, mathematical research focused on isolating the factors that influence task performance. Factors included subject traits such as gender, cognitive and reading abilities as well as the nature of the task, instructional strategies and available resources. Lester (1980) cites several such studies in his critical review of mathematical problem-solving research. For example, Jerman found that children's reading ability and the complexity of the task were factors that predict student's 'error' rates. Dodson determined that "good" problem-solvers had superior verbal, math and reasoning abilities. Krutetskii's twelve-year study is noteworthy for its focus on children's learning styles as they solved a variety of tasks. He distinguished good problem solvers from poor ones according to their visual (geometric) and verbal (analytic) abilities. Krutetskii's attention to the children's actions as they solved a task as well as to their words during post-task interviews, pointed to future research on children's math representations. Other studies revealed the positive influences of psychological traits, such as willingness, perseverance and self-confidence, on children's problemsolving abilities.

These findings, which suggest that students would be better at solving problems if they were more self-confident, raise some important questions. What comes first: development or instruction? Must children reach a certain level of cognitive, social and emotional functioning *before* being able to benefit from instruction? Vygotsky (1962) probed these questions in a series of studies involving problem-solving tasks. His conclusions that instruction precedes development eventually led to the formulation of his sociocultural theory of development that I discuss in the next chapter. Other questions needed to be addressed. For example, how should researchers investigate children's

problem solving? Do the means justify the ends? In other words, is the process of isolating variables that ensure problem-solving success a worthy endeavour? Rather than trying to boost children's self-esteem in order that they get it 'right', problem-solving tasks should be seen as learning opportunities where the means *is* the end. Researchers and educators began to acknowledge that understanding *how* children solve problems and *what* they learn in the process was more important than whether or not they solved them, how much time they needed or how many computational errors they 'committed'. Shulman and Elstein (1975) developed a 'process-tracing' method to analyze problem -solvers' words and actions. Data-gathering methods included *thinking-aloud*, where problem-solvers were invited to express their ideas and ask questions during the process, *introspection*, or analyzing thinking during the process and *retrospection*, or analyzing thinking after the process.

Lester (1980) noted that the growing support for process-oriented research would require better methods for data collection and analysis. He underlined the importance of developing a set of problem-solving research tasks that would address real-life situations. He also recommended that researchers not only observe individuals of different ages and abilities, but also observe groups as they tackle a variety of problems to better understand the mutual interacting influences of the nature of the task as well as the individual and environmental support on children's problem-solving abilities. He also addressed the need for research that is rooted in a coherent theoretical framework such as a social constructivism.

More recently, mathematical researchers have focused on developing 'good' problem-solving tasks (McIntosh & Jarrett, 2000), namely problems that present realistic situations, stimulate creative thinking, accommodate diverse learning styles, include multiple steps and necessitate the use of trial-and-error strategies. From these perspectives, it is important that children create their own problems, discuss, explain and justify their strategies with peers and have a variety of available materials at their disposal (e.g. paper, pencil, three-dimensional objects) to symbolically represent their thinking (Charlesworth, 2000).

Masingila and de Silva (2001) designed a 'good' problem-solving task that linked out-of-school and in-school mathematics. Their study is grounded in Realistic Mathematics Education (RME), which calls for reconstructing knowledge through "progressive mathematization" (de Corte, 1995). Based on the assumption that children like to play miniature golf, Masingila and de Silva asked a class of grade six students to

reproduce the curved side of a miniature golf-hole. The children visited a miniature golf course, drew sketches of it and took its measurements. In class, they explored different ways to improve on their drawings by sharing their drawings and working together to refine them. Each child kept a journal to document strategies and ideas. The goal was to use the models that the children developed to guide them in enhancing and generalizing their mathematical understandings. This problem-solving task is an excellent example of one that encourages "genuine" learning (Courts, 1992) by exploiting the motivating influence of peer-peer collaboration.

Mathematical research from a developmental, Vygotskian perspective

Researchers in mathematics education have begun to adopt a sociocultural perspective (Atweh, Forgasz & Nebres, 2001). Neo-Vygotskian researchers examined collaborative mathematical problem -solving and applied different methods for exploring the relationships between discourse and knowing in the context of collaborative and individual discourses Zack (1994, 1995) and Zack & Graves (2001) examined the ways in which children use adults and peers as social resources to make sense of mathematical problems. They focused on how talking shapes and is shaped by written illustrations of mathematical computations. They observed that by talking about the problem, children refined their understanding of it. This in turn led them to modify their written representations of the problem.

Klein (1999) observed grade five students in their classroom during the course of a school year. She was particularly interested in how they made sense of multistep mathematical problems through gestures and talk, which she described as their personalized "problem-solving language." Klein documented the ways in which children moved from reflecting or 'mulling things over' ("incubation" period) to doing ("second wind", getting wind of things) to "epiphanies" or "eureka moments", which she described as moments of heightened sensibility and awareness when children were "on-task." These studies are noteworthy for their observations of children's actions, talk and gestures as they problem-solve; specifically the ways in which their verbal responses and gestures mediate their written representations of mathematical problems. These studies also highlight the cognitive, affective and social dimensions of the processes by which children work together to solve a multi-level mathematical problem. They also identify the ways in which researchers and educators might create a positive learning environment. They include validating children's unique learning styles, avoiding confirmatory or judgmental remarks and allowing children to move around freely, consult with their peers and have sufficient time on different occasions to develop, discuss and defend their problem-solving strategies.

These studies are relevant to my inquiry for several reasons. First, an understanding of the generative role of differences and misunderstandings in peer-peer collaboration provide an interpretive lens through which I examine how children teach the 'Lulu' song to their classmate. Specifically, I attended to moments of insights and *knowing-in-action* (Schon, 1987) within the context of peer-peer dialogues. Another way in which these studies are pertinent to my inquiry is the common concern for how researchers and educators might create a 'problem-solving climate'. These studies also helped me to broaden my understandings of the zone of proximal development as an intellectual space (Zack & Graves, 2001) in which student and teacher, research participant and researcher, together create a zone for collaborative learning. Indeed neo-Vygotskian theorists in the area of mathematics education are proposing a social constructivist theory of learning mathematics where both social processes and individual meaning-making play critical roles (Ernest, 1994).

Conclusions

From an historical perspective, humanistic and constructivist theories have exerted a powerful influence on problem-solving research. This is apparent in the shifting of focus from measuring the *solution* to the problem as an indicator of cognitive abilities to contextually examining the *strategies* involved in solving problems. As educational researchers and cognitive scientists expand their lenses to probe the "microstructure of problem-solving" (Gardner, 1999, p.22), they are also becoming increasingly attentive to the potentially enabling or constraining nature of the task itself as well as to the context in which the children's actions unfold.

In her critique of the logical, numerical and geometrical problem-solving tasks developed by Piaget (1952, 1959, 1972) to study children's development, Donaldson (1978) questioned the claim that children are by nature egocentric, which is the inability to view things or feelings from another person's perspective. She concluded that difficulties in solving these tasks were due to the children's lack of understanding of the task instructions and not to a lack of logical skills. For example, Donaldson found that pre-school children could perform well on "perspective-taking" tasks if the tasks made what she called "human sense" and took into account children's previous experiences. Specifically, children were able to select from a set of photographs the one that represented their own view. Golomb (2002, 2004) was particularly interested in the multiple influencing factors on child art including the nature and wording of the task instructions, available drawing materials, graphic models, motivation, previous exposure to artistic experiences and aesthetic sensibility.

There has been a further widening of the foci of interest with the influence of Vygotskian thought and sociocultural situated learning theories that acknowledge the reciprocal influences of context, cognition, culture and affect. A central assumption of a sociocultural constructivist view of learning is that development occurs as children engage in activities that are socially and culturally situated and personally relevant. Accordingly, there has been a conceptual shift as researchers begin to focus on the construction of knowledge, not as the "reproduction of knowledge but as the development of metacognitive skills, reflective thinking and participation in social activities" (Tynjala, Mason & Lonka, 2001, p.7). More recently, neo-Vygotskian researchers have been applying discourse-oriented analytic techniques (Hicks, 1996) for documenting children's collaborative and individual discourses as they solve a writing task (Maguire, 1997, 1999, 2001, 2005; Klein, 1999; Zack, 1994, 1995; Zack & Graves, 2001). These techniques include analyses of intrapersonal (individual) and interpersonal (social) processes in order to document human change in action, or knowing-in-action (Schon, 1987). I situate my inquiry in this textured theoretical and philosophical landscape, which I describe in the next chapter.

This cross-disciplinary review of literature on children's written symbolic representations has been helpful in situating my inquiry and articulating its potential contribution to notational research. I aim to illuminate understandings of how children in grades K, 2 and 4, with no previous instruction in music, use available resources (*personal* ~singing, speaking, writing, gesturing; *material* ~ paper, pencil, coloured markers; *social* ~ myself as researcher and a classmate) to complete a music notational task.

As creations that are socially and culturally embedded, children's texts can tell us something about the children's worlds and their "positionings and actions" in them (Maguire, 2001). Hicks (1996) argued that "texts, literary and otherwise, might come to be viewed as a central metaphor for scholars documenting the development of a conscious self in social contexts" (p. 10). From a sociocultural constructivist perspective, analyzing the actions by which texts are constructed and giving voice to the creators' perspectives and other significant people in their home and school environments, can lead to a broader understanding of how children use available resources to construct meaning. Although a number of researchers have adopted a Vygotskian sociocultural framework for their inquiry into children's mathematical problem-solving, children's multilingual literacy practices and child art, there are no notational studies, to my knowledge, that have investigated children's invented musical notations from a social constructivist Vygotskian perspective. In the next chapter, I present the theoretical landscape that grounds my inquiry.

Chapter summary

This chapter set the research stage. I introduced the 'Lulu' song and I presented two data excerpts that documented the processes by which 5-year-old Al and 9-yearold Earl created their notations of the 'Lulu' song. In an overview of research on children's notations, I highlighted the need to investigate the *processes* and the *products* of children's notations in order to contribute to a fuller portrait of children's musical and meta-cognitive understandings. I identified my research questions and provided a rationale for the music notational task. A critical review of research on children's written representations in different disciplines helped to situate this doctoral inquiry and articulate its potential contribution to research on children's invented musical notations.

CHAPTER TWO

CONCEPTUAL LANDSCAPE

Overview of theoretical framework

The image of an interactive playspace of discovery, meaning-making and social construction of knowledge captures the spirit and intent in which I examine the products and processes of children's invented musical notations. I situate this inquiry in a Field of Play that I illustrate in Figure 7.



Note. The social and cultural worlds entail the range of knowledges constructed through the individual's lived experiences at home, in the classroom and in the community.

Figure 7. Field of Play Model

My concept of a Field of Play as an expanding space, rich in resources and rich in possibilities for making meaning, is inspired by the one Kenny (1989) developed as a guide for the theory and practice of music therapy and is consistent with a qualitative interpretive research paradigm. This textured landscape of interconnecting theoretical perspectives is in harmony with my epistemological thinking that there are many ways of knowing and multiple perspectives from which to examine them. It is also consistent with my conceptualization of play as a state of being that values divergent thinking and seeing with new eyes. The image of a green *field of play* that I portray as a "fusion of horizons" (Gadamer, 1975) of yellow (social and cultural worlds of the child) and blue (social and cultural worlds of the researcher/classmates) is consistent with a social constructivist stance and hermeneutic stance from which I analyze children's musical and metacognitive understandings in the context of a socially-mediated activity.

A hermeneutic stance views texts as important data sources for understanding the personal and social construction of knowledge. Gadamer (1975), a German philosopher and father of hermeneutics (Greek for interpretation), writes: "The task of understanding is concerned in the first place with the meaning of the text itself" (p. 335). Although my doctoral inquiry is not a hermeneutical study, I use Gadamer's term *fusion of horizons* to characterize a *field of play* where the search for and discovery of meanings are played out with another person, namely the children's classmates and me as researcher. Like the sociocultural theorists, Gadamer views human understanding as a phenomenon that is inseparable from social and cultural context, intention, time and place. He claims that understandings occur in dialogue with others and are transformed through a *fusion of horizons*. He explains: "The concept of the 'horizon' (...) expresses the wide superior vision that the person who is seeking to understand must have" (p. 272). Gadamer contends that by placing oneself in the situation of someone else, the other's questioning "passes into our own questioning" (p.337) and there is a fusing of horizons.

I adopt a social constructivist perspective that is grounded in Vygotsky's (1962, 1978) sociocultural theory of development. Central to this perspective is the notion that understandings are situated, and personally and socially constructed, with language in all its forms, playing a principal mediating role. Hence, self-regulation and mediation are key constructs in this inquiry. Vygotsky conceptualized the zone of proximal development (ZPD) as the boundary that is defined by what one can accomplish alone and the potential development through collaboration and assistance from an adult or more capable peer. I envision the ZPD as an interactive playspace, a *field of play*, or in Gadamer's view, a *fusion of horizons*, where learning occurs through dialogue with others.

I draw on earlier constructivist theorists (Piaget, 1959, 1973; Bruner, 1973, 1979, 1986, 1990) to support my view of learning as a dynamic process of constructing personal meaning by drawing on prior knowledge. I draw on Vygotsky and his successors, the neo-Vygoskian sociocultural and activity theorists (Wertsch 1998, Jacob, 1992; Engestrom, Miettinen & Punamaki, 1999; Nelson, 2001, Wells & Claxton, 2002) to examine the manner in which children use available resources to complete a music notational task, and the possible social and cultural factors that influence their actions. I draw on Bakhtin's (1986) dialogic theory to support my view that learning and language is a social phenomenon.

Activity theory and Bakhtin's dialogic theory provide an analytic frame for examining the processes by which the children complete a multilevel notational task. These theories are founded on social constructivist views of learning and language. Before examining these theories and showing how they are useful for addressing my research questions, I present the two interwoven dimensions of my theoretical framework, constructivism and sociocultural theory.

Constructivist views of learning

A constructivist stance challenges the notion of authoritative meaning and values personal knowing. Polanyi (1969) describes personal knowing as a fundamentally tacit activity, a "process of knowing" (p.132) that moves between subsidiary awareness, or an intuitive understanding of a particular aspect of knowledge, and focal awareness, or a conscious understanding of a particular aspect of knowledge as part of a coherent entity. He explains:

Knowing is a process in two stages, the subsidiary and the focal, and these two can only be defined within the tacit act which relies on the first for attending to the second (...) The moment we admit that all knowing is rooted in an act of personal judgment, knowledge seems to lose all claim to objectivity." (p. 133)

Dewey (1934), a philosopher and educational theorist, argued that an experience becomes conscious (...) only when meanings enter it that are derived from prior experiences" (p.272). Knowledge appropriated in this way becomes a personal resource, which can be used to construct new knowledge. Constructivism is rooted in the Kantian view of knowledge as a construction of the mind. Kant challenged pre-existing platonic beliefs that knowledge was somewhere "out there" in the ideal, utopic world. Noteworthy is that in Greek, utopia means "no place" (ou + topos) or context-free.

Nelson (2001) distinguishes between *cognitive* constructivism and *social* constructivism. Cognitive constructivism views the individual as the agent of meaning and assigns language a secondary role in the learning process. Social constructivism views the group or dyad as the agent of meaning and assigns language a primary role in mediating the learning process. Cognitive constructivism is associated primarily with the developmental theorist, Piaget (1959, 1972). Social constructivist theorists challenged his contention that the developmental trajectory moves from the inner world to the outer world as children become progressively socialized. Vygotsky (1962), in particular, criticized Piaget's view of the child as a self-motivated learner with a "nonmediated

attitude towards objects in his environment" (p.92) who becomes increasingly socialized to the point where "all that is new in development comes from without, replacing the child's own mode of thought" (p.85). Vygotsky characterized this dialectic process as a "ceaseless conflict between the two mutually antagonistic forms of thinking with a series of compromises at each successive developmental level, until adult thought wins out" (p.85). Vygotsky believed that the two processes, individual (internal) and social (external), were part of a single process. He described this process as a "movement of thought (...) constantly alternating between two directions, from the particular to the general and from the general to the particular" (p.80). Vygotsky was particularly interested in the social, cultural and historical influences that shape children's learning, and the mediating role of language in the learning process. These concerns are defining features of Vygotsky's sociocultural theory of development. The notion that our actions are rooted in social communicative processes and mediated by language and other cultural 'tools' or semiotic resources, distinguishes Piaget and Vygotsky, the two most prominent developmental thinkers of the twentieth century.

Neo-Vygotskians, including Wertsch (1985, 1991, 1998), Lave and Wenger (1991), Jacob (1992), Wenger (1998); Rogoff, Radziszewska & Masiello (1995), Cole (1995, 1999), Cole and Wertsch (1998), Engestrom et al (1999) and Wells & Claxton (2002) recognize the reciprocal influences of culture, context, cognition and language. Social constructivists embrace the notion of learning as a continual process of building on prior knowledge that is embedded in one's social and cultural worlds. This stance assumes that language, in all its forms, plays a primary role in the learning process. As a psychological tool, language mediates thinking within the context of a socially-mediated activity. From a social constructivist perspective, learning is an ever-evolving complex process, where the distinctions between process and product, competence and performance, biology and culture, internal and external, nonlinear and sequential, are complex.

A sociocultural view of learning

The three themes underlying a sociocultural perspective on human development are the social nature of cognition, the key role of language as a mediating tool, and situated mediated action as a unit of analysis for examining how humans learn (Wertsch, 1991, 1998; Cole & Wertsch, 1998). These themes are rooted in Vygotsky's (1962, 1978) sociocultural theory of development.

In his short lifetime, Lev Vygotsky (1896-1934) made innovative and lasting contributions to the field of developmental psychology and education. His conviction that

one's consciousness could be realized through socially-mediated activity, with language playing a primary role in the process, challenged the repressive Russian society in which he lived. It is no wonder that his works were banned in the Soviet Union and not published until 1956, twenty-two years after his death. Four decades after his death, Vygotsky captured the attention of the western world, thanks to Cole, who helped translate his books into English, and Toulmin, who compared Vygotsky to Mozart in his 1978 review of "Mind in Society", which he entitled "The Mozart of Psychology" (Rieber & Robinson, 2004).

Like Piaget, Vygotsky was preoccupied with examining the nature and evolution of human development, but unlike Piaget, he used a wider sociocultural lens for his inquiry. Vygotsky paid particular attention to the key, vital role of language as a mediating tool in human development and to the role of adults and more capable peers in creating a zone of proximal development (ZPD) for the child within the context of a goal-oriented motivating problem-solving task.

The formulation of the zone of proximal development resulted from a series of problem-solving experiments that Vygotsky carried out with his colleagues, Leont'ev and Luria. Whereas most studies of his day focused on measuring children's level of mental development by observing their problem-solving abilities, Vygotsky and his colleagues were curious to observe what would happen if the researcher helped the children solve the problem. They took a different approach to investigating the relationship between instruction and development. In so doing, they challenged contemporary behaviourist views of development as a gradual accumulation of conditioned reflexes, and concluded that instruction is synonymous with development. In one of the studies carried out by Vygotsky and his colleagues, the researcher gave two 8-year-old children more difficult problems than they could solve on their own. The researcher assisted one of the children by starting him off with the first step of the solution and a leading question. With guidance from the researcher, the child was able to solve problems that were intended for 12-year-olds (e.g. 8 years-old + 4 = 12 years-old), while the child with no assistance, could only solve problems intended for 9-year-olds (e.g. 8 years-old + 1 = 9 years-old). Vygotsky (1962) concluded that "the discrepancy between a child's actual mental age and the level he reaches in solving a problem with assistance indicates the zone of his proximal development; in our example, this zone is four for the first child and one for the second" (p.103). He explained further:

While the processes of instruction follow their own logical order, they awaken and direct a system of processes in the child's mind, which is hidden from

direct observation and subject to its own developmental laws. To uncover these developmental processes stimulated by instruction is one of the basic tasks of the psychological study of learning. (p.102)

These findings supported the belief that learning creates potentialities and engaging in socially-mediated activities realizes them. This view of learning recognized the social nature of human cognition and therefore challenged Piagetian thinking that development precedes instruction. That is, development creates potentialities and instruction realizes them (Vygotsky, 1962, p. 94). Findings from these investigations were instrumental in laying the groundwork for sociocultural approaches to development and learning which have captured the attention of many western scholars in different disciplines.

The social nature of human cognition

Vygotsky claimed that higher mental activity derives from social interactions with significant others in particular contexts. He contended that individual development, or intrapsychological planes of functioning, is rooted in socially-situated interactions, or interpsychological planes of functioning. "Every function appears twice; first on the social level and later on the individual level" (1978, p.57).

Vygotsky envisioned development as occurring in multiple interacting directions. The strong features of *intuitive* knowledge or nonverbal thought can complement the weak aspects of *scientific* knowledge or non-intellectual speech. In other words, a child's playfulness and ability to apply knowledge in everyday situations (even though that knowledge might be unconscious and unable to be articulated verbally) can be used to apply learned concepts to real-life situations, thereby enhancing an understanding of the concept. For example, musical notations created by children with no musical training (intuitive knowledge) can become objects for reflection and dialogue (making implicit knowing explicit), which in turn can lead to heightened sensitivity and awareness of music and its elements (formal knowledge).

This view of learning as a recursive movement between internal and external processes was inspired by the dialectical logic of the nineteenth-century German philosopher, Hegel, with whose writings Vygotsky was acquainted (Kozulin, 1990). Hegel defined dialectic as the opposing of something to its other (Berthod-Bond, 1993). He recognized the unity of opposites, namely the reciprocal dependence of the one on the other. From a Hegelian perspective, thought and being, consciousness and object, process

and product do not contradict each other but mutually illuminate each other. Vygotsky and his successors used various terms to describe the dialectical relationship between external and internal processes. Learning occurs when the "natural" (e.g. intuitive, implicit, informal, unconscious) planes of functioning and the "cultural" (e.g. scientific, explicit, formal, conscious) planes of functioning coincide, mingle, then interpenetrate to form one single line of the child's personality.

The idea that an individual's mental functioning originates in, and is transformed through, social communicative processes is useful for understanding the critical mediating role of early mother-child 'sound' dialogues in nurturing children's sense of self and overall development. The image of a child, shaping and being shaped by the resources in his environment while negotiating the tension between social convention (social ways of knowing) and personal invention (personal ways of knowing), points to the vital role of self-regulation and mediation in human development. In this doctoral inquiry, I am particularly interested in how children use semiotic resources (personal, material and social) to complete a music notational task.

Self-regulation

Self-regulation highlights the central role of human agency in the construction of meaning, and is a key construct in my inquiry. Vygotsky was particularly interested in language as a tool for regulating emotions, thoughts and actions as well as for developing higher psychological functioning. Consider the fundamental mediating role of the earliest pre-linguistic mother-infant dialogues on the child's emergence of self and in fostering overall social, emotional and intellectual development. Indeed, the seeds of self-regulation lie in the child's internalized experiences of secure attachment with the mother or primary caregiver. Self-regulation occurs when an individual's previous experiences are internalized, becoming a source and resource for future learning experiences. Bruner (1979) explains that "once internalization has occurred (...) the child is now in a position to experience success and failure not as reward and punishment but as information, that is self-generating. (p.82). Self-regulation, understood as the transfer from socially supported activity to individually regulated activity, is consistent with a social constructivist stance.

Mediation

The "fact of mediation" (Cole & Wertsch, 1998, p.1) captured the imagination of many developmental researchers and represented an important distinction from Piagetian thinking. People, language and other symbol systems are agents of mediated action,

which refers to activities that use physical (material) and symbolic (psychological, cognitive) tools to achieve their ends. Tools are "products of our evolutionary and cultural history" (Egan, 1999, p.65). As products of human actions, and passed on from one generation to the next, tools are culturally and historically bound. Tools, such as language, paper and drawing materials, are defined in and by the process of their production in particular contexts. From a Vygotskian dialectical view, the product of our understandings is inseparable from the tools that constructed them. Vygotsky distinguishes between an extensive set of *psychological* tools (e.g. speaking, reading, writing, drawing, counting out loud and/or with fingers) and *technical* tools (e.g. writing materials: pencils, papers, computers). However, one tool and form of mediation that particularly interested Vygotsky was language. Language plays a vital role in bridging the social and individual worlds. Vygotsky considered language in all its forms as the primary tool for mediating and regulating actions, which in turn leads to the development of higher consciousness.

The ability to use tools to represent things must certainly be regarded as one of the "great landmarks in human progress" (Langer, 1957, p. 29). Bruner (1990) argues that that the biological universals of human nature are constraints with which each culture must come to terms. However, an individual's *cultural tool kit* that includes language and other expressive symbolic modes, can loosen these constraints and enable one to redefine and push the boundaries of the natural limits of human functioning - in short, one's *cultural toolkit* can help achieve one's "actualization in culture" (Bruner, 1990, p.33) through goal-directed socially-mediated creative activity. The more a person uses certain resources to make sense of the world around him, the more he "masters" them. Indeed, a person's mastery over his resources signals the development of volitional, or higher mental processes (Minick, 1997). The notion of play is pertinent here. As Nachmanovitch (1990) states: "In play we manifest fresh interactive ways of relating with people, animals things, ideas, images, ourselves (...) play fosters richness of response and adaptive flexibility. This is the evolutionary value of play – play makes us flexible"(p.43).

Human development depends on resourcefulness, which I understand to mean the variety of tools that a person has access to and is able to use with increasing mastery. I use the word *resource* to mean the same as *tools* (Vygotsky, 1978), *cultural toolkit* (Bruner, 1990) and *mediational means* (Wertsch, 1991, 1995, 1998). I use the term *personal resources* to mean the same as psychological tools and *material resources* to mean the same as technical tools. For example, *personal* resources refers to children's singing, speaking, writing and gesturing, *material resources* refers to paper, pencils and coloured markers and the term *social resources* refers to myself as the researcher/ facilitator and to the children's classmates.

From a Vygotskian perspective, there are three noteworthy dimensions of mediation. First, tools or resources not only facilitate mental functioning, they transform our ways of thinking. Vygotsky (1962) underlines the critical role of language in regulating and transforming thinking when he writes, "For it is the internalization of overt action that makes thought, and particularly the internalization of external dialogue that brings the powerful tool of language to bear on the stream of thought" (p.vii). In his view, thought and speech develop along separate lines; then they converge. Initially thought is nonverbal (child cannot explain what he knows intuitively) and speech unintellectual (child appropriates language from others without understanding everything). Vygotsky refers to this kind of speech as "empty verbalism" (p.83). The child has a sense of the word, that is, he will use it spontaneously, but the word may not be thought out and the child may not be aware of its meaning. The external form of the word dominates that which is understood by perceptual knowing, or 'word-sense'. Then the lines converge: Thought becomes verbal (the child can explain what he knows) and speech becomes rational (the child understands the essence of what he is saying). The internal form of the word dominates. The child understands the meaning of the word ('word-meaning').

Vygotsky conceptualized the ZPD as the distance between word-sense and wordmeaning. In his view, the development of higher mental functions or the internalization of external dialogue unfolds along the trajectory of word-meaning. The conceptualisation of the word as a "microcosm of human consciousness" (Vygotsky, 1962, p.153) highlights the critical role of language in human development. The ZPD characterizes the child's potential for development with the help of resources, specifically social resources, namely an adult or more capable peer. More recently, sociocultural researchers are reconceptualizing the ZPD. Zack and Graves (2002) refer to it as an interactive, intellectual zone filled with potential for new understandings. As an interactive space, the ZPD highlights the role of dialogue as precursor to the self-regulated organizational function of inner speech or thought.

Another noteworthy dimension of mediation is that tools are carriers of meaning. Vygotsky recognized the empowering nature of semiotic mediation, a term Wertsch (1991) used to describe the process whereby individuals use resources to convey meanings and construct knowledge. As "carriers of sociocultural patterns and knowledge" (p. 204), tools enable and constrain, shape and are shaped by our understanding of the world. The third noteworthy dimension of mediation is that resources are historically and socially situated. The notion of situated mediated action (Wertsch, 1998) provides an interpretive lens for understanding children's actions in the light of interacting biopsycho-social-cultural influences that shape them (Cole, 1995). Situated learning theory (Lave & Wenger, 1991) offers another way of articulating that acts of meanings are individually constructed and socially embedded, and that action is constrained by the person's understanding of his place in the particular social setting. The notion that acts of meaning can only be understood in the light of a particular time, place and social setting is useful for understanding the situatedness of the children's notations and for addressing the following research questions:

What resources do children use to explain their invented notational system to me as the researcher?

What resources do children use to teach the song to a classmate?

Activity Theory

Vygotskian roots of Activity Theory

Activity theory is grounded in a Vygotskian sociocultural view of learning that acknowledges the dialectical relationships between context, culture, cognition and language (Jacob, 1992; Engestrom et al, 1999; Nelson, 2001). Activity Theory was initially conceived in the late 1930s and early 1940s by Vygotsky and his colleague Leont'ev in an effort to develop a unified theory of mind and behaviour that would allow for a holistic understanding of how humans learn within the context of a given social, historical and cultural landscape. However, as Russian speaker, Tviritenova (1999) pointed out in her comparative analysis of Vygotsky's understanding of Activity Theory and its interpretation by his successor, Leont'ev (1981), the official representative of the Russian Vygotskian School of Thought, there was an important distinction in their respective views of how development occurs. For Vygotsky, development unfolded along the trajectory of word-meaning with the word being a "microcosm of consciousness" and language the primary mediating tool. For Leont'ev, development unfolded along the trajectory of practical activity with the goal-oriented action "as a unit both of the systems of actions which constitute the individual's life and of those which constitute society" (Minick, 1997, p. 124).

Distinguishing features of Activity Theory are the object-oriented, goal-directed and socially mediated activity systems as the units of analysis for understanding how individuals learn (Engestrom et al, 1999). The underlying idea is that internal activity, or thinking, arises out of practical external activity. Activity Theory provides a framework for analyzing human activity systems. Fox (2001) defines activity systems as "the systems of relationships among participants, their cultural tools (e.g. objects, artifacts or semiotic resources such as language) and their immediate environment" (p.7). Figure 8 illustrates Leont'ev's (1981) triadic model of action. This model highlights the fundamental components of an activity system, namely the ever-evolving relationships between the three players – subject, object and available resources. In the case of my inquiry, I present children with the challenge of creating a notational system to represent a song so that a child from a distant country can sing the song just by looking at the paper. In order to complete the task, children need to use a variety of resources, including their singing, reading, writing and speaking, drawing materials (mediating artifacts) and social support.



Figure 8. Triadic model of action

Activity Theory has become an interdisciplinary sociocultural approach to learning with active research being carried out in education, psychology, philosophy, language and cultural studies, anthropology and computer science (Chaiklin, Hedegaard & Jensen, 1999). More recently, educators are referring to Activity Theory as CHAT, Cultural Historical Activity Theory (Wells & Claxton, 2002). Wells and Claxton describe CHAT as a "theory of human development that sees human societies and their individual members as mutually constitutive" (p.3). They argue:

The 'higher mental functions' do not develop simply as a result of individual learning or intellectual maturation. Rather, they depend upon mastering the use of culturally created semiotic tools such as language, artistic representations and scientific procedures which principally occur 'interpsychologically' (e.g. interactively) in activities undertaken with other members of the culture. (p.4)

CHAT is a way of understanding education as a "process of simultaneous enculturation and transformation" (p. 2). In Wells and Claxton's view, all interactions

between people - teaching and learning - involve "using, adapting and mastering cultural tools" (p. 5). CHAT is not only concerned with human cognition but values the interdependence of feeling, thought and action. For learning to occur, the activity must be directed at solving a problem with the help of motivating tools. The following poetic metaphor illustrates the nature of mediated action and suggests the need for appropriate mediational means or resources to capture the imagination of the child and move him to action.

If we compared ... the thought to a hanging cloud shedding the rain of word, then we could compare the motivation of the thought... to the wind, which moves the clouds. (Vygotsky, 1996a, p.357, translated by Tviritenova, 1999)

Cazden (1996) also makes reference to Vygotsky's motivation-thought-speech sequence, although it is translated differently, and not as poetically. Cazden compares motivation to "the wind that puts into motion the cloud that gushes a shower of words". Neo-Vygotsky CHAT theorists are expanding the notion of the ZPD to include the vital role of motivation and affect in the construction of the ZPD (Mahn & John-Steiner, 2002). They argue that educators and researchers help to create a ZPD through careful listening and emotional support. Facilitating techniques alone such as modelling, instructing, feeding back information, questioning and cognitive structuring (e.g. explanations to direct and maintain focus) cannot create a meaningful ZPD. Mahn and John-Steiner (2002) note that the interdependence between thought and affect is an important dimension of Vygotskian thought that has been neglected. They draw attention to Vygotsky's unfinished writings on emotions where he explores the dialectical relationships between thought, affect, language and consciousness. The following quote from "Thinking and Speech", a manuscript Vygotsky was working on at the time of his death in 1934 at the age of 37, highlights the centrality of emotion and volition in the learning process.

Thought has its origins in the motivating sphere of consciousness, a sphere that includes our inclinations and needs, our interests and impulses, and our affects and our emotions. The affective and volitional tendency stands behind thought. Only here do we find the answer to the final 'why' of thinking. (p. 282)

Dewey (1934) characterizes the role of emotion as the "moving and cementing force" of any meaningful learning experience (p.42). He argued that in order for an experience to be meaningful, the practical, emotional and intellectual must be interwoven. Activity Theory provides an overarching theoretical frame for my inquiry into how children without formal instruction in music use available personal, social and material resources to create their own notational systems on paper to represent a song and then teach the song to a classmate.

Examining the activity

The notion of "activity" as a generator of consciousness is central to Activity Theory. Vygotsky and his students used a dynamic approach to examine how children respond to and learn from socially-mediated activity, as I described earlier. By setting up problem-solving tasks in which a variety of mediational means were introduced, they were able to examine the emergent nature of mind-in-activity (Vygotsky, 1962). Observing individuals as they solve a problem with the support and guidance of an adult or peer can illuminate recursive movements between *reflections-on-action* and *knowingin-action* (Schon, 1987). Consider Earl as he notated the 'Lulu' song for the second time at my request. With a sense of purpose, a knowing where one's going, Earl drew several 'Lo's (*knowing-in-action*) and verified what he had done (*reflections-on-actions*). This recursive process of doing and reflecting led to changes, which in turn led to an increased awareness of the ways in which he represented the musical dimensions of the 'Lulu' song, as illustrated by how he described to Kim his two notated versions: "*Here my mistake and here's my good one*."

Process and product are mutually informing and need to be examined together in order to better understand the complexity of human cognition. Vygotsky (1978) contends that "analysis is not limited to a developmental perspective. It does not repudiate the explanation of current phenotypical idiosyncrasies, but rather subordinates them to the discovery of the actual origin" (p.63). Vygotsky distinguishes between *phenotypic analysis*, which focuses on describing the external features of a phenomenon, and *genotypic analysis*, which focuses on explaining the origins of a phenomenon. I examine the *products* of children's invented notations (*phenotypic analysis*), namely the features of the notational systems that children create to represent the sounds of the 'Lulu' song and the *processes* (*genotypic analysis*) by which they create their notations and the manner in which they are created (e.g. sense of agency, presentation of self, interactional style). I attempt to address my two overarching research questions:

What are the features of the notational systems that children invent to represent the sounds of a song?

How do children use the resources available to them to complete a music notational task?

Going beyond the activity: Social and cultural influences

Whereas the focal point is the activity itself, activity theorists recognize the inseparability of the individual, social and cultural dimensions of one's actions (Wertsch, 1995, 1998). In their view, human phenomena can only be explained in their full complexity if researchers consider the social and cultural influences beyond the activity. Cole (1999) argues: "Gardens do not obviously exist independently of the larger ecological system within which they are embedded" (p.92). Like gardeners, activity theorists are not only concerned with what happens inside the "garden" or particular activity system; they seek to understand the ways in which a single activity system is influenced by other activity systems. This involves observing and understanding the individual's actions on different planes: personal, interpersonal and community. The focus might be on one particular plane, depending on the research question. However, each plane of analysis makes sense in the context of the whole (Vygotsky, 1962, 1978).

Activity Theory provides an analytic and interpretive lens for my inquiry. A sociocultural view of human cognition that acknowledges the interconnectedness between contexts, cultures and learning (Jacob, 1992; Hicks, 1996; Engestrom et al, 1999; Nelson, 2001) offers a means of examining the relationships between the activity system that each child constructs to complete a multilevel notational task, and the larger social, cultural and intellectual worlds, or activity systems of which they are a part. This integrated view of human cognition is useful for framing my inquiry into the products and processes of children's invented musical notations. Data generated from analyses of the children's actions as well as from conversations with parents, teachers and principal, offer a means of examining the social, cultural, cognitive and affective factors that influence the ways children make sense of a problem-solving task.

Bakhtin's Dialogic Theory

Russian literary scholar, Bakhtin's dialogic theory (1981, 1986), complements Russian developmental theorist Vygotsky's socio-cultural theory of development. Vygotsky believed that language played a critical role in learning and development. Bahktin (1981) contends that individuals are always in dialogue with self and others. Any utterance "is only a moment in the continuous process of verbal communication" (p.59). Bakhtin (1986) considers speaking as a dialogic process. As a "link in a very complex organized chain of other utterances" (p.69), each individual utterance or "unit of speech communication" (p.73), cannot be examined on its own, regardless of its perceived significance. Thus, all utterances are inherently dialogic and socially, culturally and historically situated. They are constructed with the person or persons to whom one speaks in mind. For Bakhtin, the fundamental role of utterance is addressivity. He argues: "An essential marker of the utterance is its quality of being directed to someone, its addressivity" (p. 95). "Without it, the utterance does not and cannot exist" (p.99). Utterances are shaped by the kind of responses that the speaker naturally expects to elicit, whether consciously or instinctively, from the addressee or addressees. "The entire utterance is constructed, as it were, in anticipation of encountering this response" (p. 94).

As the next excerpt illustrates, 9-year-old Joyce's utterances are intended to elicit a particular response from her classmate, Nina, to whom she is teaching the 'Lulu' song. In addition to offering Nina options as to how to learn the song, Joyce provides Nina with information about the musical dimensions of the song.

Joyce: You want to try it by yourself or you want me to help you?

Nina: Both of us together

Joyce: And if you want helping, you can tap with your hands like this to the beat (again she pushes her chair back and taps on her lap). But you know it's five Lou's at the beginning, two, one, two, one, two/

Nina: one

Joyce: five, two and then three (she points to each grouping of notes as she says each number)

Nina: OK/

Joyce: And you could choose out of these (points to the two endings; one is short and one is long).

Nina: (O)K.

Joyce: Ready?

Bakhtin distinguishes between authoritative and internally persuasive discourse. Authoritative discourse, what he also refers to as undialogized discourse, does not invite meaningful exchanges with others; rather "it enters our verbal consciousness as a compact and indivisible mass; one must either totally affirm it or totally reject it" (1981, p. 343). He explains further:

The authoritative word demands that we acknowledge it, that we make it our own; it binds us, quite independent of any power it might have to persuade us internally (...) the

authoritative word is located in a distanced zone, organically connected with a past that is felt to be hierarchically higher. (1981, p. 342)

In contrast, internally persuasive discourse, what Bakhtin also refers to as dialogized discourse, invites exchanges with others and is the only kind of meaningful communication. He describes internally persuasive discourse as "half-ours and half-someone else's." Its creativity and productiveness consist precisely in the fact that such a word awakens new and independent words, that it organizes masses of our words, and does not remain in an isolated and static condition" (1981, p. 345). Meaning can only be constructed in relation to and in dialogue with two or more 'voices'. He conceptualizes voice as the "speaking personality, the speaking consciousness. "A voice always has a will or desire behind it, its own timbre and overtones" (p.434).

In the case of 9-year-old Karen, she not only appropriates her classmate, Nancy's words; she uses her own words and gestures to describe the movement of the 'Lou's on her paper, as this excerpt from a lively dialogue between the girls illustrates:

Nancy: I see like it's jumping up and down up and down up and down (she points to pink and black 'Lou's respectively in line 1)

Karen: This one is jumping up and down till up here (with right pointer finger, she traces an undulating line until the second pink 'Lou' in line 2) and then it jumps down and then it's just the same (she points to the last three 'Lou's)....Like this (she starts at the beginning of her notation), it's like going <u>upstairs</u> and then it will go like that, and then it will go like *wooo*.. (makes a sliding sound {glissando}), then your voice goes down (she points to first dark blue 'Lou').. and up up, <u>down</u>, up up (...) I should've... when I was taking my pencil, I should've gone like this (again traces a continuous wavy line over the 'Lou's in line 1).

The Bakhtian term "appropriation" is a way of conceptualising the process by which the words and utterances of others are personalized and then reworked for our own purposes.

Language, for the individual consciousness, lies on the borderline between oneself and the other. The word in language is half someone else's. It becomes "one's own" only when the speaker populates it with his own intention, his own accent, when he appropriates the word, adapting it to his own semantic and expressive intention. Prior to this moment of appropriation, the word does not exist in a neutral and impersonal language (it is not, after all, out of a dictionary that the speaker gets his words!), but rather it exists in other people's mouths, in other people's contexts, serving other people's intentions: it is from there that one must take the word, and make it one's own. (1981, p. 294)

Bakhtin (1986) views the appropriation of language as a dynamic process, whereby personal expression is mediated by and imbued with social expression (ways of acting and being), resulting in a reorganization of thinking and a heightened level of awareness, understanding and self-control. Like Vygotsky, Bakhtin acknowledges the social nature of human cognition and embraced the notion that an individual's mental functioning originates and is transformed through social communicative, dialogic processes with language as the primary mediating tool for the development of higher consciousness. Both theorists view language as the mediational means connecting the social and individual worlds and both acknowledge the role of language in regulating thinking. Vygotsky (1978) contends that adults and more capable peers can help create a zone of proximal development (ZPD) for the child. Bakhtin argues that all meaningful communication is dialogic, and involves the mind and the world.

The Bahktinian notions of voice, utterance and addressivity provide an interpretive frame for examining the differences in the ways in which the children explained their invented notational systems when addressing me as the researcher / teacher, and the manner in which they taught the song to their classmate, who did not know the song as I illustrate in chapter 5. In the case of 7-year-old Dan, the tone of his voice was more assured, and the intent and content of his utterances more internally persuasive when teaching the song to Wilbur, his classmate, in the third visit than when addressing me in the second visit. For example, after I explained the task to Dan, he asked me: "Is it OK if I get it like (...) a little bit wrong?" Note the difference in the intention and tone of Dan's voice when he addresses Wilbur while teaching him the song.

Dan: Copy what I sing (he sings Part 1 while pointing to the 'Lu's in an exaggerated fashion with his left pointer finger. Wilbur sings along). Now you try.

Wilbur sings the song alone. This time he sings the two green 'Lu's (*long long*) and the first two primrose ones (*quickquick*),. He stops at the third primrose 'Lu', looks at Dan and smiles.

Dan: You got it good ... but you don't say LU LU LU LU LU. It goes (he sings Part 1 again) ... like over <u>here</u>, it's two, you see <u>two</u> times at the same time (he points to the two red 'Lu's on line 1) and down <u>here</u> (he points to line 2) you say it <u>three</u> times (points to the first three 'Lu's of line 2), and then down <u>here</u> (he points to the last three 'Lu's). You say it three times at the same time.

Wilbur: OK.

Evident in this excerpt is the sense of authority that Dan displayed in his desire to teach the song to Wilbur as best he could. In contrast, when he asked me if it was OK if

he made a mistake while notating the song, he was addressing me as the authority; hence there was a difference in the quality of his voice, or "speaking personality". According to Bakhtin, factors such as age, title, status, social dynamics, and whether or not the addressee has special knowledge of the area of communication, can determine the nature of the speaker's utterances.

Chapter summary

In the first part of this chapter, I provided an overview of the *field of play* in which I situate myself as researcher. In the second part of the chapter, I described the features of this multi-textured social constructivist research landscape from which I examine the products and processes of children's invented musical notations. I explained the principal tenets of Vygotsky's sociocultural theory of development and highlighted two key constructs of this inquiry - self-regulation and mediation. I examined two related theories that inform this inquiry - Activity Theory and Bakhtin's dialogic theory and showed how they are useful for addressing my research questions. In the next chapter, I describe the methodology and methods of my inquiry.

CHAPTER THREE

METHODOLOGY AND METHODS

Methodology in action

In this excerpt from my third visit with 9-year-old Earl, he is trying to teach the 'Lulu' song to Kim. While 'reading' Earl's notations as illustrated in Figure 5, chapter 1, Kim invents a melody. When she is finished, Earl imitates how she sang and asks her if she wants help. She tries singing the song but is unable to because there is not enough musical information about the song on his paper. I intervene and ask Earl a question:

Deb: Can I just ask you one thing that will make it maybe easier for Kim? What happens <u>here</u> (I point to the first four Lo's of Earl's second notation, which correspond to the 'a' pattern) till you get <u>there (I point to the first Loo, which corresponds to the first note of</u> 'b'), like what about the melody ?

Earl: it has a <u>tune</u>..... Lo Lo Lo (he sings the 'a' pattern, marking each 'Lo' by pointing in the air with his pointer finger). At the third one you go high (he points to the third Lo) and these ones you go medium (he points to the first 2 Lo's).

I sing the 'a' pattern twice. The first time I tap my pointer finger on the table and the second time, I point to the Lo's on Earl's paper. Then I ask Kim:

Deb: What would be the direction?

Kim: It starts from the <u>lower to the higher</u> tones. (With palm down, she moves her left hand from just above her lap to the level of her head)

Earl: Oh! {Eureka moment}

Deb: Yeah!.. So here (I point to 'a 'in Line 1) -, perhaps you can't really see it on the paper because /

Earl: but I could take the pencils (pretends he's picking up a pencil) and make the little <u>music</u> signs (he points to the space above each Lo) to tell you that there's a <u>tune</u> (he looks at Kim)

Deb: yeah

Earl: Now you <u>know</u> there's a tune (as he takes a pencil and writes a music note). Ah! (he looks up at the notes he made in his first notation) Yeah that's right. There's a <u>tune, tune, tune, tune</u>, then it goes <u>high</u> (makes a long sound)

Meanwhile Kim is bent over the table watching Earl closely as he draws a musical note each time he says the word 'tune'.
Kim: I thought these two went high (points to the *quickquick* of 'b')

Earl: me too (He starts to sing the song. Kim joins in on the 5th Lu. He begins the song and Kim follows his singing until the 'b' whereupon Earl continues on his own until Part 2)

Earl: Ah (looks at me, left hand on head) OK it goes <u>high (</u>draws a note high above the first Loo) then low (draws two notes just above each Lo of LoLo) then <u>high</u> (draws a note high above the second Loo), <u>low (</u>draws two notes just above each Lo of LoLo), <u>high</u> (draws a note high above the third Loo), <u>low</u> (draws two notes just above each Lo of LoLo). He continues drawing above the Lo's in the 'a' pattern in Part 2). I'm doing a little <u>tune</u> (he continues to draw musical notes above the 'Lo's in Line 2) and these ((they need a tune too)) (he points to the last three Loo's). Now sing the <u>tune!</u>

As Earl draws a musical note above each Lo, he provides a verbal commentary of what he is doing. When he finishes drawing a note above the last Loo, he tells Kim to "sing the tune!" His tone is emphatic but he is smiling. He moves the paper closer to Kim as he draws a little note beside the smiley face. In a softer tone, he says to Kim, "Now sing the tune." She looks at his paper and sings line 1 silently while pointing to each 'Lo' with her left pointer finer. She then sings the whole song out loud while pointing to each 'Lo'. This time, her singing resembles the song except for the *quickquick* part of b2, which she sings as *Long Long*. Meanwhile Earl looks alternately at his notation and at Kim. When she finishes singing they both giggle. Earl offers Kim feedback and praise, and at the same time, decides to make the last 'Loo' longer, as illustrated in the next excerpt.

You're supposed to slow down but she did better than ((the first time)) ... extra 'o' (he adds a third 'o' to the last 'Loo').

Earl's actions as 'teacher' demonstrate a robust sense of agency and responsibility for teaching the song to Kim so that she can sing it the way Earl thinks the song should be sung. I ask Kim if she thought Earl did well in teaching her the song.

Kim: Yes... I'll probably sing that all day! (giggles)... Lo Lo Lo (she starts singing the song until Earl interrupts her in the middle of line 2) /

Earl: It still has a tune at the end! {(refers to the last three 'Lo's in line 2, which correspond to 'b2' }. It <u>continues</u> just like I make it a long line (sweeps his hand across the paper)

Kim: Yeah but I can't get the tune at the end.

Earl: It goes *Lo Lo* (he sings the song alone and points to each Lo. He looks up at Kim while singing the last 'Looo")

Kim sings the song alone and Earl points to each Lo

Earl: Bravo (he claps his hands and looks at Kim when she finishes singing the song)

I join in with my own "Bravo" and then thank Kim for coming. She responds by 'bowing' with her right hand in a circular motion: "*Bye bye. You're a great teacher*", she says as she nods to Earl.

This data excerpt from my third visit with Earl highlights a key epistemological principle of my social constructivist, methodological stance, particularly my role in interacting, guiding, acknowledging and challenging Earl and Kim in order to facilitate self-regulated actions and collaborative problem-solving. When I suggested that his notation lacked sufficient musical clues for Kim to sing the song, Earl drew musical notes above each 'Lo' *"to tell you that there's a tune."* My prompting, as well as Kim's misunderstandings about what Earl was trying to convey musically through his notations, resulted in a series of self-regulated actions aimed at refining his notation so that Kim could read it. Indeed, shaping the environment in a supportive and non-intrusive manner to enable children to become self-regulated life-long learners has been a preoccupation both in my personal life and professional life as music therapist and educator.

In this chapter, I present the methodology and methods of 'portraiture' as described by Lightfoot and Davis (1997). I discuss the relevance of portraiture as an epistemological and methodological frame for my inquiry. I then explain my role as researcher from a portraitist's perspective. In the second part of the chapter, I describe the different phases in my research process including how I gained entry to the research site and how I collected, coded and analyzed different data sets.

Portraiture as an epistemological frame

Portraiture seeks to capture the complexities of human experiences with "vigilance to empirical description and aesthetic expression" (Lightfoot, 1997, p.12). As a qualitative research methodology, portraiture reflects my overall vision of portraying as fully as possible children's musical and meta-cognitive understandings. Lightfoot explains that:

Portraitists seek to record and interpret the perspectives and experiences of the people they are studying, documenting their voices and their visions – their authority, knowledge and wisdom. The drawing of the portrait is placed in social and cultural context, each one negotiating the discourse and shaping the evolving image. (p. xv)

The interwoven epistemological stances that are embedded in portraiture resonate with my own assumptions about how children learn. From a humanistic stance, I acknowledge that individuals have an innate drive to make sense of our world and that the best way to activate that drive is within a supportive and unconditionally accepting environment. Portraitists are concerned with building a relationship of trust by means of an empathic regard, namely by accentuating the positive with a focus on health and resilience. Lightfoot and Davis (1997) describe portraiture as "an intentionally generous and eclectic process that begins by searching for what is good and healthy and assumes that the expression of goodness will always be laced with imperfections" (p. 9). As a music therapy educator, clinician and researcher, I am concerned with accentuating the positive by building on what students, clients and research participants already know, thereby enabling them to be increasingly self-regulated and responsible for their own learning.

A Vygotskian view of learning as socially, culturally situated practice compels me to not only scrutinize my role as researcher within the activity that the child constructs to make sense of the notational task, but to also look beyond the field of play to parents and teachers in order to understand the sociocultural influences on the children's actions. Adopting a social constructivist stance, I embrace the notion that there are many ways of knowing and many ways of revealing and constructing what one knows. I am particularly interested in examining children's idiosyncratic meaning- making processes as they notate the 'Lulu' song and then teach it to a classmate. I also value the children's own interpretations of their notational symbols. Lightfoot and Davis (1997) argue that:

The portraitist does not impose her definition of what is "good" on the inquiry, or assume there is a singular definition shared by all... Rather the portraitist believes there are myriad ways in which goodness can be expressed and tries to identify and document the actors' perspectives. (p. 9)

Like portraitists, I value the meanings that individuals create rather than measuring their performance against some abstract ideal of perfection. Therefore, I am concerned less with the 'goodness' or accuracy of the children's invented notational systems than with the ways in which they use the available resources to negotiate the 'fit' between the sounds of the song as they hear it, and the symbols on their paper. Above all, I value the children's own interpretations of their notational symbols. Like situativity theorists and activity theorists, portraitists insist "the only way to interpret people's actions, perspectives and talk is to see them in context" (1997, p.11). Indeed, the philosophical basis of the qualitative inquiry movement is interpretive, and its principal aim is to understand and make sense of other's actions and words (Schwandt, 2000).

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Portraiture as a methodological frame

Portraitists seek to capture the complexity and aesthetics of the human experience. Portraitists identify five essential features that capture the portraitist-as-researcher's attention. They are context, voice, relationship, emergent themes and the aesthetic whole (Lightfoot & Davis, 1997). As a portraitist, I aim to paint an integrated picture of children's musical and meta-cognitive understandings framed by insights gleaned from conversations with parents, teachers and school principal. To this end, I listen to the participant's 'voices' as they make sense of the notational task. As I discussed in the previous chapter, the notion of activity as the unit of analysis to study human functioning and development defines Activity Theory (Vygotsky, 1978; Engestrom et al, 1999) that provides the overarching theoretical frame for my inquiry.

Lightfoot (1997) contrasts the portraitist's interpretive stance with a positivist approach where "the personal view and judgment are considered distortions of an objective process. Voice is irrelevant. By design, it is neutralized out of existence" (p.86). Similarly, Dewey (1934) criticizes a positivist approach to research for being "divorced from the funded meanings of past experiences", and Bruner (1979) criticizes the aseptic quality of empirical research and the "self-imposed fetish of objectivity" (p.5). Bruner (1990) argues that "to insist upon explanation in terms of 'causes' simply bars us from trying to understand how human beings interpret their worlds and how we interpret their acts of interpretation" (p.xiii).

Research methodologies have mirrored the epistemological shift from the quest for certainty in a world where true knowing was through reason (mind over matter) or through the senses (matter over mind), to the quest for meaning in a world where knowledge is subjective, and therefore "inescapably indeterminate" (Polanyi & Prosch, 1977, p. 61), and where mind and matter are considered inseparable. The mind/matter or mind/body dialectic finds expression in the idea of embodied knowledge. A recent collection of essays, entitled *Knowing Bodies, Moving Minds* (Bresler, 2004), draws attention to the critical role of the body in teaching and learning from the perspectives of arts-educators and practitioners, anthropologists, ethnomusicologists and curriculum planners.

This shift in epistemology is reflected in the move from product-oriented research where researcher objectivity is valued and participants' viewpoints excluded, to processoriented research, where value is placed on research subjectivity, participants' voices and the social, cultural and historical situatedness of human actions. For example, as I illustrated in my review of literature on children's representations of mathematical problem-solving tasks, the earlier studies focused on the product and in identifying the factors that affected the ability to solve the problem. Solving a problem meant getting the correct answer. The implication is that the knowledge is "out there" and the task is to "find" or "get" the right answer. The quest is for certainty rather than for meaning. In this light, it is understandable that early research on children's symbolic representations of math, art and music are based entirely on adult observations and interpretations of the children's creations. The children's voices are not heard.

In my quest to capture an authentic portrait of children's musical and metacognitive understandings, I was attentive to voice, context, relationships, emergent themes and the *aesthetic whole* (Lightfoot & Davis, 1997). The notion of voice in portraiture embraces three interrelated stances. Epistemologically speaking, voices refer to the many ways of knowing. Ideologically speaking, voice can be viewed as a metaphor for authorship and empowerment. Methodologically speaking, voice refers to the researcher's role in the inquiry process. I use voices to conceptualize the children's different ways of knowing as they complete a music notational task. I also draw on the Bakhtinian notion of voice as the "speaking personality" or "speaking consciousness, with a "will or desire behind it" (1981, p. 434). Hence, I am interested in the children's intentions, as expressed through their self-regulated and socially-mediated actions as they create their notations and teach the song to a classmate. I also provide opportunities for parents, teachers and principals to voice their opinions on the children's notations, as well as their thoughts about education, music and literacy practices at home and at school. Although the latter are not the main part of my study, the adults' voices provide complementary background for understanding the children's actions as they complete the task.

I look closely at the physical and relational *contexts* in which the data collection takes place as well as possible social and cultural *contextual influences* that might illuminate my insights into the children's actions by speaking to the children's parents, teachers and principal. I consider the kind of relationships that emerge. I examine the *intrapersonal* relationships between the children's speaking, singing, gestural and written voices as they create their notations and the *dialectical* relationships between the products and processes of their notations. I also examine the *interpersonal* relationships that emerge between child and researcher, child and classmate as well as classmate and researcher. I identify emergent themes through data coding and analysis in order to illustrate aspects of the children's problem-solving strategies as they engage in "artistic production and perception" (Lightfoot & Davis, 1997, p.xvi).

Role of researcher

As observer, facilitator, conversation partner and self-reflective practitioner, my ontological positioning as researcher-*bricoleur* (Lévi-Strauss, 1966) reflects the values that drive my professional roles as music therapist and educator. I value empathic understanding, participants' voices, encouraging different ways of knowing, and understanding the personal and social processes by which meanings are constructed. As Lightfoot and Davis (1997) state,

In portraiture, the voice of the researcher is everywhere: in the assumptions, preoccupations and framework she brings to the inquiry; in the questions she asks; in the data she gathers; in the choice of stories she tells; in the language, cadence and rhythm of her narrative. Voice is the research instrument, echoing the *self* of the researcher. (p.85)

I frame my discussion of the role of researcher around the six interconnected ways portraitists use voice as research instrument, namely voice as witness, voice as interpretation, voice as preoccupation, voice as autobiography, listening for voice and voice in dialogue.

Voice as witness: Voice as witness or listening to voice refers to the researcher as 'discerning observer' systematically documenting the children's actions and remaining open to surprises at the same time. From a Rogerian humanistic stance, I acknowledge that a way to understand the intentionality and motives of my research participants is by means of an empathic regard. Lightfoot (1997) refers to Rollo May who contends that empathy is the opposite of egocentricity; one must be able to *witness*, provide a space for others to express themselves and be open to surprise and willing to be changed in the process. In the following reflective memo (*RM*), I share some data with Chris, the school principal. I reflect on my own empathic attitude in the way I attempted to listen and provide a space for the children and adults to express themselves.

Emphatic encounters

At recess, I shared with Chris, the "emotional baggage" that several children, parents and teachers unpacked and revealed to me during our encounters ~ Karen talked to me about the song she composed for her dog that died under suspicious circumstances. She sang it to me while reading the lyrics on a crumpled piece of paper that she carried around with her! Ned's dad confided to me about the challenges of being a single dad and Earl's dad told me about his passion for music and even gave me a CD of his band playing a song about being homesick. He also talked about the hardships growing up in a rural area in the Philippines. It occurred to me that I intuitively gave each of them an opportunity

to express themselves- no doubt thanks to my experiences as a music therapist, not to mention the subject matter, whose role I value in facilitating the expression of emotions and authentic responses. Music matters! RM, 5/5/03

While sharing this data, I began to realize that I intuitively gave my research participants space to express themselves and talk about matters that were important to them by conveying that I care what they had to say and by listening to them in an attentive manner. As a practicing music therapist since 1978, I have honed these skills. Note that *therapeia* in Greek means attending, caring and waiting. Lightfoot points out that an empathic encounter with another person can elicit insight and generate knowledge. The American psychiatrist, Karl Menninger (1964) described listening as a magnetic and creative force. The experience of being listened to can be empowering and reaffirming. It can make a person want to open up and express himself.

Voice as interpretation: Voice as interpretation refers to the researcher's search for meaning. My focus of inquiry is to understand children's meaning-making as expressed by their singing, writing, gesturing and speaking voices as they create their notations and teach the song to a classmate. Lightfoot and Davis (1997) compare the researcher to a visual artist creating a portrait with emphasis on the ongoing dialectic between process and product. Aigen (1993) and Bruscia (1998), both of whom are musicians, music therapists and qualitative researchers, compare the process of collecting and analyzing data to the creative approach required in music improvisation. Consider the root of the word improvisation, imprévue, which means unforeseen or not seen before. Eisner (1991) describes the role of researcher as a 'connaisseur' who uses an enlightened eye to understand the data. He speaks of two levels of 'seeing', which he refers to as an awareness of the qualities of an experience through all the senses. Primary seeing refers to the particular phenomenon. In my case, I observed children's actions as they completed a music notational task. Secondary seeing refers to an awareness of the particular phenomenon within a larger sphere. In my case, I talk with parents, teachers and school principal about their experiences and reflections on music, teaching and education. I also asked them to comment on the children's invented notations. This multi-level seeing enabled a more textured understanding of children's understandings.

Voice as preoccupation: Voice as preoccupation refers to the underlying assumptions, personal experiences and theoretical perspectives that shape the way the researcher goes about researching what it is she wants to research, the lens through which she sees and how she make sense of what she sees. One preoccupation I had was to ensure that the data I collected was as authentic as possible, although I was very aware

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that the task itself might seem contrived because children do not engage spontaneously in writing music. It is not an activity that unfolds naturally such as singing a song or writing in a diary. Therefore, I was very aware of the fact that the children would not be doing the task if I was not there and so what I observed and the data I collected was a direct consequence of my presence in the research setting. For example, children's perceptions that adults order and control their lives as well as expectations that they must listen, respect and obey, might impact the way they behave in a research situation (Eder & Fingerson, 2002), particularly the ways they address the researcher. Consider Dan, who could hardly wait for me to finish the task instructions at the outset of the second visit before asking me: "Can you tell me how you spell it?" immediately followed by "Is it OK if I get it like ... a little bit wrong?"

I addressed the inherent power imbalances between the children and me by creating a shared space, *a field of play*, what Vygotsky (1978) refers to as a zone of proximal development, within which I supported, reinforced and guided their actions, if necessary. I tried to be as careful as possible in how I guided them through the task. I was preoccupied with enabling them to notate the song on their own by drawing on what they know, namely singing the song, and if they experienced difficulty singing back the song while reading their notation of it, I suggested that they point to each symbol as they sang. I was also attentive to the situational constraints that might have influenced the children's actions as they completed the task. For example, I was attentive to the nature of the physical setting (cozy and laid back), time of day as well as the children's activities preceding the research task (e.g. first activity of the day; just before or after recess). I was also preoccupied in ensuring that my conversations with the parents, teachers and principal unfolded as naturally as possible. The following methodological memo (MM) highlights my concerns about talking too much while asking them to comment on the children's notations:

Am I talking too much?

I spend an inordinate amount of time describing how each child notated the song, offering my own comments and observations. Actually I like to think of my individual encounters with the adults as exchanges, a sharing of points of view, a give-and-take. I can show that it is ecologically valid in that the encounters seemed to unfold naturally and comfortably. They did not seem to be contrived even though I had a set of open-ended questions that I asked them. I sensed a sharing of control rather than a control of power. *MM*, 30/4/03

The following exchange with Chris, the principal, is a typical example of the kinds of dialogues that took place. When I showed her Earl's first notation, she pointed to

the blue musical notes above and between the 5th and 6th 'Lo's and said: *"Isn't that cute?"* She seemed aware that these notes corresponded to the two *quickquick* 'lo's in the 'b' pattern. I informed her that Earl was not aware of this sound-symbol relationship:

Deb: He said these had nothing to do with the song; they were just decoration.

Chris: Oh they're just decoration? Pardonnez-moi!

Deb: But isn't that interesting because if I wouldn't have asked him, I would have thought the same thing as you (Chris laughs).

This slice of data points to the importance of listening to the children's voices before making one's own interpretations.

Voice as autobiography: Voice as autobiography refers to the belief that who we are determines the qualities of our interactions and the 'intensity' of our questioning. Our actions are inseparable from the assumptions, values and understandings that drive them. An image of myself, "suspended in webs of significance" (Geertz, 1973) that I personally have spun, is a useful reminder that can only understand the actions and words of others through the filter of my own values, beliefs, experiences and ways of knowing and being. Similarly, who I am and what I value influence the ways in which I enable or limit the actions of the research participants, which I, in turn, interpret.

I value the authentic and original voices of others (e.g. students, clients) that emerge within the context of an interactive *field of play*. The creative open-ended nature of the music notational task is coherent with my approach to teaching and clinical practice. As musician, music therapist and music therapy educator, I value music as a source and resource for learning. I am particularly intrigued by expressions of musical intelligence, which I regard as the innate sensitivity to music that is rooted in the earliest mother-child sound interactions.

Contrary to a positivist, empirical approach that attempts to maintain objectivity by factoring out personal traits and biases, I recognize that my presence and influence as both observer and participant, is a "resource, which must be capitalized upon" (Holliday, 2002, p.145). As I illustrated in the data excerpt that opened this chapter, my role as social resource was critical, particularly in the manner in which I acknowledged, guided and challenged Earl and Kim. In so doing, I helped to trigger a series of self-regulated actions to make the notation more understandable, that is, more singable, to Kim.

Listening for voice: This concept of voice refers to the researcher's voice discerning the sound of the research participants, which Lightfoot and Davis refer to as

actors. Listening for voice is distinct from listening to voice, or voice as witness. They explain:

When the portraitist listens for voice, she also *observes* very closely, watching for the ways in which the actors' movements and gestures express and communicate what they mean (...). The listening portraitist is discerning of the idiosyncratic sound and use of language by actors, describing individual variations in the way people express themselves. (1997, p.99-100)

In the case of this inquiry, listening for voice means observing very closely the idiosyncratic ways in which children use words, song and gestures to notate the 'Lulu' song, explain their symbols and then teach the song to a classmate. Listening for voice also means listening to the tone of their voices and to its expressive and affective quality. When portraitists listen for voice, they are also watching, questioning and being attentive to silence. Lightfoot and Davis explain:

It is often true that moments of silence are just as important to understanding the story as the message conveyed through the words. Silences speak about points of confusion or resistance, or they indicate ambivalence or evasion, or they hide private feelings or make a dramatic point. (p.100)

What Lightfoot and Davis imply here is that silence can be just as illuminating as words. The music composer and educator, Murray Schafer (1976) compares the silence in music to the windows in a building; they both allow light to come through. Observing children during moments of silence can reveal aspects of the recursive process of doing, or knowing-in-action, and reflecting, or reflections-on-action. In the case of Earl, I observed his self-regulated actions as he wrote a few 'Lo's and then reflected on what he had just done by singing the song silently to himself while pointing to each 'Lo'. Moments of silence can also reveal uncertainty and, in the case of 5-year-old Joy, invite gentle prompting. As I explained the task her at the beginning of the second visit, Joy watched me intently. When I finished speaking, she took out a pink marker from the box and sat still, hands on paper, marker in hand. Several prompts later (e.g. "Write the sounds of the song on the paper"; "If you have any questions or you need help, just ask me."), Joy removed the lid of the marker and drew a pink circle in the middle of the paper, giggled and said, "Circle". She looked at me as she put the lid back on the marker: I asked her: "Is that the first sound?" She nodded and I sang Lu. I prompted her again, "Do you have to do some more circles for the song?" and then I offered a suggestion: "While you're doing it you can also sing it, so for each circle it could be a 'Lu'." Slowly and carefully, she drew a line of circles.

Voice in dialogue: Voice in dialogue refers to the voices of the researcher and the research participants. While Lightfoot and Davis (1997) contend that in portraiture, "the voice of the researcher is everywhere" (p.85), they also note that "the voice of the portraitist is poignant with paradox: it is everywhere *and* it is judiciously placed; it is central and it is peripheral" (p.86). In the following statement, Lightfoot and Davis describe the interplay between the researcher's voice and the actor's voices:

Her voice is also a premeditated one, restrained, disciplined and carefully controlled. Her voice never overshadows the actor's voices (though it is sometimes heard in duet, harmony and counterpoint). The actors sing the solo lines, the portraitist supporting their efforts at articulation, insight and expressiveness. (p. 85)

Voice in dialogue assumes that the researcher is able to elicit the participants' authentic and meaningful 'voices' by means of an 'empathic regard'. As participant-observer and facilitator, my challenge was to continually decide when to step in to question or respond to a child's actions and when to step back to allow for the child's own 'voices' to surface. As I illustrated earlier, in the case of Earl, I guided his efforts at notating the 'Lulu' song. I also challenged him by making comments and asking him and Kim a question. I then stepped back and listened as he tried to teach the song to Kim. I observed him as he added musical notes above each 'Lo' to let her know that "there's a tune" because Kim was having difficulty singing the song. I joined them now and then to acknowledge or reinforce what they said.

Research Methods

As a "method of inquiry and documentation in the social sciences" (Lightfoot, 1997, p. 3), portraiture frames the ways in which I collected, coded and analyzed my data with attention to context, voice and emergent themes.

Tools of inquiry

My tools of inquiry included: 1) observations of children doing an open-ended problem-solving task, 2) purposeful conversations with children and adults, and 3) textual analyses of the children's invented musical notations of the 'Lulu' song. I collected different data sets, including videotapes, audiotapes and field notes, from different sources, including children, parents, teachers and school principal. I observed how children used available resources to notate a song on paper. I spoke with their teachers, principal, and in some cases, their mother and/or father in order to understand the possible sociocultural influences in the way the children approached the task. I see the children and adults as rich resources and as the best authorities on their own experiences. Therefore I used these tools of inquiry to foreground their voices wherever possible. Specifically I listened for any differences in the ways they explained their notational symbols to me in the second visit and to a classmate in the third visit. This multi-method approach to collecting data enabled me to observe what the children did, listen to what they said and guide their actions in my role as a social resource. It also allowed me to examine their actions in the light of my conversations with the children's parents, teachers and school principal as well as my own impressions of the school environment, and in the case of two children, their home environments.

My goal was to create an integrated, nuanced portrait of the products and processes of children's notations by weaving together the repetitive and dissonant refrains that emerged from the portraits of the children as they completed the task.

Two overarching questions guide this inquiry:

What are the features of the notational systems that children invent to represent the sounds of a song they have learned to sing

How do children use the resources available to them to complete a music notational task?

Chronology of research process

In the second section of this chapter, I describe the various phases of the research process. Table 2 presents a chronological overview of the research process that took place between February 2003 and August 2005. The table describes the actions I undertook to gain access to the research site and to collect, transcribe, analyze and code the data. Note that I used pseudonyms in place of participants' names to ensure confidentiality

Table 2

Overview of Research Chronology

	GAINING ACCESS
Feb. 2003	Initial school visit: met with the principal and teachers; explained the nature and purpose of the study, identified the criteria for the selection of research participants (e.g. no musical training equal # of boys and girls if possible, culturally diverse backgrounds) and clarified my expectations of the teachers (e.g. take care of the consent forms, choose the children and the order in which I will see them)
	DATA COLLECTION
FebMar. 2003	Conducted pilot study with two 7-year-old boys to refine data collection procedures
MarMay 2003	Met with children to teach song (visit 1), and to observe and guide them as they completed the research task (visits 2 &3);
	Interviewed parents, teachers and school principal
	DATA TRANSCRIPTION AND ANALYSIS
Mar. 2003	Copied tape onto VHS videotape and completed preliminary observation notes of the unfolding of visit with each child.
JanMay 2004	Transcribed conversations with children and identified emerging themes
May-June 2003	Transcribed conversations with adults and organized data around themes that were addressed in the open-ended questions
	CODING SCHEME
Oct. 2003	Began developing a coding scheme to address my research questions that focus on examining children's use of available personal material and social resources to complete the research task (RQ2).
Dec. 2003	Added the following categories: "classmate as social resource" and "child accepts guidance" while preparing to write Dan's case study. This study served as a prototype for presenting data from the other children
Jan. 2004-Aug. 2005	Ongoing refinement of categories =14 versions

Negotiating entry to research site

I was fortunate to know Judy, an administrator in one of the school boards on the island of Montreal, who was especially interested in my research project. She suggested I send her a brief description of my study so she could in turn forward it to several principals in her school board whom she thought would be excited about having me work with their students. Several days later, Chris, one of the principals contacted me and expressed interest in having me conduct my research at her school. We arranged an initial meeting with three teachers of grades K, 2 and 4 respectively. At the same time, I applied for a certificate of the ethical acceptability of my doctoral project from the university (Appendix A) and sent a formal request to the school board (Appendix B).

Once I received official approval by the university and the school board, I proceeded to seek informed consent from the parents.

Obtaining consent

Chris, the school principal, supported my research project by including a cover note with each letter and informed consent form that was sent out to parents of children in grades K, 2 and 4, who had no previous formal training in musical notation. Chris' cover note read: "We hope your child will be allowed to participate in this study. It is always exciting for us to take part in educational research projects. Thank-you." Appendix C includes a sample of the letter and consent form that each parent received.

When the signed consent forms were returned to the teachers, I sent a letter to the children's parents, again via Chris, the school principal, seeking a meeting to talk with them about the role of music in their lives and in the schools. I also asked them to share their views on the goals of education. At the same time, I sent a letter and informed consent form to other parents of eligible children, seeking consent to have their children participate in the study as 'peers' to whom the research participants would teach the song. I sought and obtained permission from the teachers and school principal to ask them to share their views on music, teaching approaches and the goals of education.

Research sites

The research sites consisted of two schools, Cedar School, where I observed children in grades K and 2, and Victoria School, where I observed children in grade 4. Both schools, whose names appear here as pseudonyms, were located in Montreal-area suburbs and had an ethnically and linguistically mixed student population where English was the principal language of instruction. Cedar School was in an upwardly mobile neighborhood while Victoria School was located in a neighbourhood with a lower socio-economic status.

Research participants

Research participants included thirteen children (6 girls and 7 boys) and 11 adults, including 7 parents, 3 teachers and Chris, the principal of both schools. Chris, who was both animated and poised, was a key player in creating an ambiance that was conducive to learning and researching. The following account of my first encounter with Chris in her

colourful office reveals her dedication and creativity, which had a strong influence on the teachers and students alike.

Today, I met Chris in her office that looked more like a playroom. She talked excitedly about her most recent purchases for the school – eight stuffed gingerbread dolls, each one a different colour. They were all sitting next to me on chairs! She planned to put the dolls in the library because the children loved them so much. FN, 18/2/03

The next time I came to the school, the gingerbread dolls greeted me as I entered the library to set up the space for my research. In this excerpt of my audiotaped conversation with Chris, she eloquently articulates her personal philosophy of education in a succession of 'I believes':

A philosophy of education in action

I believe that:

- Kids want to and can learn.
- Everyone tries their best and you just have to learn how to get better.
- Learning is implicitly interesting and exciting and that it should be, and that would be what I try to make it, interesting and exciting.
- With all the variations in the world of kids, there's something for everybody and if you build it, they will come" ...(laughs).

I have to say I guess I really think that it's fun, which is why I laugh a lot and enjoy things and put funny pictures and funny things because that's just joyful, not painful. And when it gets painful, every problem has a solution, or almost every problem has a solution, and I guess it's how I would treat it with kids too. *Conversation with Chris*, 9/5/03

Children: Thirteen children with no formal music training participated in the study. Included were 4 children from grades K and 2 respectively and 5 children from grade 4. Selected classmates participated in the study for the third visit only. Table 3 presents the grade, age, name and personality traits of each of the 13 children who participated in this study.

Table 3 -

Presenting the Children

GRADE	AGE	NAME	PERSONALITY CHARACTERISTICS
К	6	COLIN	Pleasant and talkative
К	5	JASMINE	Intriguing mix of calmness and assurance yet often asks me for guidance.
ĸ	5	JOY	Friendly, alert and attentive
К	5	AL	Playful, relaxed and self-assured
2	7	DAN	Sociable, inquisitive and conscientious
2	7	WAYNE	Soft-spoken, speaks English haltingly; unfocused at times, easily distracted
2	7	JULIE	Quick and confident, fidgety; for example she 'combs' her hair with her fingers
2	7	RUTH	Articulate and self-assured
4	9	NED	Reserved, little eye contact, responds in a matter-of-fact manner but is cooperative and engaged in the task
4	9	KAREN	Sociable and giggles a lot
4	9	JOYCE	Cheerful disposition, curious and outspoken
4	9	EARL	Pleasant and curious; at times self-effacing, at times self-assured
4	9	SUE	Very chatty and strong-willed

Adults: I conducted semi-structured conversations with Chris, the principal of the two schools and with the grades K, 2 and 4 teachers : Lillian who was warm and soft-spoken, Mary, who was outgoing and humorous, and Bev, who was firm yet very invested in her students' emotional and academic well-being. The parents of six of the thirteen children consented to meet with me: I met four of them at school after school hours. They included Jasmine's mother, Ned's mother, Joyce's father and Earl's father. I met with three of the parents in their home. They included Colin's parents and Dan's mother. These conversations were informal and centred around themes where each conversation unfolded in its own way.

Data sources

The primary and secondary sources of data for each grade are presented in Tables 4, 5 and 6 respectively. The tables are organized into five columns. The first two columns present the primary sources of data. They include the children's invented notations of the 'Lulu' song as well as the audio- and videotaped transcripts of the unfolding of the three visits. The pseudonyms of the children are in the first column and the pseudonyms of the classmates, to whom the children taught the song in the third visit, are listed in the second

column. The last three columns present the secondary sources of data. They include audiotaped conversations with the teachers, parents and principal. The goal of these conversations was to share their reflections on the role of music in their lives and in the school system, and on the goals of education. I also wanted to hear what they had to say about their child or student's musical creations, thereby offering another lens with which to understand the products and processes of the children's notations.

Table 4

PRIMARY SOURCES		SECONDARY SOURCES		
CHILDREN	CLASSMATES	PARENTS	TEACHER	PRINCIPAL
Invented notations & three audio-and	Visit 3 only	Audiotaped	Audiotaped	Audiotaped
videotaped visits: 12/3, 18/3, 26/3/03	26/3/03	29/4/03	29/4/03	9/4/03
COLIN	Pierre	Both parents at home		· · · · · · · · · · · · · · · · · · ·
JASMINE	Kelly	Mother at school	- Lillian in her	Obvia in has alling
JOY	Pierre		classroom	Units in her office
AL	Kelly			

Primary and Secondary Data Sources: Kindergarten

Table 5

PRIMARY SOURCES SECONDARY SOURCES CHILDREN CLASSMATES PARENTS TEACHER PRINCIPAL Invented notations Visit 3 only : Audiotaped Audiotaped & three audio-and Conversation: See Table 4 Conversation : videotaped visits: 1/4/03 29/4/03 29/4/03 12/3, 26/3, 1/4/03 DAN Wilbur Mother at home WAYNE Belinda Mary in her JULIE Cathy classroom RUTH Marla

Primary and Secondary Data Sources: Grade 2

Table 6

Primary and Secondary Data Sources: Grade 4

PRIMARY	SOURCES	SECONDARY SOURCES		
CHILDREN	CLASSMATES	PARENTS	TEACHER	PRINCIPAL
Invented notations & three audio-and	Visit 3 only :	Audiotaped	Audiotaped	Son Table A
videotaped visits: 12/3, 19/3, 27/3/03	27/3/03	5/5/03	25/4/03	See Table 4
NED	Norm	Mother at school		
KAREN	Nancy		······	
JOYCE	Nina	Father at school	Bev in the	
EARL	Kim	Father at school	- principal's Onice	
NED	Pat	Mother at school		

Davis (1997) used a quilting metaphor in her description of context as the underlying cloth on which a design is sewn, the design representing the foci of investigation. The contexts in which the data was collected constituted in itself a valuable source of data. As I discussed earlier, context is one of the essential features of portraiture that capture the researcher-as-portraitist's attention. The following portrait of Cedar School, drawn from my field notes, describes the physical and educational context in which I saw the children in grades K and 2.

A Portrait of Cedar School

Cedar School is an English-speaking school, located on the South Shore off the island of Montreal in the predominantly French-speaking province of Quebec, Canada. The school is housed in a smallish two-story red brick building with exterior paint peeling off. There is an asphalt play area to the left and a larger grassy playground just across the street to the right.

Inside the school, there is an informal cozy, family-like atmosphere. Everyone knows everyone else. Teachers not only look out for the students in their classes but in the other classes as well, like one big extended family. In fact, the organization of the physical space is like a huge house. The entrance to the school is on the ground floor, which includes the common spaces. The gym/assembly area is on the right and the day-care is on the left, next to the library, which is where I observed the children as they created their notations. It is a bright and welcoming space. Windows line the left library wall overlooking the parking lot in front of the school. Bookshelves run the length of three walls – the one in the front, to the left beneath the windows and to the right. There are tables and chairs of varying sizes to accommodate growing children. Posters on the doors and back wall praise the joys of reading. Stuffed figures of all colours sit side by side on a counter at the back of the room.

Straight ahead from the front door are stairs leading to the upper floor. Halfway up the stairs is a level area with a photocopy machine and shelves filled with paper and other school supplies. When you reach the upper floor, you are in the hallway, facing the secretary's work area, which is in an alcove next to the principal's office. Children's art cover the walls. Up and down the small hallway are six classrooms (one for each grade level), a remedial room and, at the far end of the hallway on the right, the teacher's lounge. It is a small, cozy space with a long table, a sofa, fridge and sink. There are several inspirational posters on the wall including one by Albert Einstein that reads, *"The world we have created is a product of our thinking; it cannot be changed without changing our thinking.."* The teacher's lounge also houses a "professional library". Some titles include: *Releasing the imagination* by Maxine Greene, *Encouraging the artist in your child* and *Teaching science through discovery*. In the hallway, it is not uncommon

to see children in all manner of dress (there are no school uniforms) sitting on the floor, on the couch near the stairs or at a small table, watching little fishies swimming in an aquarium as they do schoolwork, arts & crafts projects or talk quietly. FN, 18/2/03

This portrait of Cedar school captures its spirit and educational philosophy, as discerned from, what portraitists call, its *repetitive refrains*. The wide-ranging collection of resources in the staff room reflects concern for multiculturalism, creativity, self-discovery, literacy, whole language, play and collaborative learning. Inspirational sayings on the wall, like the one that reads "It is not what is poured into a student that counts, but what is planted", remind teachers of their mission, which is to empower children by planting the seeds of self-confidence and self-regulated learning. The *repetitive refrains* are audible and visible. The stuffed figures and posters in the library espousing the joys of reading as well as the inspirational sayings and books in the staff room all "shout out" the school's educational values (Lightfoot & Davis, 1997).

Collecting, coding and analyzing data - Children

Exploring data collection strategies

To develop and refine my data collection strategies, I met with Jack, the 7-yearold son of an acquaintance, and his friend. I saw the boys twice at Jack's home and audiotaped the visits, which took place in Jack's bedroom. During the first visit, I taught them the song, "Oh when the saints go marching in" sung to 'Lu'. The boys mastered the first four measures but then they got lost. I realized that the song might be too long (e.g. 32 sound units) to recall when creating their notations. Nevertheless, I returned four days later and observed them as they invented symbols to represent "Oh when the saints..." sung to 'lulu'. I decided to visit the boys again two weeks later with another song that was shorter (23 sound units) and had two well-defined parts. This is the 'Lulu' song that I used for the present inquiry. I re-introduce the song in Figure 9.



Figure 9. 'Lulu' song in standard musical notation

I explained the song's structure as I taught it to the boys. I noted that Part 2 starts the same way as Part 1. I also told them that Part 1 has three recurring LU lulu [Long quickquick] patterns (b b1 b2). I also told them that there is only one 'b' pattern in Part 2. Finally, I pointed out that the last three notes of the song are longer than the others. I returned the following day to observe them as they wrote the song on paper. I did not ask Jack to teach the song to his friend simply because I had not yet decided to add this aspect to my inquiry.

This exploration raised several questions: How much information about the song do I give the children when I teach it to them? Do I withhold information that would make it easier for them to learn the song just because it might provide too many clues about how to go about representing the song on paper? I decided that withholding clues about the song would be questionable, ethically speaking. Questions from the boys about the use of the generic text 'Lu' also came up. Jack wanted to sing the song to "H-a" for Harry Potter, whose larger-than-life picture was hanging on the wall above his bed. At one point he suggested in a playful way that we use "doorknob" instead of 'Lu'. I suggested we incorporate the word "doorknob" for the *quickquick* part of 'b'. We tried it out; however, later I asked him to hold off using it while singing the song. I wanted him to focus on getting a sound image of the song, rather than on being distracted by thinking of different song lyrics.

Despite Jack's reluctance at times to sing the song to 'Lu', I considered that using the generic text might generate data on the potentially enabling or constraining dimensions of the task. Furthermore, I expected that some children in my doctoral inquiry might also suggest another sound, which in turn might tell me something about how they approached the task, including their sense of agency, the manner in which they took control of their own learning and how they interacted with me as the researcher.

This exploration of my data collection strategies also enabled me to articulate a rationale for using the 'Lulu' song. I chose this traditional American folk tune for two principal reasons. First, I assumed the children would not be familiar with it. Research findings revealed that children tended to use a variety of notational symbols when asked to notate an unknown song. However, when asked to notate a well-known song, such as 'Twinkle, Twinkle Little Star', children tended to draw pictures (e.g. stars) or write words (e.g. twinkle) that did not convey specific musical information about the song (Upitis, 1992, 1993). When asked to explain their notations, children would often remark, *"Anyone would know it's supposed to be 'Twinkle, twinkle... '"*. Second, I chose this tune

because of its well-defined two-part form and its recurring patterns. Findings from Upitis' studies revealed that children's choice and use of symbols were more likely to focus on the melody or on the rhythm depending on which one of these musical dimensions were more salient in the song. In the case of the 'Lulu' song, there is a relatively equal amount of melodic and rhythmic interest. Melodic interest refers to 'a', the ascending pattern of four notes that begins Part 1 and Part 2. Rhythmic interest refers to 'b', the three-note LU lulu *{Long quickquick}* song pattern that recurs three times {b b1 b2}. I decided to use a generic text in light of research findings (Barrett, 1999) that children's notational focus often shifts from the musical dimensions of the song to the lyric content when the song text is present, thus diverting their attention from the musical dimensions of the song, including rhythm, phrasing and duration.

Collecting data

I observed the children during three visits to their school between March and May 2003. The visits with the children in grades K and 2 took place in the Cedar School library. The visits with children in grade 4 took place in two different rooms of Victoria School: the 'free-flow'/all-purpose room on the second floor and in the art-room on the first floor.

I used a Canon 8mm Video Camcorder and 8mm videocassettes (TDK P6-120MP Premium) to videotape the children's actions. The camera was mounted on a tripod about twelve feet from the children. I audiotaped the children during the second and third visits in addition to videotaping them to ensure that their speaking and singing 'voices' could be clearly heard. For this purpose, I used a Sony Microcassette-corder M-100MC which was placed on the table where they notated the song.

Visit 1 - Learning the 'Lulu' song: During the first visit, I taught the 'Lulu' song to all the children together in each of the three classes - grades K, 2 and 4 respectively. For each of the three groups, I introduced myself, and told the children, who sat in a semi-circle, that I would teach them a song without words. I explained to the children that teaching them the song was part of my homework for university, and that I would see them two more times. I told them that, by being part of my study, they would be helping me complete my 'homework'. I sang the song while tapping the rhythm on my lap. I emphasized the first note of the 'b' pattern and each of the notes of 'c' by singing and tapping louder as I moved my body forward and lowered my head. I explained that there are two parts to the song and that both parts begin in the same way: five ascending notes (a) and a Long quickquick pattern (b). The 'b' pattern occurs three times in Part 1 (b, b1, b2) and only once in Part 2. I asked the children to repeat the song section by section, together and then individually. In the case of the children in grade 2, I made links to the visual realm, namely patterns in architecture. I explained the similarity between how a song is constructed and how objects are constructed with lego blocks - when you build a house, you start with a foundation and then you build up, adding section by section until there is a structure. My decision not to withhold information about the song when teaching it to the children was based on questions that arose during my visit with Jack.

Visit 2 - Notating the 'Lulu' song: I met with the children individually and asked them to: a) sing the song; b) write it down on a blank piece of paper (9 x 12 inches) in any way they wished, using black lead pencils and/or coloured markers (Crayola non-toxic washable broad tip markers, Colossal Collection) so that someone from another school or another country would be able to sing the song just by 'reading' your paper, c) sing the song from your paper as if you were that person, d) explain your invented notations to me. Table 7 presents the verbal protocol for the task. The verbal protocols for all three visits are presented in Appendix D.

Table 7

Verbal Protocol for the Notational Task

VISIT 2	Do you remember the 'Lulu' song we sang together last week?
	• Here is a sheet of paper, pencils and coloured markers. Write down the song any way you want so that someone
	who doesn't know the song can sing it, just by looking at the marks on your paper. The 'someone' could be a person
	you know or one you never met before, like, say a girl or boy from another school or another country. You can use any
	marks you like to help that person sing the sounds of the song.
	Prompt if needed: You can use lines, circles, dots ~ whatever you want.
	• Now pretend you are that person. Sing the song again, this time as you read the symbols on your paper.
	Can you tell me about the symbols you created?
VISIT 3 (a week later)	Can you tell (classmate's name) what you did with me last time we met?
	Can you explain your notation so s/he can know more about the song?
	• Pretend you are the teacher and teach the song to (classmate's name) using your notation

Visit 3 - Teaching the song to a classmate: I met the children a third time, in the company of a classmate. I asked the children to pretend they were the teacher and explain to their classmate what they did and then teach the song. Afterwards, alone with me, I asked the children to explain once again the symbols they created. This allowed me to evaluate the consistency of their verbal explanations with those made to me during the second visit. Thus, I was able to collect two subsets of data - the children's explanations of their notations to me and their explanations to their classmate in order to address the following research questions:

What resources do children use to explain their invented notational system to me as the researcher?

What resources do children use to teach the song to a classmate?

I asked the children about their musical preferences as well as family, school and other personal information. Some of the questions that guided our conversation were: Do you listen to music at home ? At school? Alone? With other people? Where do you listen to music? What kind of music do you like to listen to? Which singers do you like to listen to ? Do you make music? Can you tell me about any of your music-making experiences? Do you have any brothers or sisters? The purpose of these conversations was to find out more about the child's social, cultural and musical worlds that went beyond the research activity.

Transcribing data

Immediately following each visit, I wrote down initial observations and reflections of what I had seen and heard in my *research journal*. The same day or the day after, I completed a preliminary account of the unfolding of each visit on my laptop computer, while simultaneously viewing the videotapes for the first time and transferring them onto normal-sized VHS video cassettes in preparation for transcribing the data that I collected. Videotaping the children in action enabled me to view and re-view the phenomenon many times from both a holistic and analytic perspective. For example, 7-year-old Dan used a pencil to write 'Lu's for each one that he sang and then used markers to colour them in. It was only upon viewing and re-viewing the tape that I was able to observe the systematic self-regulated manner in which he coloured his 'Lu's. Using 11 different markers, he started with the last 'Lu' and systematically worked his way to the first one, putting each marker back in the box before choosing another one. I would not have captured this dimension of Dan's actions without having filmed them.

With each repeated viewing of the videotapes, I focused on different aspects of the activity which the children constructed to make sense of the task: 1) I described their actions as they notated the song on paper; specifically I documented their singing, 'reading', speaking and gesturing; 2) While listening to the audiotape and watching the videotape, I transcribed their verbal utterances as they notated the song and explained their notations to me; 3) I documented their singing, 'reading', speaking and gesturing as they explained what they did to their classmate and then taught them the song, and 4) I noted if, when and how the children 'used' me and/or their classmate as social resources to seek guidance or approval, or to tell us something. The transcript I worked from was the result of multiple and multi-layered viewings of the videotape and hearings of the audiotape. This process yielded approximately 15 hours each of videotape and audiotape, and 218 pages of data transcripts. Table 8 shows the breakdown of transcript pages for each of the three visits with the children. The first column indicates the grade level. The second column lists the number of transcript pages at each grade level for the first visit during which I taught the song to the children as a group. The third column indicates the names of the children, with the total number of transcript pages in brackets for the second and third visits with each child. The last column lists the total number of transcript pages for the children at each of the three grade levels with the grand total of 218 transcript pages.

Table 8

GRADE VISIT 1 (group) Visits 2 & 3 Total Pages Κ 7 12 (Al) + 10 (Joy) + 10 (Jasmine) + 7 (Colin) 46 15 (Julie) + 23 (Wayne) +8(Ruth) + 39(Dan) 2 6 91 Δ 4 14 (Karen) + 18 (Sue) +19 (Joyce) + 11 (Ned) +15 81 (Earl) **Total Number of Pages** 218

Breakdown of Transcript Pages

Throughout the data collection process, I kept a *research journal* that included *reflective memos, analytical memos* and *methodological memos*. These memos offered me another multi-dimensional perspective from which to make sense, in as coherent and authentic manner as possible, the children's actions as they completed the research task. In my *reflective memos (RM)*, I included reflections on how the research process was going as well as ethical issues and questions concerning ecological validity. For instance, I wrote the following *reflective* memo after the third visit with 7-year-old Dan and his classmate Wilbur. An oversight on my part allowed me to reflect on the potential constraining effect of videotaping on the children's actions:

What happens when the videotape is not recording?

Today I forgot to press the record button on the video camera before sitting down with Dan and Wilbur. Dan's written notation from visit 2 was on the table and just as I was about to ask Dan to explain his notation to Wilbur, I realized that the video camera was not recording. In the less than a minute it took me to get up, press the record button and return to my seat, Dan was already showing his notation to Wilbur and singing the song. Had I placed Dan's notation on the table between the two children and observed I might have witnessed a less natural occurring event. RM, 13/4/03

In my *analytical memos (AM)*, I included data management issues. For instance, some of these memos took the form of a 'coding journal' that documented the development and refinement of my coding scheme for examining the children's use of resources as they completed the task. In the following memo, I reflect on my actions as facilitator (F), specifically whether or not there was a distinction between complimenting (F-co) and validating (F-va).

I am still not convinced that F-co (co=complimentary) and F-va (va=validating) are so distinct from each other. For now, I will use the code F-co for spontaneous comments about what a child has just said or done (e.g. "that is very pretty") and F-va for statements that validate or reinforce what the child has just said or done (e.g. "Yeah", "You're right") *RM*, 28/20/03

In my *methodological memos (MM)*, I focused on my role as researcher and on data collection procedural issues such as how to explain the task to the children and where I position myself in the room to observe them.

With some of the grade 2 children and all the grade 4 children, my decision to move away from the table, sit on a chair nearby and return to the table once they completed their notations or when they asked for help, was intuitive. I instinctively decided that moving away was the right and natural thing to do at that time in order to facilitate their self-regulated actions. *MM*, 19/3/03

This excerpt reflects my concern for shaping the environment so as to invite children's self-regulated actions. Reflecting on my actions as I reviewed the videotape, enabled me to further articulate my goal as researcher to provide the children with as much freedom and autonomy as possible for self-regulated actions, and as much structure and guidance as necessary. In contrast to the older children, I sat next to each of the 5-year-old children as they created their notations. I intuitively felt that my physical presence was reassuring, and encouraged them to seek guidance and approval in a way that might not have happened if they were alone at the table.

Coding and analyzing the product

I used Bamberger's (1982) notational sequence to code the children's notations as presented in Table 9. According to this coding system, notations are scored according to the level of rhythm [R] or pitch [P] they consistently represented in their notations: Level 0 if there are no units to represent the sounds; Level 1 if there are units, Level 2 for unit groupings [R] and shape of the melody [P]; Level 3 for underlying pulse plus grouping [R] and exact pitch relationships [P].

Table 9

Bamberger's Coding System of Notational Sequence

Rhythm [R]	Pitch [P]
Level 0 - no units to represent the sound	Level 0 - no units to represent the sound
Level 1 - units to represent each sound	Level 1 - units to represent each sound
Level 2 - grouping of the units or beats	Level 2 - shape of the melody
Level 3 - underlying pulse plus grouping	Level 3 - exact pitch relationships

I also used one aspect of Elkoshi's (2002, 2004) method of graphic analysis, namely *Conceptual* interpretation [C] which refers to the content of the notation as a whole and the children's own explanations. I coded the children's notations according to the four categories of C: Association [A] ~ child attends to nonmusical elements such as images or story factors; *Pictogram* [P] ~ child attends to musical instruments, if any, involved in the task; *Formal response* [F] ~ child attends to a sequence of sound events; *Gestalt* [G] ~ child attends to sound groupings and division of these groupings into units.

Consider the invented notation of 9-year-old Karen that I present in Figure 10. Not only does Karen sequence the sound units of the song [F], she also uses colour and positioning of the 'Lo's on her paper to show the overall form or gestalt of the song [G]. In addition, the undulating line with arrows shows that the unfolding of the sound units and the black lines represent the musical staff in standard music notation. Of all the children, Karen's notation is the most song-specific. I coded her notation: FG.



Figure 10. Karen's notation

Based on the notion that children's invented musical notations not only reveal what they know about music, but the meaning they have derived from the experience, I identified five ways of describing the children's notations (Carroll, 1995):

- Child's notation is in response to the event itself.
 For example, Wayne (gr.2) drew a picture of me singing and conducting the song while teaching it in visit 1.
- Child's notation reveals previously acquired knowledge (e.g. use of letters, shapes, musical notes..) that are not related to the musical features of the song.
 For example, Al (gr.K) uses a variety of shapes and patterns that bear little resemblance to the song. He seems to be intent on creating patterns for the sake of creating patterns rather than for the sake of representing the song.
- Child's notation consists of an elaborate symbol system that suggests an awareness of certain musical features but they are not clearly related to the song. For example, Sue (gr.4) created a complex graphic systems and placed one or several 'na's (instead of 'lu's) in each box.
- 4. Child's notation is song-specific for parts of the song.
 For example, Julie (gr.2) clearly represents the final three notes of the song {c} and the 'b' pattern preceding 'c'.
- Child's notation is song-specific for the entire song.
 As illustrated above, Karen's (gr.4) colour-coded notation clearly represents the song's melodic shape and rhythmic groupings.

Analyzing the children's notations using methods described by Bamberger, Elkoshi and my own enabled me to classify the idiosyncratic strategies each child used to invent their notations. Specifically, these coding scores, together with detailed descriptions of the children's notations, helped to address my first research question:

What are the features of the notational systems that children invent to represent the sounds of a song they have learned to sing?

What musical dimensions of the song do children represent on paper? (e.g. pitch, duration, phrase groupings)?

Coding and analyzing the process

Table 10 displays the conventions I used to ensure the consistency and clarity of the transcripts (Ochs, 1979; Silverman, 2000). The column on the left refers to the conventions - words, slashes, dashes and dots - as they appear in the transcripts. The column on the right describes when these conventions are used.

Table 10

Transcription Conventions

Italicized words	refer to a vocal sound that the child makes, usually lu, the generic song text
Words inside a bracket ()	describe actions/gestures
Words inside a double bracket (())	indicate the best estimate of what is being said
Slash (/)	indicates that the speaker's words were interrupted by the other person
Underlined words	indicate speech that is emphasized/accented
Three dots ()	indicates a long pause between words
A dash and a comma (-,)	indicates that the speaker changes stream of thought or does not complete a thought
Words inside []	refer to my comments
O.C. observer's comments – refers to my explanatory or interpretive comments	

To prepare the transcripts for coding, I included simultaneous actions on the same line and successive actions on separate lines, as I illustrate in this data transcript from Karen's first moments of notating the 'Lulu' song.

Karen's nose is almost touching the pencil she holds in her right hand.

She writes an ascending line of 'Lou's followed by a low-lying 'lou' [corresponds to 'a b'& 1st note of 'b1' of the song]

She sweeps her pencil across what she has already done and continues.

She starts to make a third low Lou (she draws the beginning of a capital 'L') but then verifies from the beginning, pointing to each 'Lou' with the tip of her pencil.

She erases the beginning of the third low 'Lou' and makes an inaudible remark

She finishes 'line' 1

By initially displaying my transcripts in this way, I addressed the second research question that examines the processes by which each child completes the multilevel music notational task:

How do children use the resources available to them to complete a music notational task?

What resources do children use to notate a song on paper?

What resources do children use while singing back their notation of the song?

What resources do children use to explain their invented notational system to me as the researcher?

What resources do children use to teach the song to a classmate?

Coding scheme

In developing a coding scheme, my goal was three-fold: 1) to ensure a finegrained description of the moment-to-moment actions of the children (temporal analysis), 2) to gain a better understanding of children's meaning-making processes as expressed through the interplay among their speaking, singing, writing and gesturing (pattern analysis) and, 3) to obtain a more complete picture of what happens when children teach the song to their classmates (interactional analysis). Wertsch's analytic scheme (1991) was useful in articulating the multiple purposes of the coding scheme that I developed to address my research questions. Wertsch states that the entry point into the analysis is the activity that children construct to make sense of a goal-oriented task. The activity as unit of analysis for understanding how individuals learn is a key feature of Activity Theory. Wertsch's scheme is characterized by a temporal analysis of the flow of events, interactional analysis of the dyads and pattern analysis of the interrelatedness of the multiple domains of the process. I categorized the resources children used to complete the notational task as follows:

I used the term personal resources to refer to children speaking (S), singing (Sg) and gesturing (G) as they created their notations.

I coded all verbal utterances with S. If children asked a question I coded it S-q. If they evaluated their actions I coded it S-ev. If they referred to one or more musical dimensions of the song, I coded it S-mu and if they expressed a certain feeling, I coded it S-fe.

I coded instances of the children's singing with Sg. If children sang the song alone or with me upon my request, I coded it S-R and if they sang voluntarily on their own to verify what they had written, I coded it S-V; any singing action coded S-V indicates a self-regulated action.

I coded the children's gesturing with **G**. If children pointed to their notational symbols as they sang the song or explained their notations, I coded it G-po. If they embodied a musical concept with their arm, head, etc. I coded it G-b. If they smiled, frowned or made other facial expressions, I coded it G-f.

I used the term *material resources* (**M**) to refer to children's use of available materials, such as pencils (M-p), markers (M-ma), erasers (M-e), or other materials (M-o). I used the term *social resources* to refer to facilitating strategies that the children used in terms of guidance. When children *offered* guidance when teaching the song to their classmate, I coded it **O**. When children *accepted* guidance that is offered by their classmate or myself, I coded it **A**.

I coded my role as facilitator F. When the classmate asked questions or made comments about the notations I coded it Cl. I added this category when analyzing the interactions between Dan and Wilbur in preparation for a study of Dan, which I used as a prototype for presenting and analyzing my data on the other children. Lightfoot (1997, p.188) notes that coding is a form of early and ongoing analysis. Indeed, I added an additional category - Classmate facilitates, when I noticed that the classmate would sometimes unconsciously guide or redirect the 'child-as-teacher's actions.

My decision to colour-code the transcripts came later in the coding process. It was prompted by my desire to more readily identify themes, such as the interplay between the children singing, speaking, writing and gesturing that began to emerge from the more conventional coding scheme. In the following excerpt, I revisit the initial moments of Karen notating the 'Lulu' song, this time, in colour. The alternating gray and yellow lines highlight the dynamic interplay between her writing and pointing. For example, Karen wrote a line of 'Lou's and then quickly verified what she had just done with the tip of her pencil. In the middle of writing another 'Lou', she stopped to look over her 'Lou's from the beginning using the tip of her pencil. She erased the 'Lou' she had just started and proceeded to finish the first line of 'Lou's:

Karen's nose is almost touching the pencil she holds in her right hand.

She writes an ascending line of 'Lou's followed by a low-lying 'lou' [corresponds to 'a b'& 1" note of 'b1' of the song]

She sweeps her pencil across what she has already done and continues.

She starts to make a third low Lou (she draws the beginning of a capital 'L') but then verifies from the beginning, pointing to each 'Lou' with the tip of her pencil. She erases the beginning of the third low 'Lou' She finishes 'line' 1

Table 11 displays the 14th and final version of the colour-coded Coding Scheme that I used to examine the children's use of resources as they completed the task.

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Coding Scheme

Action	Code
PERSONAL RESOURCE	S
Refers to one or more musical dimensions of the song	S-mu
Expresses a feeling	S-fe
Critically evaluates what he did	S-ev-
Explains what he did or is doing	S-ex
Asks a task-related question	S-q
.B. Codes can be combined ~ S-q/mu	
Sings the 'Lulu' song upon request (with or without his notation)	Sg-R
Verifies notation on his own by singing back the song or parts of it	Sg-V
HILD GESTURES	G
Points to the symbols on paper while 'reading' his notation or to explain a musica	ll concept G-po
Embodies a musical concept such as high or low, slow or fast with his body or an	ms G-b
Smiles, frowns or makes other facial expressions to seek guidance or approval	G-f
B. Codes can be combined ~ G-b/S-ex	
MATERIAL RESOURCES	S
HILD WRITES; CHILD USES OTHER AVAILABLE MATERIALS	M-pe
Uses pencil	M=pe
Uses coloured marker	M-ma
Uses eraser	M-e
Uses other materials (e.g. ruler)	М-о
SOCIAL RESOURCES	· ·
an a	
Asks child a task-related question	F-S-q
Explains something to child	F-S-ex
Suggests something to child (e.g. prompts)	F-S-s
Compliments one or more of child's task-related actions	F-S-co
Reassures child	F-S-re
Validates (endorses) one or more of child's task-related actions	F-S-va
Models singing of song	F-sg-mo
Supports child (e.g. sings with him and/or points to symbols while child sings ald	one) F-sg-su
Embodies a musical concept such as high or low, slow or fast with his body or an	rms F-G-b
Smiles or makes another facial expression to offer approval or guidance	F-G-f
B. Codes can be combined (e.g. If I smiled at the child after he sang the song, I codec	1 it like this: F-S-re/G-fa
IILD <u>OFFERS</u> GUIDANCE AS 'TEACHER'	0
Suggests something (e.g. prompts) to classmate	0-S-s
Criticizes one or more of classmate's task-related actions	O-S-cr
Compliments one or more of classmate's task-related actions	O-S-co
Reassures classmate	O-S-re
Validates one or more of classmates task-related actions	O-S-va
Models singing of song	O-Sg-mo
Supports classmate by singing with him and/or pointing to his symbols while class	smate sings alone O-Sg-su
ILD GESTURES	O-G
Points to the symbols on paper	O-G-po
Embodies a musical concept such as high or low, slow or fast with their body or a	irms O-G-b
Smiles or makes another facial expression to offer approval or guidance	O-G-t
ILD ACCEPTS GUIDANCE	Α
Follows up on a suggestion by classmate or researcher	
Suggests	Cl-s
Criticizes	Cl-cr
Explains	Cl-ex
Questions	Cl-q
Compliments	Ci-co

In the left margin of the transcripts, I coded the children's use of resources. I also colour-coded the transcripts to highlight the resources that the children used. As well, I colour-coded my actions green and the classmate's pink. In the body of the text, I included observer's comments (O.C.). Observer's comments are my reflective remarks that arose while writing up my field notes and while transcribing the videotapes of the children in action. In the right margin, I wrote memos in the form of brief comments upon reviewing the transcripts. The dual coding system (e.g. conventional and colour), three forms of memos (e.g. observer's comments in the body of the text, handwritten comments in the right margin and coding journal) as well as the adults' insights about the children's notations, enabled me to interpret the data from multiple perspectives. See Appendix E for a conventional and colour-coded data excerpt with which I opened this chapter.

Collecting, coding and analyzing data - Adults

Collecting data

Throughout the data collection process with the children, I had informal conversations with their teachers and school principal about my initial observations. Lalso welcomed any relevant comments they offered. In the month following the final visit with the children, I met individually with their teachers and school principal and, in some cases where there was consent, with their parents. The purpose of these informal theme-centred conversations was to invite key 'players' in the children's lives to share their experiences and reflections on music, teaching and education. I also asked them to comment on the children's invented notations. The following are the types of questions that guided the conversations.

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Table 12

	 Do you listen to music? What kinds of music do you like to listen to? Where do you listen? What kinds of music do your children listen to?
ON MUSIC-RELATED EXPERIENCES	Does anyone in your family play a musical instrument?
	Do or did you ever play a musical instrument?
	 Did you have music classes when you went to school?
	Do you have any memories of them?
ON TEACHING (for teachers & principal)	• Can you describe your style of teaching/ style or principaling (in the case of the principal)?
	Do you have any thoughts about having music as a subject in school ?
011111010	Any reasons for why music as a subject would be important?
ON MUSIC	 Do you think it would be a good idea to have music as part of your child's school curriculum (listening, creating & playing), and if so, why?
	In your view, what are the principal goals of education?
	What role should the school play in educating children ? OR
	What are the teachers' responsibility for helping children reach those goals?
	What role should the home play in educating children? OR
ON EDUCATION	 What are the parents' responsibility for helping children reach those goals?
	 What role should the community play in educating children? OR
	 What is the community's responsibility for helping children reach those goals?
	 If you think back on your own schooling for a moment, are there aspects of it you liked? Is there anything you did not like about it?
For parents:	What are your hopes for?
	How do you perceivestrengths?
ON CHILDREN'S INVENTED NOTATIONS	I will now show you what your child/the children {in the case of the principal} did when they were
	With me
	 Knowing the way you do, is there anything striking about hermis drawing that you think might be helpful in my understanding of?

Questions for Parents, Teachers and Principal

I audiotaped our conversations, which took place in the classroom (with the teacher), in the principal's office (with the school principal) and at home or at school (with one or both parents). Following each conversation, I jotted down my impressions and any other issues that may have arisen in my research journal. I then transcribed the conversations while listening and re-listening to the audiotapes as follows:

First hearing of tape - I made preliminary handwritten notes while transferring the audiotaped conversations from micro-cassette to normal-sized cassettes (Maxell UR, 90 min. IEC Type I – Normal). I then entered the handwritten data into the computer.

Second hearing of tape - I made additional notes on the unfolding of each conversation. I wrote down some responses *ad verbatim* and indicated where I might want to transcribe a response in full.

Third and fourth hearings of tape - I transcribed selected responses in their entirety and added more observations and personal reflections.

There are three main reasons why these conversations with the adults were useful in illuminating my understandings of the possible social and cultural influences on how the children approached the task. First, they provided me with information about their underlying values and beliefs about education. For example, when I showed Mary, the grade 2 teacher, the second more refined notation that one of her pupils created with help from his classmate, she says:

And this is the way we work in class, too. You don't just -, nobody is able to sit down and work perfectly on their first draft. Nobody is expected to do work without wanting some changes (....) So you do your work. You ask for other's opinion or other's help. Then you do a good copy, which you feel confident to submit or present.

Conversation with Mary, 29/4/03

Second, these conversations provided me with biographical information about the adults' own music-related experiences and how and why they valued music. Third, their comments on the children's notations offered multiple points of view – children's, parent's, teacher's, principal's, classmate's and mine - from which to paint a more complete portrait of the children's musical and meta-cognitive understandings.

Coding and analyzing data

After grouping the transcripts according to each of the central themes as illustrated in Table 12, I examined the adults' responses for any *repetitive or dissonant refrains* (Lightfoot & Davis, 1997) in the ways they reflected on these themes. For example, there were several repetitive refrains concerning the adult's music-listening experiences. For some, including Earl's father and Chris, the school principal, music plays an integral role in their lives. Earl's father expressed this to me, "I think it's a big part of my life, *really. It's like another medium for me, away from being stressed, or whatever situation I'm in. It's my little get-away.*" As for Chris, "music has always been there, running throughout my life." Music has served her well both in her personal life and professional life as an educator. Some parents said that they only listened on the weekends or when they were driving in the car. Dan's mother stated, "I'm not a person to listen to non-stop *music. I listen to music in the car.* On the weekends she "*puts in cassettes*" from her home country Mauritius. Jasmine's mother likes "*pretty much what's on the radio (...) mostly in the car because that is the only time I have time to listen to music.*" I analyzed the data for any possible factors that might help me understand the manner in which the children approached the task (e.g. self-agency, degree of self-confidence, sense of identity, preoccupations, interests, etc.). For example, this is what Dan's mother said when I shared with her some of my impressions of Dan and noted that he was one of the only children in his grade that asked me about my research:

I think what we hear about him...he's not even 8, but I think he acts a little bit older than his age... probably being with adults. We must say we are... like all the four of us are... adults because maybe being with adults. And ...Natasha [his sister], she will talk to him like really... use big words and then when he doesn't understand this big word.... she will just explain the words ... so he has an advantage.

Conversation with Dan's mother, 29/4/03

Portraitists describe the interpretive process as voice-centred analysis where each 'sounding' of the data transcripts offers another possibility for multilayered description and interpretation (Gilligan et al in Lightfoot & Davis, 1997). In the case of my doctoral inquiry, I listened *to* and listened *for* the voices of the children, classmates, parents, teachers and principal in my quest to portray the products and processes of children's invented musical notations in as inclusive a manner as possible.

Chapter summary

In this chapter, I described my research methodology and research methods. I situated myself as a 'portraitist' and illustrated how portraiture as a strategy of inquiry provides a fitting frame to articulate my methodological assumptions about human inquiry and my role as researcher. I explained how I gained access to the research site and I provided details of my process for collecting, coding and analyzing the multi-dimensional aspects of the sources (e.g. videotaped transcripts of the children in the process of completing the research task and the children's notation; audiotaped transcripts of the informal conversations with parents, teachers and school principal). In the next chapter, I address the two overarching research questions that deal with the products and processes of the children's invented musical notations.

CHAPTER FOUR

ANALYSIS AND INTERPRETATION

Overview

This chapter is divided into two parts. In part one, I provide a phenotypic analysis of the features of the notational systems created by the 13 children who participated in this inquiry. Specifically I address the first overarching question that asks: *What are the features of the notational systems that children invent to represent the sounds of the song they have learned to sing*? In the descriptive portraits that accompany the notations, the children's voices are presented in *italics* or as indented block texts. In part two of this chapter, I provide a genotypic analysis of the processes by which the children created their notations of the song to a classmate. In so doing, I address the second overarching question that asks: *How do children use the resources available to them to complete a music notational task*?

I begin this chapter by re-introducing the 'Lulu' song that I taught the children in the first visit and then asked them to represent on paper in the second visit. As Figure 11 indicates, the song is in two parts: 'a b b1 b2' (Part 1) followed by 'a b c' (Part 2). The 'a' pattern refers to the first four ascending notes. The 'b' pattern refers to the 3-note LU lulu pattern () f)) that recurs twice (b1 b2) in Part 1. I refer to this pattern as the long quickquick 'b' pattern. The 'c' section refers to the three long LU's that mark the end of the song. I refer to these three patterns by letter name (a, b, c) throughout the text.



Figure 11. 'Lulu' song in standard musical notation
Portraying the 'Lulu' song: A phenotypic analysis

Kindergarten children

Four kindergarten children, aged 5-years-old, created the first series of notations: chatty Colin, Jasmine with her intriguing mix of calmness and assurance, wide-eyed Joy and playful Al. I met them each individually in the school library at a small round table.

I begin with Colin's line of 'L's as illustrated in Figure 12.

Colin			
	LELELLE	9900000 9900000 9900000 9900000 9900000 9900000	
	•	anya, ba '' bo'' van ang	
		• •	

A line of 'L's

Figure 12. Colin's notation

Colin's neat and straight line of 'L's resembles a writing exercise to practice the letter 'L'. This is how he explains to me in my second visit why he chose 'L' to be his notational symbol: "I was thinking about like Lu Lu and it always has an L in it, so I started to make L L L."

I have called Jasmine's notation "Sounding Shapes" as illustrated in Figure 13.

Sounding shapes



Figure 13. Jasmine's notation

Jasmine's notation consists of three lines of alternating blue circles and blue triangles. She used triangles in line 2 "because this is the same part (points to lines 1 & 3) and this is not (points to line 2) so I put triangles." The first two lines correspond to Part 1 of the song and line 3 corresponds to Part 2. The four circles in line 1 represent the ascending 'a' pattern. The triangles in line 2 represent the three LU lulu patterns ('b b1 b2') where LU is equal to one beat and lulu is also equal to one beat for a total of six beats which are represent ell by six triangles. The first four circles in line 3 represent 'a'. The next two circles represent 'b. The last two circles and a triangle represent 'c'.

Joy's three rows of pink circles are illustrated in Figure 14.



Figure 14. Joy's notation

Joy's notation consists of three rows of pink circles that equal the number of 'lu's in the song (23 'lu's). She drew the different sized circles in an upwards-sloping fashion because as she explains to me towards the end of the third visit, "*I just draw them like that*."

Al's drawings of "playful patterns" are illustrated in Figures 15 and 16. His second notation was created at my request in the hope that he would use his singing to help him represent the song.



Figure 15. Al's notation 1

Figure 16. Al's notation 2

Playful patterns

As illustrated in chapter 1, Al's notations consist of a sequence of colourful shapes and patterns that are not related to the song except for hints of a link between the recurring 0000X patterns in line 3 and the ascending 'a' pattern.

Grade 2 children

The second series of notations were created by the children in grade 2, aged 7-years-old: inquisitive Dan, soft-spoken Wayne, fidgety Julie and Ruth who was bright and cheerful. As with the kindergarten children, I met them individually in the school library at a small round table.

Wayne's decorative notation is illustrated in Figure 17. I have called his notation "With a little help from a friend" because it reflects his classmate, Belinda's contribution to the final product.



Figure 17. Wayne's notation

Wayne's notation consists of four lines of groupings of blue, orange, purple and yellow 'Loo's plus a sun, musical notes and a "*teacher teaching the song*". The squiggles under each 'Loo' show that "*it sounds like 'LOO'*" (he sings a long LOO) rather than "*just a word, like 'LOO'*" (he makes a short accented sound). The 'LOOO's represent the long note of 'b' and the 'LoA', which he added in the third visit following Belinda's suggestion to do so (e.g. o = first short 'Lo' and A = second short 'Lo'). The line after the first yellow 'Loo' was also added during the third visit and marks the end of the song.

Ruth's rows of "blue 'Lo's" are illustrated in Figure 18.

lo 10 60 10 Lalo Lo lo ho hada ho 6 10 Ruth

Blue 'Lo's

Figure 18. Ruth's notation

Ruth's notation is neat and straightforward. She represents the 'a' pattern by spacing out the 'Lo's evenly. In contrast, the two quickquick 'Lo's of the 'b' patterns are almost touching each other. She shows the long-sounding last note by adding three extra o's to make it 'Loooo'. In this next excerpt from the third visit, Ruth gives Marla, her classmate, a detailed description of her notation:

OK. We made up a song and the song goes Lo Lo Lo .. and I did it like Lo Lo Lo Lo Lo (she sings 'a' while pointing to each Lo with her right pinky). When it's together (she quickly moves her right hand sideways and looks at Marla) it's like lolo (she produces a fast and accented sound accompanied by a sudden forward thrust of the fingers of her right hand which are spread out). It's fast (she smiles and looks at Marla then at me).... and at the end it's Loooo (she looks at me as she produces a long sound while moving her right hand down and away from body)...like long. Explains to Marla in Visit 3

Dan's notation is illustrated in Figure 19. I have called it "Sound symmetry".

Sound symmetry



Figure 19. Dan's notation 1

A sense of symmetry is evident in Dan's notation. He uses the entire paper ~ four lines of 'LU's take up the top half, his signature design is in the bottom half and there is a decorative design in each of the four corners. Dan uses small 'u's and capital 'U's to represent the 'a' and 'b' patterns of the song. The 'Lu's in 'a' have small u's which he associates with a softer and faster sound. The 'LU's in 'b' have capital U's which he associates with a louder more accented sound. In the next two excerpts taken from the second and third visits respectively, Dan explains his reasons for using *small 'u's* and *capital 'U's*.

I put these <u>small</u> (he points to the first five 'Lu's in line 1) and these <u>capital</u> (he points to the last two 'LU's in line 1) because when you're doing these, it's kinda like, it's kinda you have to do it really loud like '<u>LU</u>' (he sings loudly). Explains to me in Visit 2

The ones that didn't have the tails (he points to the beginning of line 1), that means like it's kinda like high and the ones that have the tails are like... little (he cups his hands, as if holding something small)... lower, and the ones that don't have a tail are a little bit higher (he points to the 'LU's on lines 1 and 2). *Explains to me at the end of Visit 3*

In the next excerpt, taken from the second visit, Dan explains to me that he drew three squiggly 'LU's for the ending {c} to show that they are long, low notes and to distinguish these 'LU's which he describes as a "*low version*", from the straight 'Lu's and 'LU's.

At the ending I put it like this one because it's kinda like a different version...like it's kinda, it's going like a low version (he makes a low sustained sound, palms of his hands facing the ground to reinforce the concept of a low sound)... you have to sing low (he motions with his head)... It's kinda like, as though you have to put your voice like really low (he gently puts his left hand on his throat, lowers his head, moves the palm of his hand downwards and chants the word "low" in a low-pitched voice). *Explains to me in Visit 2*

Julie's squiggles all in a row are illustrated in Figure 20.

c songto Lo Julie \sim

Squiggles all in a row

Figure 20. Julie's notation 1

Julie explains her two rows of squiggles to her classmate, Cathy, in this way: "This is one song (she points to the pink squiggles) and this is the other part (she points to the purple squiggles), so it goes, Lu Lu Lu"...(she sings her version of the song while pointing to the squiggles with her left thumb). Julie sings Part 1 twice, which she represents first with pink squiggles and then with purple ones. She follows by singing Part 2, which is represented by purple squiggles, orange squiggles for the Long quickquick 'b' pattern and two large squiggles followed by a larger elongated one for the 'c' pattern. Julie wrote 'the song 'Lo Lo' under her squiggles "because if not, the person would come and say, 'Ugh what's the song?'"

Grade 4 children

The third series of notations were created by the five 9-year-olds: pleasant and outgoing Earl, giggly and sociable Karen, cheerful Joyce, chatty Sue and soft-spoken and serious Ned. Earl's two notations are illustrated in Figure 21.



"Here's my mistake and here's my good one"

Figure 21. Earl's notations

Earl's first notation, his "*mistake*" as he describes it to his classmate, Kim, in the third visit, is contained within the upper two lines. Except for the three underlined LOO's at the end of line 2 that represent the 'c' pattern, these two lines of 'Lo's do not contain any musical information about the song. The musical notes in blue and red are decorative. In contrast, in his second notation, the "good one", Earl clearly articulates the 'a', 'b' and 'c' patterns through the length and spacing of the 'Lo's. In addition, he drew musical notes at different levels above the 'Lo's to show Kim that it's a tune.

Ned's undulating line of 'lu's and 'la's are illustrated in Figure 22.

An undulating line of 'lu's and 'la's



Figure 22. Ned's notation

"All that is the first part, after it's the second after it's the third" is how Ned described his notation to me in the second visit, while pointing to the arches formed by his undulating line of 'lu's. He describes his notation to his classmate, Norm, in the following excerpt taken from the beginning of the third visit:

OK. Well, we did a song. It starts like uh <u>soft</u> (he taps his pointer-finger on the first 'lu'). After it's louder after it goes down (he looks at Norm), it's get(ting) louder and louder, after you go down soft (he points to the first three 'lu's after the second peaked one), after softer, softer and softer, after it's all the same thing (he quickly taps his finger up the extra ascending 'a' pattern) and after it goes like loud for three times (he points to each of the last three 'lu's and looks at Norm). *Explains to Norm in Visit 2*

Ned's notation is a large oscillating wave of continuous 'lu's that reflect the melodic contour of the song as he explains it and as he sings it. That is, he repeats Part 1 twice followed by a truncated version of Part 2, in which he omits 'b' and adds an extra 'lu' to 'c'. The ascending 'lu's represent the 'a' patterns, the descending 'lu's represent the recurring 'b' patterns and the row of larger 'lu's at the end represents 'c'. The 'lu's on the peaks represent the first note of 'b'. They are larger and stand out above the others. As he explained to me in the second visit, *"When you do like 'lu lu lu lu '(he sings 'a' and the first note of 'b'), it's getting louder so it's going to be bigger."* He added the 'la's in the third visit to satisfy Norm, who suggested they sing the song to 'la'.

Karen's colour-coded notation is illustrated in Figure 23.

A colour-coded musical creation



Figure 23. Karen's notation

Karen described her notation to me in this way:

OK the lighter ones are for the more high-pitched ones and the darker ones are for the lower pitched ones, so this is the darkest (she points to the dark blue 'Lou's) this is the 2nd 3rd 4th 5th 6th and then the lightest (she points to the purple, blue, red, primrose and turquoise Lou's that represent the 'a' pattern in Part 1). *Explains to me in Visit 2*

In the third visit, Karen described the shape of the song to her classmate Nancy, while tracing an undulating line with her right pointer finger above the 'Lou's:

It's like going upstairs and then it will go like that, and then it will go like wooo.. (she makes a sliding sound going down) then your voice goes down (she points to the first dark blue 'Lou') and up up, down, up up. *Explains to Nancy in Visit 3*

Karen represents the 'a b' pattern as an ascending line of colour-coded 'Lou's with the *quickquick* (lulu) part of 'b' represented by two pink 'Lo's on the highest line, followed by a repeating sequence of dark blue-pink-pink) to show the recurring 'b' pattern. The three dark blue 'Lou's in line 2 represent 'c'. The undulating line, complete with yellow arrows above the Lou's and black arrows pointing downwards to the dark blue 'Lou's, shows that the 'Lou's are connected and moving forward and up and down.

The black lines are suggestive of the lines of the musical staff in traditional music notation. Of all the children, Karen's notation is the most song-specific.

Joyce's multi-coloured musical representation is illustrated in Figure 24.

A multi-coloured musical representation

LOU LOU LOULOULOU LOULOULOU LOU LOU LOU LOU LOU LOU Lou Lou Joye

Figure 24. Joyce's notation

Joyce's notation consists of three lines of coloured 'Lou's, three 'Lou's that are crossed out in line 4 and three large 'LOU's that move downwards in a diagonal fashion {c}. She adds "*or Louuu*...." to the last LOU. The multi-coloured 'Lou's represent 'a'; the tri-coloured 'Lou's, followed by two black ones, represent 'b'; the two 'Lou' patterns of blue-black-black and red-black-black represent 'b1' and 'b2' respectively. In the next excerpt, Joyce describes her notation to me in detail, using words and gestures:

Well, you can see <u>these</u> (she points to the 'a' pattern) are smaller than these ones (points to the three pairs of black Lou's that represent the *quickquick* part of 'b'). It becomes <u>Lou Lou</u> (she taps her hands on her lap) then you go lightly and then you go a little darker and then you go lightly and then you go-, ... These (she points to the first pair of black 'Lou's) are like you go a little darker then these <u>small</u> ones (she points to the last blue Lou in line 1). *Explains to me in Visit 2* Joyce shows intensity (loud/soft) through the size, spacing and colour of the 'Lou's. The 'Lou's representing the 'a' pattern are smaller and sung *"lightly"*, while the 'Lou's representing the 'b' patterns are sung *"harder"* because they are darker and larger. In the next two excerpts from the second visit and the end of the third visit, Joyce makes a further distinction between the last three 'LOU's {c} and the black 'LouLou's:

These ones (she points to last three 'Lou's) don't sound like they're supposed to be together (she points to the first pair of black 'Lou's with her right pointer and middle finger spread apart and then puts them together) so I tried to separate them (she points to the last three Lou's). Explains to me in Visit 2

These (points to last LOU's) are harder than these (she points to the black LouLou's). They go slower.. they're at the end (she giggles). Explains to me at the end of Visit 3

Finally, Joyce explains to me in the third visit that the arrow indicates that the last 'Lou' in line 2 marks the beginning of 'a' in Part 2, and not the first 'Lou' of 'b':

Well, it's 'cause it looks like you're going like 'Lou' and then it goes 'LouLou' again, so like it goes down here (she points to line 3), but I had no room to put it here (she points to the end of line 2). *Explains to me at the end of Visit 3*

Sue's notation, which she did <u>her</u> way, is illustrated in Figure 25. This graphic notational system consists of five columns of 'na's. Some are grouped together on top of a column or in a bottom square. This is how Sue explained her notation to her classmate, Pat at the beginning of the third visit:

It goes 'Lu lu lu lu lu '(she sings a semblance of the ascending 'a' pattern as she moves her right pointer finger up a pretend ladder in the air). You know, and then it goes 'lu lu' (with each 'lu' that she speaks, Sue thrusts her right hand towards Pat). Then you have the same high, the same -, I don't know what, um, the same -, like you think of 'na na na na '(again she sings a semblance of 'a' as she points to the first column of 'na's). Then you say it twice the same thing.. and that's what happened, and then I copied it with other sounds. Explains to Pat at the beginning of Visit 3



Figure 25. Sue's notation

The first four columns represent 'a b' x 4, which corresponds to how she sings the song at first. She only realizes that she drew two 'extra' patterns towards the end of the third visit, at which point she disregarded the first two columns with the word "Extra" and made a thick line to show that the song now begins in the third column. Although there is a 1:1 sound:symbol correspondence as well as an awareness of pitch {a} and phrase groupings {b}, there is no attention to rhythm and duration. Furthermore, her representation of the 'b' and 'c' patterns as being the highest {b} or lowest {b1 b2 & c} points, does not correspond to the melodic contour of the song.

Summary of the musical features of the children's notations

These descriptive portraits illustrate the unique notational systems that each child invented to represent the 'Lulu' song. Table 13 presents a summary of the ways in which the children used colour, length, shape, size and positioning of their notational symbols to show the musical dimensions of the song, such as duration, rhythm and pitch.

Table 13

Notational Strategies

	Notational	Drawing materials/ Colours	Length, Shape, Size	Spacing and Positioning	(ippear)(ve
Kindergarte	n children				
Joy	Circles	Pink			
Colin	L	Pencil			
Al 2 notations	multiple shapes	multicoloured			all aspects of drawing
Jasmine	circles & triangles	Blue	circles {a } & triangles {b b1 b2}		
Grade 2 chi	ldren				tay area
Ruth	Lo	Pencil —> blue	Lo {a}; Lo LoLo {b}; Loooo {end}	Lo's spaced {a} Lo's together {b}	
Julie 2 notations	squiggles ~ {a b b1 b2}; ~ ~	pink {Part 1}; purple {repeat of Part 1; Part 2, orange {b' in Part 2}	~~ {last squiggle]		
Dan	Lu	Pencil> multicoloured, colour- coded	Lu {a}; LU{b}; .squiggly LU {c}		signature & design in each corner
Wayne	Loo	colour-coded	LOO{a, c}; LOOO & LO <u>A</u> {b}		music teacher & musical notes in each corner
Grade 4 chi	ldren				and the second second
Ned	Lu, la {added in visit 3} undulating line	Pencil	Lu & la on the peaks	lu/la going up {a}; going down {b}, straight {c}	
Joyce	LOU	colour-coded	LOU {a b}; LOUUuu.{ending}	Last 3 LOU's{c} on separate lines	
Earl	Lo	Pencil & blue line under each LOO and LOOO (to show duration & accentuation)	Lo {a}; <u>LOO</u> Lo Lo {b}; <u>LOO</u> LOO LOOOO {c}	musical notes at two levels above each Lo/LOO/ LOOO	musical notes, smiley face in first notation
Karen	Lou Pseudo musical staff	Pencil> colour- coded, pitch-related - darkers to lighter colours		Lou's going up {a b}, 1 low, 2 high {b1 b2}, 3 low {c}	
Sue	na Graph –5 columns	Pencil		'na's going up , ascending {a}, na's on top or bottom {b}	

Use of symbols: As Table 13 shows, the children in this study used a variety of symbols to represent the sequence of sound units. The four kindergarten children used circles, lines, squares and/or triangles to represent the sounds of the song, except for Colin. He used the letter 'L' "because 'LU' starts with L." In contrast, all the children in grades 2 and 4, with one exception, used the generic text, which they spelled 'Lu', 'lo', or 'lou' to represent each sound unit. Seven-year-old Julie used squiggles (first notation) and circles (second notation) to represent each sound unit. She wrote 'the song Lo Lo' "because if not the person would come and say, 'Ugh what's the song?'" For 9-year-old Karen and Joyce, the question was not what to use as a symbol, but how to spell 'Lu'. Karen wrote 'Lou' because "I just thought that's how you write 'Lou'" (Visit 2). Joyce also used 'Lou' "cause I think that's how my friend spelled it and her name is Loulou, so it goes with the song, so I just wrote L-o-u too." Sue found it difficult to sing the song to 'Lu' and decided to use the generic text 'na' following my suggestion to use another sound with which she felt comfortable. At the beginning of the second visit, Sue explained to me why she used the generic text 'na':

It's because I don't have a low voice. I have like <u>OOH</u> (she sings a high –pitched sound). Lu, I have trouble saying that (...) I think we could use the word na, like *na na na* (she sings the 'a' and 'b' patterns)

With the exception of Jasmine, who used circles for 'a' and triangles for the recurring 'b' patterns in Part 1, the notations created by the kindergarten children provide few musical cues about the song. In the case of Joy, there is a 1:1 correspondence between the sounds of the song and the notational symbols, which I refer to from now on as a 1:1 sound:symbol correspondence. The 22 'L's on Colin's paper represent one less 'L' than the 23 Lu's in the song. Al seemed to have unintentionally drawn three times as many shapes as sounds in the song for a total of 69 shapes, which represents a 3:1 correspondence between his shapes and the 'lu's in the song. In contrast, as Table 13 shows, the children in grades 2 and 4 used a variety of notational devices such as colour, length, shape, size, spacing and positioning of their notational symbols to show the musical dimensions of the song's patterns.

Use of drawing materials and colour: 7-year-old Ruth used a blue marker over her penciled Lo's. Julie used pink squiggles followed by purple ones "cause that was the first time" as she pointed to the pink squiggles, "and that's the second" as she pointed to the purple squiggles. Dan colour-coded his notation. He used different coloured 'Lu's to show 'a' and the same coloured 'LU's to show each of the 'b' groupings and 'c'. The three 'LU's

in 'b1' and 'b2' are groupings of green and primrose respectively. The squiggly 'LU's are turquoise. Chris, the school principal, commented on Dan's representation of the song's patterns after singing the song on her own from his notation:

Now this is pretty interesting because this one is like clumps..... It's the same colour (she points to the two red 'LU's in line 1).... Lulu (she sings the *quickquick* part of 'b')... and a clump (she sings 'b1') another clump (she sings 'b2'), then here (she points to 'a' in line 3) ...so they varied by the, I don't know what you call it, the direction of the music.... Oh isn't that something!

Glancing at Dan's second notation that he co-created in the third visit with his classmate, Wilbur, Chris said, "So he was very clear that LU LULU (she sings the 'b' pattern) were together." Dan also used eleven markers to colour the 'Lu's and five different colours to write his name and decorate the four corners of the page.

Nine-year-old Joyce's colour-coded notation reveals an awareness and sensitivity to phrasing, rhythmic patterns and duration. Karen's colour-coded notation is pitch-related – from darker to lighter colours. The lowest 'Lou' is black and represents the first note of 'b'as well as 'c'. Black is followed by purple, blue, red, primrose, turquoise and pink. Of all the children's notations, Karen's notation contains the most musical clues about the 'Lulu' song and most resembles traditional music notation. Earl used colour to show duration and accentuation. He underlined his 'Loo's in red or blue to show that they were longer than the 'Loi's and accentuated. Specifically, he underlined the last three 'Loo's of his first notation. He also used coloured markers in his first notation to draw two musical notes and two smiley faces. Yellow and green markers were used to separate the lines of 'Lu's in his first and second notations.

Use of length, shape and size: Children used length, shape and size as notational devices to show whether the corresponding sound is long or short, loud or soft. Some children in grade 2, including Wayne and Ruth, and others in grade 4, including Earl and Joyce, added extra 'o's to their 'Loo', 'Lou' or 'Lo's to represent duration for the *Long* note of 'b' and for the three notes of 'c'. Seven-year-old Julie used larger squiggles to represent the first two notes of 'c' and she drew an elongated squiggle for the final 'Lu' of the song. She further reinforced the ending with an orange arrow, which she drew underneath the elongated squiggle. Dan used small letters for the sounds of 'a', capital ones for 'b' and larger squiggly ones for 'c' because "*it's kinda like a different*

version, like it's kinda, it's going like a low version." Wayne and Earl also used squiggly shapes. Wayne underlined each 'Lou' with a squiggle to distinguish it from a word. Earl underlined his lines of 'Lo's in a squiggly fashion.

Use of space and positioning on page: 7-year-old Ruth used spacing between her 'Lo's to represent the 'a' and 'b' patterns. The 'Lo's representing the 'a' patterns are more evenly spaced out while the 'LoLo's corresponding to the two quick notes of 'b' are very close together. As Table 13 shows, all the children in Grade 4 showed an awareness of pitch and accentuation by the positioning of their notational symbols. Earl placed musical notes above the 'Loo's to "tell you that there's a tune." In fact, these notes that he placed on one of two levels (e.g. higher above the 'Loo's and lower above the 'Lo's) contain information about the intensity and accentuation of the 'Lo' below it, rather than melodic contour. In Sue's graphic notation, the 'na's in the columns represent the 'a b' pattern, while the row of 'na's at the bottom or top of a column represent bl and b2 "'cause they're the same notes. It's all the same notes." Joyce represents 'c' by a diagonally descending line. Joyce, Karen and Sue associate strong accentuated sounds (e.g. the first note of 'b' and the 'c' pattern) with low sounds, perhaps suggesting a sense of groundedness. Karen, Ned and Sue used ascending lines to indicate the melodic shape of the ascending 'a' pattern. They also showed that the first note of the recurring 'b' pattern or the notes of the 'c' pattern were accentuated by placing their notational symbols higher or lower on the page. For example, Karen used dark blue for the first notes of the 'b' patterns as well as 'c', and placed these 'Lou's lower than all the other ones. She seemed to be clearly aware of pitch, rhythm and duration. Karen described her notation as "a pattern in a pattern." She demonstrates by covering patterns with her left hand and with her right hand pointing to others (ex. 'a b'). Bev, her teacher, offered this response: Wow, I'm so impressed. A different level of intellect (...) I don't know how I would do this. Isn't that clever?"

Ned's notation is in the form of a large squiggle whose undulating line of 'lu's and 'la's suggest melodic contour, intensity and an almost exact 1:1 correspondence between the 'lu's as he sang them and the 'lu's as he wrote them. He distinguished the 'a', 'b' and 'c' patterns with ascending 'lu's ('a'), descending 'lu's ('b') and a straight row of larger 'lu's at the end ('c'). His teacher, Bev, found Ned's notation "very interesting. The picture shows the repeated patterns that make up the song (...). Very very cute....a very bright intelligent student."

Table 14 presents the coding scores for the children's notations, based on criteria developed by Bamberger (1992), Elkoshi (2004a, 2004) and Carroll (1995), as I described in chapter 3. These coding scores show that, with the exception of Jasmine, the notations of the kindergarten children were coded at Level 1 for Pitch [P1] and Rhythm [R1] according to Bamberger's system, and F (Formal response) according to Elkoshi's system. A formal response indicates that the child used notational symbols to show the sequence of sound events. The notations created by the children in grades 2 and 4 were coded at Level 2 for Rhythm [R2] and all of them used notational symbols to show the sequence of sound events (*F*- Formal response)) as well as sound groupings and division of these groupings into units (*G*-Gestalt). The table also shows that the children's notations became increasingly song-specific as illustrated by the prevalence of '5's according to Carroll's coding sequence. In addition, all the children in Grade 4 showed an awareness of pitch by the positioning of their notational symbols, which was reflected in their coding score of Level 2 for Pitch [P2].

Table 14

Coding Scores

Bamberger Benyinn Polich	Elkosni A. Associations (mages) Parionnal (soundisymbol) Geografii (group/ngs)	Carroli Elve levels of describing Initiales en allons
lren		
R1, P1	F	2
R3 (line 2); P1	FG	4
R1; P1	F	2
R1; P1	F	3
		A
R2; P1	AFG	$4 \rightarrow 5$ (visit 3)
R1; P1 R2; P1 (end of visit 3)	AFG	1; 4 \rightarrow 5 (visit 3)
R2 ('c' only); P1	F (hint of G)	4
R2; P1	FG	5
AFA (1) 大学的 1943		e and the street
R2; P2	FG	5
R2; P1 (P2 for 'c')	FG	5 .
R2; P1-2 (hint of pitch)	AFG	5
R2; P2	FG	5
R1-2; P1-2	FG	3 → 4(visit 3)
	Bamberger Banyim PEpitch Banyim PEpitch R1, P1 R3 (line 2); P1 R1; P1 R1; P1 R1; P1 R2; P1 R2	BambergerElKoshiBambergerAssociations (noncest)Frontel (sourcest)Frontel (sourcest)BambergerFrontel (sourcest)Ri, P1FR3 (line 2); P1FGR1; P1FR1; P1FR1; P1FR2; P1AFGR1; P1FR2; P1AFGR2; P1FR2; P1FGR2; P1 (end of visit 3)AFGR2; P1FGR2; P2FGR2; P2FGR2; P1-2 (hint of pitch)AFGR2; P2FGR2; P1-2FG

The coding scores illustrated in Table 14 and the summary of the musical features of the children's notations are consistent with findings that 5-year-olds tend to use abstract symbols to represent individual sound units with little or no attention made to grouping these units together in relation to the song, and that children use colour, size, length, shape, space and positioning as notational devices to show contour, phrasing, duration and rhythmic groupings with increasing sophistication (Davidson & Scripp, 1988; Carroll, 1995, Elkoshi, 2004a, 2004). However, this phenotypic analysis of the children's notations alone does not tell the whole story. It does not reveal the processes by which the children created their notations and the changes they made along the way as a result of singing the song back, explaining what they did and teaching the song to a classmate. Nor does it reveal the ways in which the children used words and gestures to explain their notations, thus bringing to light musical understandings not seen in their notations alone.

In the next part of this chapter, I look beyond the children's notations as sole object of analysis in order to gain a better picture of children's musical and metacognitive understandings from a social constructivist perspective. Using data excerpts, I examine how children used singing, gesturing and talking to notate the song and sing it back in the second visit, and I illustrate the *knowing -in-action* that emerged as the children taught the song to their classmate in the third visit. The portrait galleries in Figures 26, 27 and 28 exhibit the notations created by children from each of the three grade levels, K, 2 and 4. They provide visual reference points for the genotypic analyses that follow.

Portraying the activity: A genotypic analysis

I now examine the processes by which the children made sense of the music notational task. Specifically, I address the following questions:

How do children use the resources available to them to complete a music notational task?

What resources do children use to notate a song on paper?

What resources do children use while singing back their notation of the song?

What resources do children use to explain their invented notational system to me as the researcher?

What resources do children use to teach the song to a classmate?

Notating the song and singing it back

During the second visit, the children faced the challenge of notating the song and then singing it back from their notation. Notating the song involved deciding on a symbol to represent each sound unit, matching the number of sound units with the number of written symbols, which I refer to from now on as establishing a 1:1 sound:symbol correspondence and, finally, encoding the symbols to represent the musical dimensions of the song so that someone who does not know the song could sing it. Singing the song back from their notations involved 'reading' what they had written while pointing to the symbols. I use selected examples from my videotaped transcripts and present them in the form of narrative vignettes to illustrate this creative process.

The portrait gallery in Figure 26 exhibits the notations created by the kindergarten children. It provides a visual reference for the genotypic analysis that follow.

PORTRAIT GALLERY

Kindergarten



Figure 26. Portrait Gallery - Kindergarten

The first narrative vignette, "Delightful drawings" was drawn from my observations of 5-year-old Al, whom I introduced in chapter 1. It illustrates the process by which Al created his representation of the 'Lulu' song.

Al: Delightful drawings

Notating the song #1 - When I ask him if he remembers the song that we sang the previous week, he tells me he remembers "just some parts" of it. He sings the song alone in a low-pitched confident voice. His singing matches the song except for omitting the *quickquick* part of 'b2' and singing 'LU lulu LU' at the end, instead of LU LU LU. After I explain the task, he says, "I don't know how to write it." I remind him that some people use lines or circles or squares or anything to show the sounds of the song. Al picks up the box of markers and chooses a red one. He draws a red square, puts the lid on the marker, chooses a green one, then draws a triangle and so on.... He is silent as he draws. "I'm making a pattern", he replies when I ask him what he's doing. On two occasions, he glances back on what he has already drawn: the first time he looks at the shapes in line 1 before starting line 2; the second time he counts the circles in the 0000X pattern on line 3 before drawing the pattern again. Five rows, 59 shapes and 10 minutes later, Al says, "I'm finished."

Singing the song back #1 - Al sings Part 1 of the song twice, omits 'b' in Part 2 and stops on the first note of 'c', which corresponds to the last shape on his paper, whereupon he adds two vertical lines in pencil. The second time he 'reads' the song, he sings Part 1 minus 'b2' <u>three times</u>, and when he reaches the final shape on his paper, he continues singing a truncated version of Part 1 <u>two more times</u> while adding six more vertical lines plus a square. The third time he 'reads' the song, he sings Part 1 minus 'b2' <u>five times</u>, and at the end, he adds a green vertical line. With each 'reading' of the song, he modifies his singing and his fingerpointing, sometimes sweeping over an entire row of shapes with his pointer finger while singing a single 'LU', usually the *long* 'LU' of the 'b' pattern.

Notating the song #2 - I invite Al to write the song again and to sing it as he writes. He chants 'Lu Lu' as he draws two red triangles. Then he quickly makes eight red lines for each of the eight 'Lu's that he sings ('b b2 a' plus one long LU). He draws each of the eight lines from bottom to top, as if he were 'taking notes'. He adds a triangle while singing the *quickquick* part of 'b'. At this point, he stops singing but continues to draw shapes including simple shapes AND shapes in the form of shapes (e.g. circles in the form of a circle and lines in the form of a square!). He finishes his second drawing in less than four minutes.

Singing the song back #2 - Al sings a new melody which does not resemble the 'Lulu' song. I ask him to explain why he sang a different tune. "I didn't use the same thing and it does not make the same song (as he points to the shapes in notation #2). That's why."

As he silently drew a series of coloured shapes and patterns, Al glanced back on what he had done on two occasions, seemingly to replicate a sequence of shapes he had already drawn. When singing the song back from his drawing, Al adapted his singing and fingerpointing to account for the colourful patterns and to define the musical dimensions of duration and rhythm. His efforts outnumbered the sounds of the song by a ratio of 3 to 1; there are three times as many shapes on his page (69 shapes) as 'Lu's in the song (23 sound units). Although there was evidence of some capacity to use his singing to create his second notation, the new drawing is the reference point for a new song. As Al said, "*I didn't use the same thing and it does not make the same song*."

The next vignette, "All L's all the way" illustrates how 5-year-old Colin was able to establish 1:1 sound:symbol correspondence with my help, particularly in the way I guided his singing as he pointed to each 'L's.

Colin: All 'L's all the way

Notating the song - "I'll use a pencil", Colin says after I explain the research task. I suggest we first sing the song together. He begins before me and sings louder than I do. The rhythm and melodic shape/contour of the 'a', 'b' and 'c' patterns, as he sings them, are accurate but not the relationships between the pitches. After singing the song a second time together, I ask him if he has chosen a mark for the sounds of the song. "L L L", he says as he writes a row of 'L's, 16 of them, one after the other. As he writes, he looks up from his paper three times, as if thinking about the song or singing it silently to himself. A minute and 25 seconds later he says, "I'm finished."

Singing the song back - The first time he sings the song from his paper at my request, he invents a melody while pointing to the 'L's. The next time he follows my singing quietly as he slides his finger from one 'L' to the next, but stops singing in the middle of 'a' in Part 2 and looks at me; there are no more 'L's on his paper. I continue singing until the end. I guide his singing a third time and once more he stops singing when he reaches the last 'L' on his paper. I finish singing the song and he joins me on 'c'. The fourth time we sing the song together, he adds an 'L' to represent the *long* note of 'b', then two more for each of the *quickquick* notes of 'b. Finally he adds three more for each of the last three 'Lu' s that he sings alone. The fifth time we sing the song together, Colin's singing resembles a series of monotones rather than the 'Lulu' song. As he has done several times before, he slides the tip of his pencil across the 'L's, as if tracing a line with no attention to the musical patterns in the song. As it stands, there are 22 'L's in the line.

Like Al, Colin adapted his singing to the straight row of 'L' on his paper and did not seem to be bothered by the lack of information about the 'a', 'b' and 'c' patterns that make up the 'Lulu' song despite the fact the he sang the song with relative rhythmic and melodic accuracy before notating it.

The next vignette illustrates how 5-year-old Jasmine, equipped with a 'sound' internal image of the song, approached the task *"slowly but surely"* and often used me as a resource. Her mother told me that Jasmine is like that, *"Every time we do something, I always try to explain exactly what we will be doing so she doesn't get scared."*

Jasmine: Slowly but surely

Preparing to do the task - "I need your help to write it", Jasmine says after I explain the research task. I explain further, "Use any marks. Some people use circles for the sounds of the song, some people use lines". She is still not ready to begin. "I'm just going to think in my head." Seventeen seconds later, she looks at me and calmly says, "I want you to help me do it." to which I reply, "What kinds of shapes do you like?", "What kinds of things do you like to draw?" "You might want to use a different symbol for different sounds." She sighs and in an emphatic voice says; "Now I know."

Notating the song - She takes the light blue marker from the box and draws a circle with her right hand, taps her left ring finger on the table 5tims ['a' and first note of 'b'] and then points to the circle she just drew and to the space beside it. She draws another circle, points to each of the two circles and then to an imaginary one. She draws another circle, puts her left hand to her forehead as if she's thinking of the song in her head and then draws the fourth circle. She looks up as if in thought before she sings the first four 'Lu's of the song silently to herself while pointing to each circle. Jasmine draws four triangles below the four circles, then looks at me, leans back in her chair, puts the lid on the marker and, 45 seconds later, says, "*I'm finished.*" Up to now she has notated a little more than half the song.

Singing the song back - She sings the song from the beginning, stops on the last triangle and looks at me. I remind her about the song's form and the recurring *Long quickquick* 'b' patterns. I slowly sing sections of the song and she joins in. Then she sings the song or parts of it on her own before verifying what she needs to do, all the while asking for help, either directly with words (*"I need help"*) or indirectly with gestures (looks at me). In this way she draws the first 4 circles in Line 3, constantly referring to the circles in Line 1. She draws the next four circles as we slowly sing them together. For each 'Lu' we sing, she makes a circle, 2 to represent 'b' as she did with the triangles representing the recurring 'b' patterns in line 2 (*Long* = 1 circle/triangle; *quickquick* = 1 circle/triangle) and 2 to represent the first two notes of 'c'. Finally she draws a triangle to represent the last note of the song. Jasmine was the only child in kindergarten to systematically use her singing and pointing as a guide for notating it. Note that her representation of the *Long quickquick* (LU lulu) pattern as two triangles (Part 1 of song) or two circles (Part 2 of song) is consistent and shows that her focus is on the underlying beat (2 beats) rather than on the three sound units (LU lulu).

The portrait gallery in Figure 27 exhibits the notations created by the grade 2 children. It provides a visual reference for the narrative portraits that follow.

PORTRAIT GALLERY

Grade 2



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Figure 27. Portrait Gallery - Grade 2

The next four vignettes illustrate the ways in which Wayne, Ruth, Julie and Dan notated the song and sang it back. The first excerpt, "Taking time", portrays the slow, measured, and at times distracted manner in which 7-year-old Wayne approached the task.

Wayne: Taking time

Preparing to do the task - Wayne tells me that the song is "hard to remember 'cause they're a lot of lu lu lu's." He can sing Part 1 but not the ending. "After the second part it's kind of the same thing, but it doesn't end like the same way." We sing the song together three times and I point out the 'a', 'b' and 'c' patterns, in particular the recurring 'b' patterns.

Notating the song - Slowly and carefully, Wayne draws 'Loo's, one at a time with a squiggly line under each one. He stops after each 'Loo', stares down at the table or in front of him, and then points to the 'Loo's, sometimes pointing to an imaginary one next to the last 'Loo'. It takes him nine minutes to draw the first eight 'Loo's as follows: LOO LOO LOO LOO LOO

Decorating the paper - Wayne asks me if he's allowed to make musical notes "here and here", as he points to each of the four corners of the page. I nod. He slowly draws black musical notes in each of the four corners, followed by a yellow sun near the upper right corner of the page. He spends six minutes decorating his page and another four minutes drawing a purple figure conducting and singing the song.

Singing the song back - I redirect him to the research task. In the course of singing the song back from his notation fifteen times, he adds 1, 2 or several 'Loo's at a time. With each added 'Lo' or series of 'Lo's, Wayne verifies what he has done by singing or counting 'Loo's while pointing to each one. He adds two green 'Loo's to complete Line 1 the sixth time he sings the song back. In Line 2, he adds four green 'Loo's, three purple Loo's and three yellow 'Loo's the tenth time he sings the song. Finally he adds a blue 'Loo' before the very first one on his paper the twelfth time he sings the song. With few musical clues on his page to guide him, and lacking an overall 'sound' image of the song, Wayne stops twice in the middle of 'a' in Part 2 and says he is mixed up. Because he does not make any changes on his own despite my repeated prompts, I tell him we'll look at his notation again next time.

Wayne frequently sought my guidance in establishing a 1:1 correspondence between the sounds of the song and the 'Lou's on his paper. He made no changes on his own but, as I illustrate in the next section, he modified his notation in the company of Belinda in the third visit. In contrast, 7-year-old Ruth was deliberate and self-regulated in her actions. The next vignette, "Straight as an arrow" illustrates the swift and direct manner in which Ruth notated the song in pencil, sang it back and coloured the 'Lo's in blue.

Ruth: Straight as an arrow

Preparing to do the task - Ruth responds quickly when I ask her if she wants to sing the song alone or with me. "*Hmmm... alone... 1, 2, 3, go.*" She sings the song in a self-assured voice as she taps the rhythm on her knees and nods her head with each 'Lo', all the while looking at me. The moment I finish explaining the task, she is off and running.

Notating the song in pencil - After every few 'Lo's, she points to each one while whispering the song. She erases, adds or re-positions 'Lo's as necessary in order to establish a 1:1 correspondence between the 'Lo's as sung, the 'Lo's as written and her fingerpointing. It takes her three minutes to notate the song - a process that includes eleven self-regulated verifications and six changes to her notation.

Singing the song back - Ruth lifts her paper and points to each 'Lo' with the tip of her pencil while singing the song back at my request. As she sings, she exaggerates the last 'Looo' by bending her head forward as I did when teaching the song the week before.

Colouring the 'Lo's in blue - Without missing a beat, Ruth says, *"Back in marker."* She reaches over the table to get the blue marker and traces each of her penciled 'Lo's. She works quickly and silently and does not look up from her paper. Less than two minutes later, she blurts out, *"There you go"*, and hands me her paper.

Like Ruth, 7-year-old Dan, notated the song in a systematic and self-regulated manner. His diligence is illustrated in the next narrative, "Diligent Dan".

Diligent Dan

Preparing to do the task - I ask Dan if remembers the song we learned together the previous week. He responds in an easy and outgoing manner: "*I know the ending but I don't really*.... *I know the*...*uh*, *uh*, *the start and then the Lu-lulu {'b'} and then there's a change in the middle and then the ending*." We sing the song together and then he sings it alone. He imitates the shape of the melody but not the exact relationships between the notes. The rhythmic patterns of the melody, however, are accurate. I explain the task. He can hardly wait for me to finish:

Dan: Can you tell me how you spell it?

Deb: However you want to spell it. There is no right or wrong answer.

Dan: OK (He takes a pencil).

Deb: There's an eraser and if you have any questions, ask me.

Dan: Is it OK if I get it like ... a little bit wrong?

Deb: There is no right or wrong answer. If you want to change something you can.

Dan: OK

Notating the song in pencil - Dan verifies what he has done after writing a 'Lu' or a group of 'Lu's. He sings back the song or parts of it while pointing to each 'Lu' with the tip of a pencil or his right pointer finger. Sometimes he embodies the *quickquick* part of 'b' with his head or he waves his hands as if he is a conductor.

Notating the song in colour - Without stopping, Dan colours the 'Lu's. He starts with the last 'LU' until the first 'Lu' and verifies what he has done eight times. When he is finished, he asks me, "*Is it OK if I make like little designs?*" He writes his name with coloured markers and frames it in pink [I call it his 'signature design'] and decorates the four corners of his page.

Singing the song back - While singing back the song at my request, he adds a tail to the 'u' of the third 'Lu' in Line 3, erases the tail on the 'U' of the last 'LU' in Line 1 and adds two squiggly 'LU's in line 4.

Throughout the process, Dan seemed conscientious and serious about representing the song as best he could. Noteworthy were the 37 notational changes that Dan made the following week in the company of Wilbur, his classmate, to more clearly represent the song.

Like Ruth and Dan, 7-year-old Julie was deliberate and self-regulated in her actions. However, unlike them, Julie's written representation of the 'Lulu' song did not correspond to her sound image of the song before she invented her notational system. She simply adapted her singing to correspond to what she created. The next narrative vignette, "Swift and squiggly" illustrates the self-assured manner in which Julie notated the song.

Julie: Swift and squiggly

Preparing to do the task - She sings the song alone with confidence and a smile on her face. Her singing is rhythmically accurate; melodically and tonally it is unstable. I explain the task. Julie wants to make sure she understands what I have asked her to do.

Julie: Like you say like <u>Lu</u> (she stresses each 'Lu' as she thrusts her right hand forward twice, with her fingers touching her thumb) and then all the rest?

Deb:Yeah/

Julie: Oh now I get it!

Notating the song - With her head bent and her shoulder-length black hair touching the paper, 8-year-old Julie quickly makes squiggly horizontal lines with the pink marker. After the 4th, 6th, 13th & final (16th) squiggle, she points to each one with her left pointer finger to verify what she has done. She puts the lid on the marker, takes out a purple marker and with the tip of the marker, points to each pink squiggle while whispering an extended version of Part 1 to account for the three extra squiggles. She makes five purple squiggles to complete line 1 and continues drawing two more in Line 2 before verifying what she has done. This time she whispers an extended version of Part 1 followed by Part 2 ('a', 'b' minus 'c'). She draws ten more squiggles, including three larger ones at the end to represent 'c'. She points quickly to each squiggle as she whispers her extended version of the song - Part 1 ~ Part 1~ Part 2. She draws another squiggle under the 9th one in line 2 and an orange arrow under the last squiggle. Again she sings her version of the song, crosses out the squiggle she has just drawn with a black marker, then sings part of the song silently to herself. She writes "the song Lo Lo" under her squiggles before verifying what she has done four more times. Finally, she adds two orange squiggles under the thick black line and then another one to match her singing of the song. "I'm done", Julie announces confidently. It takes her 6 minutes and 16 seconds to write her notation including 14 self-regulated verifications of her actions, which represents an average of one verification per minute!

Singing the song back - Each time I ask her to point to the squiggles as she sings the song, she consistently sings Part 1 twice followed by Part 2. She matches her singing to fit her notation; from her perspective there is no need to make any changes to her notation.

During the third visit, Julie made no changes in the company of Cathy, her classmate. However with much prompting from me after Cathy left, Julie changed the last three pink squiggles in line 1 to purple to indicate the beginning of a new section, which in this case was a repeat of Part 1. Towards the end of the third visit, I asked Julie whether she would notate the song differently if she could do it again. She promptly responded, *"I would do dots for this* (as she looked at her paper) *and then I would count how many pink ones, so then I can do how many of one colour and then I would count how many these are* (as she pointed to the purple squiggles) *and then I'll make them bigger."* Julie completed her second notation in two minutes – a good example of how words shape actions. In Julie's case, she did exactly what she said she would do.

The portrait gallery in Figure 28 exhibits the notations created by the grade 4 children. It provides a visual reference for the narrative portraits that follow.

PORTRAIT GALLERY





Karen



Joyce





The next four portraits illustrate the systematic, self-regulated manner in which the grade 4 children, with the exception of Sue, notated the song. In the case of Earl, a sense of agency is most evident as he notated the song a second time as illustrated in the next narrative vignette, "Finding the tune."

Earl: Finding the tune

Preparing to do the task - "I need some help", Earl replies when I ask him if he remembers the song. We sing it together and then he sings it alone. His singing matches the rhythmic and melodic patterns of the song except for the pitch relationships between the four ascending notes of the 'a' pattern.

Notating the song #1 - As he draws 'Lo's on the paper, he does not sing the song out loud, nor are there any signs that he is singing the song silently to himself. He stops after every few 'Lo's, smiles, looks at me, then at his paper and writes more 'Lo's. After drawing the 10th 'Lo', he stops a moment before putting the pencil down. He takes out a blue marker and makes a happy face in front of the 1st 'Lo'. He puts the marker away, picks up the pencil and looks at his paper before adding the last 'Lo' in line 1. He stops again for a moment before drawing a second line of 'Lo's. After writing eight 'Lo's on line 2, he makes a yellow squiggly line under each line of 'Lo's. He then chooses a turquoise marker and adds two musical notes (quarter notes) – a big one and a small one. He takes a red marker and adds two more musical notes (two eighth notes) between the first and second 'Lo' in line 2. He underlines the three Loo's at the end of line 2 with the same red marker, takes out a black marker to make a dot just under the eighth 'Lo' in line 2 and says, *"I think I'm done."*

Sensing a lack of direction and purpose, I suggest he try again. He promptly picks up the pencil and begins to notate the song anew.

Notating the song #2 - After every few 'Lo's, Earl verifies what he has done by pointing to each one with the tip of his marker or with a pencil from above. He erases some 'o's and several 'Loo's at the end when he realizes that "I made too many 'Loo's." Earl completes his notation in three minutes. Upon finishing, he says in a confident tone, "<u>Now</u> I did it a <u>little</u> better. Now I think it's right !"

Singing the song back - I suggest he sing the song from his notation to make sure that all the long 'Loo's are "in a place that is with your singing." Each time Earl sings the song back at my request (6 times) or on his own (10 times), he makes changes as he goes along. He erases some 'o's (e.g. "This one should go away") and adds some 'o's (e.g. "This one's supposed to have an extra 'o""). I ask him if he would like to add anything to his notation. He immediately takes out a green marker and makes two lines under each

of the rows of lo's, saying "One line" as he draws each one. He then takes out a blue marker and underlines each 'Loo' saying "long" each time he underlines one. He also makes "*a little head*" in blue at the end. The last time he sings the song, there is a 1:1 correspondence between his singing, the 'Lo/Loo's on his paper and his fingerpointing.

While notating the song for the first time, Earl pointed to each of the first four 'Lou's, as if counting the number of 'Lou's he just drew. He also underlined the three 'Loo's at the end of line 2 to represent the 'c' pattern. Despite these actions, Earl seemed to be aware that his notation did not match his singing (*"I think I'm done"*). A simple suggestion from me to try again set him on track. The creation of his second notation involved writing a 'Lo' or two, verifying what he had done up to that point by singing silently to himself, in a whisper or out loud, and then modifying his notation by adding more 'Lo's or erasing all or part of some 'Lo's.

The next narrative vignette "Quietly capturing the contour" illustrates the process by which Ned represented the 'Lulu' song as an oscillating line of 'lu's.

Ned: Quietly capturing the contour

Preparing to do the task - We sing the song together three times. Every time he sings his own version: He repeats Part 1 (so does Julie), sings two 'Lu's instead of three for 'b2' and omits 'b' in Part 2. Ned sits quietly as I explain the task.

Notating the song - He moves forward in his chair and begins to write with a pencil that, unbeknownst to me, he was holding since he came into the room! He writes ascending and descending 'lu's until the second 'peak'. Along the way he erases the first two descending 'lu's and spaces them out more evenly. He counts the descending 'lu's after the first peak before writing four descending 'lu's after the second peak. He points again to the four corresponding 'lu's following the first 'peak' and then silently sings back the song from the beginning. He continues to refer to 'lu's already written before adding more 'lu's and erasing others to space them out more evenly. He completes his notation in less than three minutes [in 2 minutes and 46 seconds, to be exact].

Singing the song back - After singing the song back twice at my request, he sings it back twice in a self-regulated manner while making changes at the same time: He erases the second peaked 'lu', and after verifying the 'lu's from the beginning with his left pointer finger, h replaces this 'lu' with another one that is o the same level on his paper as the first peaked 'lu'. He also erases the last lu's, spaces them out more evenly, adds another 'lu' before 'c', touches up the 'u' of the one just before it and then sings the song on his own for the last time. This time he sings 'c' as four long 'lu's instead of three long ones. His

actions are entirely self-regulated. He sings to himself as he writes the 'lu's and does not ask for guidance. To verify what he has done, he points to each 'lu' with his pencil in the air or he moves his head slightly forward with each 'lu' he sings.

Ned's actions were entirely self-regulated as he quietly captured the rise and fall of the song's melodic contour by continually erasing and re-spacing the 'lu's to create a balanced undulating line. The next vignette shows the intentional manner in which 9-yearold Joyce used blue, red, brown, black, purple and green markers to represent the song's patterns.

Joyce: Blue, red, brown, black, purple and green

Preparing to do the task - When I ask her if she remembers the song, she replies, "*I guess.*" We sing the song together then she sings it alone. The rhythm and melodic contour are accurate, but not the relationship between the pitches. After I explain the task, she immediately opens the box of markers, says, "*I'll pick three colours*" and takes out a blue, red and brown marker.

Notating the song - Holding all three markers in her hand, she writes the letter 'L' in blue and 'o' in red. She stops and asks me about the 'a b' pattern. "There's five 'lu's? (...) five 'lu's and then lulu?" She taps the table twice on 'lulu' with the edge of her right hand. I suggest she sing the song in her head. She puts the markers down and sings the beginning of the song, namely, the 'a b' pattern, while tapping the rhythm on her lap. "Yep", she replies to her own question, as she picks up the markers and writes a 'u' in brown to complete the first 'Lou', followed by a blue 'Lou' and a red one. She taps the marker on the first three 'Lou's while singing silently. She then draws the 4th 'Lou' in brown before putting down the markers. She sings 'a b' in a whisper as she taps the rhythm on her lap. She picks up the markers and picks up a black one, writes two 'Lou's and puts it down. She sings 'a b b1' in a whisper as she taps the rhythm on her lap. She continues in this systematic manner, singing while tapping on her lap or on each 'Lou' before writing more 'Lou's. Less than five minutes after she began, Joyce cheerfully says in a high-pitched voice, "Here we go. I'm finished."

Singing the song back - The first time she sings the song back at my request, she realizes that the song goes on and that she is missing some 'Lou's. "Oops, it's supposed to be LouLou and then Lou Lou Lou", she says as she taps on each of the two purple 'Lou's in line 3 and then taps three times on line 4, before looking up at me and saying, "Oops!" She takes the black marker and traces over the two purple 'Lou's in line 3, crosses out the 'uuuu' in line 4, but not the 'LOU' just in front of it, draws three big 'LOU's in purple, and as she writes, "or Louuuu", she explains: "I'm going to do it in a different colour.

I'll do it green." The second time she sings the song from her notation, she stops at line 4 and says, "*Darn... messed that up again.*" She takes a purple marker, writes "*LOU LOU*" and crosses out the first 'Lou' in line 4. As a result of these changes, there is a shifting of the musical function of some of the 'Lou's. When she realizes that the last 'Lou' in line 2 now represents the first 'Lou' in Part 2, she draws an arrow after it to show that Part 2 continues on the next line.

Joyce's actions were systematic and resourceful. She used singing, pointing, tapping and a variety of coloured markers to notate the song, while dialoguing with herself. Like Joyce, Karen devised a strategy to represent the song on paper. As I illustrated in chapter 3 with a colour-coded transcript, Karen's sense of agency was evident, particularly in light of the fact that she already notated part of the song on her own after I taught the song in the first visit. The next narrative vignette, "Moving right along" illustrates this sense of knowing where she's going.

Karen: Moving right along

Preparing to do the task - When I ask her if she still has the 'Lulu' song in her head, she smiles, says "*Yeah*", pushes her chair away from the table and sideways to face me and begins to sing the song. Her singing is rhythmically accurate, but the melody is unrecognizable. As I explain the task, she moves her chair close to the table and picks up a pencil.

Notating the song in pencil - With her nose almost touching the pencil, which she holds in her right hand, she draws her first 'line' of 'Lou's. She then sweeps her pencil twice across what she has already done; the first time until the first low 'Lou' and the second time until the second low 'Lou'. She completes 'line' 1 and, without a pause, completes 'line' 2. Two minutes after starting her notation, she says, "*Finished*!"

Singing back the song - At my request, she sings the song alone while pointing to each 'Lou'. There is a 1:1 sound: symbol: fingerpointing correspondence. When I ask her to tell me something about why she chose to use a pencil, she immediately replies, *What I could do now, I could write over it, uh the low, uh* (she points back and forth over the low-lying 'Lou's with her pointer finger) *like*...

Colour-coding the 'Lou's - Karen picks up the box of markers, takes out six markers and places them one by one in front of her on the table. She points to each 'Lou' until the first low-lying one while silently counting the 'Lou's up to that point (7 'Lou's). After counting the markers in front of her (6 markers), she chooses another one from the box before arranging and rearranging the seven markers on the table. She traces over all the highest 'Lou's in line 1 in pink and the lowest 'Lou's in lines 1 and 2 in dark blue. She

looks over what she did before tracing over the two highest 'Lou's in line 2 in pink. With the purple marker, she traces over the first 'Lou' in lines 1 and 2. Similarly she traces over the 2nd, 3rd, 4th, and 5th 'Lou's in lines 1 and 2 in blue, red, primrose and turquoise respectively. It takes her 2 ½ minutes to colour-code her notation.

For Earl, Ned, Karen and Joyce, notating the song involved a recursive process of writing, verifying by singing and pointing, making changes, then referring to what had been done before writing more 'lu's and so on. As for Sue, she was in a class of her own, as I portray in the next narrative vignette, "Fussy Sue and her three notations."

Fussy Sue and her three notations

Preparing to do the task - When I ask Sue if she remembers the song, she sings the first 5 notes of a musical scale very softly and quickly and says: "I don't remember the notes. I remember what to say {Lou} but I don't remember the notes. I don't remember how it started." I suggest she choose the starting note and I join in. She repeats a semblance of Part 1 {5 scale-like ascending notes and 2 quick ones} when I am singing Part 2. After singing the song alone at my request, she assures me that: "I am not really shy. Those notes I have like trouble singing it like out loud." After singing the song 9 times - 7 times at my request (3x alone and 4x together) and twice on her own, she picks up a pencil. She stares in front of her for about five seconds, poised to write and says: "I think we could use the word 'na', like *na na na na <u>na</u> nana*." She sings the 'a b' pattern accurately for the first time !

Notating the song (1st attempt) - Sue draws two 'na's in an ascending diagonal fashion. She stops, sings the 'a b' pattern, makes sure that there are "five lu's that go up" and then continues writing three more 'na's. She points to the five 'na's on her paper, draws two more and sings the 'a b' pattern. She moves her eyes up and down across the page as if planning her next move. Fourteen seconds later, she begins to make a line across the page, but then stops and asks for a ruler. I cannot find one but there is a Kleenex box, which she uses to complete the line. She draws another line and then erases both lines because they are converging. Meanwhile I notice a yardstick on the ledge of the blackboard. She gets it and starts whistling as she draws lines. But they still converge. I ask her if she wants to starts over. She turns over the paper, places the yardstick across it and says, "I'm so fussy."

Notating the song (2nd attempt) - Sue begins to draw lines across the page, "I'm just going to make some lines", she announces. While drawing the lines, she asks me how the other children did in my study. She also tells me about a song that she "just started to make with the notes of other songs I heard." After making five horizontal lines, Sue sings six 'na's in an ascending fashion. She then writes six 'na's diagonally on the paper, one on
each of the five lines she drew and three 'na's in a row on the top line. She sings and points to the 'na's again and says, "Going well going well." She sings her version of the 'a b' pattern a third time before repeating the pattern on the paper. This time she sings each 'na' for every 'na' that she writes. Upon completing the two diagonal patterns, she realizes she has a problem ~ there is no space left to continue:

There's only one single problem. I made them like that (she picks up her paper and shows it to me). I was just stuck because I'm making them like that, and I won't have room to finish, so I did something wrong, didn't I? I just need to erase.

As she erases all the 'na's, she says, "It's going to take me so long because I'm so fussy."

Notating the song $(3^{rd} attempt)$ - She continues her verbal monologue as she writes the first ascending 'a b' pattern in the first column. She sings it back twice as she counts each 'na' on her left hand. She sings it again, this time pretending to move her left hand up a ladder in the air, before asking me how many times the pattern recurs. We sing it together. She hears that it is repeated twice, but when I sing it alone, she hears it four times and shapes her notation accordingly: "I heard it four times, so I keep in my head four times, I count four times and na na a {'c'}." She writes a second ascending pattern of 'na's and, without verifying what she has done, announces that she will make lines:

I'll make lines in between to say like we change notes (moves ruler to right), like not lines like that (moves hands across page), but lines like that (moves hands up and down) to say we just change sentence kind of.

As she makes vertical lines with the ruler, she resumes her monologue, this time explaining that all her senses are perfect, but not her attitude. After drawing the fifth line, she continues to make two more ascending patterns, all the while talking about herself, but not verifying what she has done. Based on her singing of the song, that is, she sings the 'a b b1' pattern five times, she realizes she is missing more 'na's : "Well, I don't get it. I don't have it. I always do 'LouLou' (quickquick part of ``b') and then I go back up again, but you didn't go back up again when you sang it."

She adds a 'na' to each of the four bottom squares of her graph and, without singing it back, says: "Now it's all right because I did something wrong but it's correcte." (French pronunciation)

Singing back the song - Upon singing the song back at my request the first time, Sue realizes that there should only be one 'na' in the first square, so she erases the extra one. The third time she sing the song, the first column of 'na's correspond to her singing of 'a' with regard to melodic shape, but by the second column, she sings a recurring 3-note descending pattern that bears no resemblance to the song. By 'c' she is back on track.

The process by which Sue created her representation of the song presents a different refrain from the ones heard from the other grade 4 children. After singing the song (or an approximation of it) 11 times alone or together with me, Sue began to draw ascending 'na's but soon turned the paper over and said: "I'm so fussy." She decided that her first attempt was messy because the lines she made to separate each 'na' converged. Her second attempt at notating the song was also unsatisfying to her because the 'na's were too spread out so she erased all the 'na'. She began her third attempt by making lines across the page. After completing her second 'column' of 'na' s, she decided to draw vertical lines so it would be easier to show that the notes should be read up and down the page, rather than across the page. This third and final attempt at notating the song was characterized by extended soliloquies about her being fussy and perfect, and whistling while she drew lines and 'na's. The manner in which she notated the song not only contradicted her talk about being perfect, but she also declined my attempts at guiding her. For example, she wrote four lines of ascending 'a b' patterns despite my repeated modeling of the song with two 'a b' patterns and then added a 'na' to each bottom square when she finally realized that the 'b' pattern consisted of three notes. After singing the song from her notation five times at my request, Sue added, erased and re-positioned 'na's within her graph, but the notation, which took her 19 minutes to finish, was not yet quite right to her.

Section summary

In this section, I drew on videotaped transcripts of the second visit to portray the children's actions as they notated the 'Lulu' song and sang it back. I illustrated the creative ways in which the Kindergarten children used their singing and fingerpointing as resources to inject musical meaning into their notations. For the children in grades 2 and 4, I showed how notating the song involved a recursive process of writing, singing and pointing to their symbols to verify what they did, make changes if necessary and then re-evaluate the changes before writing more 'lu's. I also highlighted aspects of Sue's notational process that, from a portraitist's perspective, presented a *dissonant refrain* from the actions of the other grade 4 children.

Teaching the song to a classmate

In this section, I use videotaped transcript excerpts to illustrate how the children tackled the task of teaching the song to their classmates in the third visit. While most of the children naturally assumed the role of teacher, I observed that some children, namely Al, Colin and Joy, did not use their singing or their notations as meaningful tools for

teaching the song. Therefore, I do not discuss these kindergarten children for the purposes of the present analysis. Several factors may have influenced their ability to exercise their role as teacher. They may not have had a stable and fully formed sound image of the song, or they may not have used their notation as a teaching tool for lack of sufficient musical clues about the song. The absence of song-related questions or comments from their classmates that might have challenged them to modify their notation to better represent the song may also have been contributing factors. Moreover, I considered it appropriate to allow the peer-peer interactions to unfold as they may, rather than to insist that the children teach the song to their classmates.

In the cases of 5-year-old Jasmine, 7-year-olds Ruth and Julie, and 9-yearold Joyce, three important factors enabled them to teach the song. Apart from their apparent ease in the role as teacher, they all had a relatively stable image of the song; their notations had sufficient musical cues about the song; their classmates were active learners. I use the term, *Self-regulated teaching*, to characterize the actions of these children, who used their singing, gestures and verbal explanations as resources to teach the song, and who do not make any notational changes in the company of their classmates. As for 7-year-olds Dan and Wayne, and 9-year-olds Earl, Karen, Ned and Sue, they all benefited from their classmate's questions and comments as well as their classmate's singing of the song, to refine their notations. I use the term *co-construction of knowledge* to illustrate how the children's notations and, in some cases, their singing were redefined with input from their classmates.

Self-regulated teaching

The following excerpts illustrate the ways in which Jasmine, Ruth, Julie and Joyce used their resources to teach the song to their classmates in the third visit and the dynamic interactions that emerged. As I indicated earlier, these children did not make any notational changes in the company of their classmate. In the first excerpt, Jasmine explains to Kelly what we did together in the second visit, following my request to do so.

Jasmine: We sang and we did circles and triangles and... I don't remember the rest.

Deb: So first we learned how to sing a song with the other kids in a little group. Tell Kelly what I asked you to do.

Jasmine: Our song with the circle and the triangle. And we practiced the song with <u>this</u> (points to the paper), with the little circles and triangles.

Jasmine and Kelly sang the song together slowly, both pointing to the shapes

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as they went along. There was a slight pause between each 'Lu'. Perhaps Jasmine was waiting for Kelly to sing the next 'Lu' or perhaps Kelly was waiting for Jasmine. The result was that they sang together in unison and seemed to listen closely to one another. The next excerpt illustrates the deliberate and exaggerated manner in which Jasmine used her singing and pointing to guide Kelly's singing.

The next examples illustrate how 7-year-old Ruth and Julie used their singing, talking and fingerpointing to construct a sequence of strategies to teach the song to their respective classmates. They told them what they were going to do. They modeled the song, then asked their classmate to sing together or alone. They offered critical feedback, modeled the song again while pointing to each symbol, invited their classmate to try again, complimented, criticized and so on. Teaching the song provided them with opportunities to exercise their role as teacher and convey their knowledge about the song to someone who did not know the song.

In the next excerpt, 8-year-old Ruth is articulate and animated as she explains to Marla what she did in the second visit. She points to specific parts of her notations as she speaks. She frequently looks at Marla and sometimes at me:

OK. We made up a song and the song goes Lo Lo Lo ...and I did it like *Lo Lo Lo Lo Lo* (she sings 'a' and points to each Lo with her right pinky) when it's together (she quickly moves her right hand to the side and looks at Marla) it's like <u>lolo</u> it's fast (she makes a fast and accented sound accompanied by a sudden thrust of her right hand, outstretched) (smiles and looks at Marla then at me) ... and at the end it's <u>Loooo</u>...like long (she makes a long sustained and accented sound as she moves her right hand diagonally down to the right away from her body and looks at me)

When I ask Ruth to pretend she is the teacher, she turns towards Marla and says, "I do the first paragraph." I suggest she sing the entire song first. Ruth moves the paper towards Marla and sings the song quickly and accurately. She points to the Lo's with her right pinky and slides over the quick LoLo's. When she finished singing the song, she asks Marla, "Do you understand that? Like it's o, L-o it's L-o so it's Lo so L-o. Could you sing it?" Marla replies, "OK." Ruth moves the paper towards Marla, who sings a string of monotone 'Lo's. Marla chants the Lolo's faster and the Looo at the end longer than the other 'Lo's. As she sings, Marla swings her legs vigorously back and forth. Ruth moves her body forward in rhythm to Marla's singing of the song. She watches Marla attentively until the last 'Looo' at which point she corrects Marla. "Loooo and at the end it's Looo... all the time." With arms crossed and outstretched in front of her on the table, Ruth sings a long *Looo* while moving her upper body to the left. I ask her if there is something Marla should know about the song, to which Ruth replies "*No*", shaking her head. I ask a more focused question, hoping to elicit a reference to the ascending 'a' pattern.

Deb: What happens in the beginning of the song?

Ruth: It's four times Lo Lo Lo Lo (looks at the first four Lo's). It's a,- no it's five times and after it's together then after it's one after each together and now it's one together, five times together, two times, after it's like Lo (more sustained sound) it's like o o

Deb: How about trying to sing it together.

Ruth: Yeah!

Ruth nods her head and so does Marla, who moves her chair a little closer to Ruth. They sing together in a robust manner. Ruth points to each Lo with her right pinky. This time her pointing is more precise and articulated. When they finish the song, Ruth compliments Marla: "*You got it!*" They sing it together one last time as Ruth points to each Lo. When they finish, Ruth looks at me and says, "*She got it!*"

These series of excerpts portray Ruth as a dynamic teacher interacting with an active student. Marla learned to sing the song thanks to Ruth's clear verbal instructions, finger pointing and notation, which Marla referred to as Ruth's *"song drawing"*. Ruth not only explained to Marla what she did, but also analyzed the musical dimensions of duration/rhythmic groupings by weaving together words, singing and gestures. She sang the song and then asked Marla if she understood, while providing more details about the song: *"Do you understand that? Like it's o, L-o it's L-o, so it's Lo so L-o."* She invited Marla to sing the song while listening closely and pointing to each 'Lo' to guide Marla's singing. Finally she praises her singing: *"You got it"*. Mary, Ruth's teacher, echoed my observations of Ruth as being straightforward and articulate. Mary comments: *"Yeah that's Ruth. When she explains, there's no room for argument, but it's fine because it's clear. She's very confident."*

Like Ruth, 7-year-old Julie was in control, systematic and self-regulated in her role as teacher. This was how she explained her notation to Cathy:

So... this is one song (points to pink squiggles with her right thumb) and this goes to the other one (points to purple squiggles). These ones (points to the third and second to last squiggles) are only like <u>Lo</u> (makes two accented sounds while lifting her forearms and stretching out her fingers, head moving forward) and then this one goes <u>all</u> the way

down (looks at Cathy)... .. so OK (she lifts her right sleeve up to her elbows; she's getting ready ..).

Julie pointed to each squiggle in a decisive manner as she sang her version of the song that included a repeat of Part 1. Using the following instructions, she told Cathy what to do and prepared her for what was to come:

OK start here. OK practice it!
OK the whole thing. OK now these ones.
You want to try it again? OK.
Let's go on to this part.
OK you do that part.
Try again. Then we'll try the whole song. (O) K?
OK (moves her chair closer to Cathy). Do you want to try it all by yourself or again with me?

Julie sang the song section-by-section for Cathy, then with her and finally asked Cathy to sing it alone. She guided Cathy by singing slowly and pointing rhythmically to each squiggle. She checked in with her to see if she understood: "*OK. You get it or not that much?*" Julie offered critical feedback. When Cathy sang 'a b' accurately, but not 'b1', she noted that "*these ones go together*. *OK?*" as she pointed to the 9th and 10th purple squiggles corresponding to the *quickquick* part of 'b'. She encouraged and reassured Cathy: "*We'll see if you can do it but if you get any mistakes*. *I'll correct you*." She even instructed, encouraged and complimented Cathy, and accomplished this all in one utterance!: "*Want to try both together? It might be better. OK? But you're good enough.*"

Like Ruth and Marla, Julie was an effective teacher and Cathy was a cooperative student. Although Julie did not ask any notation-specific questions nor did she offer any active constructive feedback, Cathy learned to sing the song (as Julie sang it – Part 1 twice), because of Julie's caring and confident manner of teaching. Mary, her teacher offered this comment about Julie: "*She's a very quick thinker and she has nice ideas.*"

Like Ruth and Julie, 9-year-old Joyce made extensive use of her resources to teach the song. Nina, her classmate was engaged, offered comments and completed Joyce's explanations. The next excerpt is taken from the beginning of the third visit, following my request to explain the song to Nina and then to *"imagine you are the teacher and you are going to teach the song to her."* As this excerpt illustrates, Joyce not only analyzes her notation; she also points out the *"accidents"* and *"mistakes"* she made while notating the song in the second visit. She explains: Joyce: Well you know it's Lou Lou (for each 'Lou', she moves her hands towards Nina, her classmate and looks at her). I decided to put it blue, red and brown (points to the first Lou) 'cause Lou... and at the end you, - like the <u>u</u> pounces out at you, so, - but then I just like took the blue by accident I did the whole word (points to the second Lou), so I decided to go on with that, and I put these in black (points to the 3 pairs of black 'Lou's) 'LouLou', like they're <u>hard Lou's</u> (moves both hands, palms down, to emphasize the words 'hard' and 'Lou's'). So then (she points to each Lou with her left pointer-finger until Line 4), and by accident I did a mistake (giggles and points to the crossed out Lou's on line 4) and I made <u>this going down (points to each of the last 3</u> 'lou's with both pointer fingers) 'cause it's going like '*LOU LOU LOU'* (she moves her chair back, looks at Nina and sings the song, accenting each 'Lou or Louuuu'), like when you're singing the song, you could choose this one <u>or</u> that one

Nina: or a longer Lou.

Joyce: Yeah.

The girls look at me.

When I asked Joyce to imagine she was the teacher, she immediately began singing the song and pointing to each Lou. When she finished singing, both girls laughed. They seemed to be amused at Joyce's rendition of the song, that is, she sang the song rhythmically but not melodically; she sang the ascending 'a' pattern in a monotone and the *quickquick* part of 'b' was much higher in pitch than 'a'. The next excerpt portrays the kinds of resourceful teaching strategies that Joyce used to teach the song to Nina.

Joyce: You want to try it by yourself or you want me to help you?

Nina: Both of us together.

Joyce: And if you want helping, you can tap with your hands like this to the beat (again she pushes her chair back and taps on her lap). But you know it's five Lou's at the beginning, two, one, two, one, two/

Nina: one.

Joyce: five, two and then three (she points to each grouping of notes as she says each number)

Nina: OK/

Joyce: And you could choose out of these (points to the two endings; one is short and one is long.

Nina: (O)K.

Joyce: Ready?

Joyce provided Nina with detailed information about the song, including the phrasing, number of notes in each pattern, colour-coding system and helpful tips, such as tapping your lap while singing the song. She modeled, explained and often checked in to make sure that Nina understood what she said. She also laughed with her 'pupil'. It was if Joyce wanted to make certain that Nina was as fully prepared as she could be - emotionally and intellectually - to sing the song. Joyce also suggested they sing it in 'a round'. A round is a form of singing when a person starts and when he reaches the second phrase, the next person begins and so on. After several attempts, Nina understood what Joyce wanted her to do, as this excerpt illustrates:

Joyce: When I go LouLou.. you could start from the ending and I just go on. OK?

Nina: OK.

Joyce: But I'll do lightly and you'll do hard. OK?

Nina: OK.

They begin singing together and when they come to the first pair of black LouLou's, Nina sings them loudly. This is not what Joyce has in mind.

Joyce: No no no. When I get like here (points to the first pair of black LouLou's), you start (points to each of the first 3 Lou's) OK?

Nina: OK.

This time they sing in a round until the end, When Nina gets to the black 'Lou's, she pushes her chair back and taps the *quickquick* rhythm on her lap, then leaves her hands there as she continues singing. She resumes tapping when she gets to the last pair of black 'LouLou's and continues tapping until the end.

The next excerpt from the end of the third visit illustrates Joyce's use of words, singing and gestures to evaluate Nina's singing. She compares the way Nina sings the song compared to Ned, with whom Joyce learned the song in the first visit, along with the other grade 4 children who participated in this inquiry. The excerpt opens with my praising Joyce's teaching strategies and asking her whether she thought she was a good teacher:

Deb: You really showed her how to sing the song (...). What do you think?

Joyce: OK.

Deb: Do you think you taught it well?

Joyce: Yeah but (she chuckles)... when she was going like Lou Lou Lou (she sings the first three notes of 'a' as she taps the rhythm on her lap) ... she [Nina] was going down {=soft} like Ned (cups hands, facing each other in front of her) but higher (lifts palms upwards) than Ned. It's 'cause she's probably shy.

Deb: What do you mean 'higher than Ned'?

Joyce: 'Cause Ned, he goes Lou Lou very low (she whispers the Lou's and taps very gently on her lap). She [Nina] was just going like this 'Lou Lou Lou Lou' (again she whispers the Lou's and taps very gently on her lap, but this time she sings each Lou on a higher pitch) like you hear her, but when other people sing you hardly hear her.

Co-construction of knowledge

Dan, Wayne, Earl, Karen and Ned began to see and hear their notations with new eyes and ears, following their classmates' questions, comments and/or singing of the song. I begin with Dan, Wayne and Earl. The following sets of excerpts portray the recursive process of *reflection-on-actions* and *knowing-in-action* as these boys made changes to their notations and then resumed their role as teacher with increased confidence. The less defined the teacher/learner moments were, the more fluid the peer-peer interaction. These moments evolved into a collaborative problem-solving learning environment. Noteworthy is that Dan and Wayne were aware of the limits of their sound image of the song and the discrepancies between the song as sung and their notational symbols. Dan spontaneously evaluated his singing of the song in the second visit: "I know the ending but I don't really.... I know the...uh, uh, the start and then the Lu lulu {'b' pattern} and then there's a change in the middle and then the ending." Wayne told me that the song is "hard to remember 'cause they're a lot of lu lu lu's." He has a sound image of Part 1 but not the ending. "After the second part it's kind of the same thing, but it doesn't end like the same way." Wayne explained his difficulty in singing the end as he shakes his head and smiles: "I don't get the end part, like I'm always on the Loo lolo { 'b'pattern}."

The first set of excerpts emerged from the interactions between 7-year-old Dan and Wilbur, his classmate. Dan took his time to respond to my request at the beginning of the third visit to tell Wilbur what we did during the first two visits. Dan had gym the previous period and hurt his head. An icepack was on his lap and he was slowly zipping the pant bottoms to his shorts and had not yet put on his other shoe. Wilbur was becoming impatient waiting for Dan to speak: "*He takes very long almost*." Dan put the icepack on the table and begins to give Wilbur a chronological account of our first and second visits together as the next excerpt illustrates: When we first came here, Miss Debbie taught us a song and then the second time we came here, we have to, we're supposed to write it any way you want to; it's OK if you wrote it wrong or good (...) and then when we finish writing it you could decorate it and use markers ...and then you give it to Miss Debbie.

Being a teacher seemed to come naturally for Dan. He created a resourceful strategy to teach the song to Wilbur. He also used his 'sound' understanding of the song's structure, including when and how many times the 'a' and 'b' patterns recur, to explain his plan of action to Wilbur. Like Julie, he explained what he was going to do: *"I'm going to tell you the first version, the second version and the last version."* He directed Wilbur's attention to a particular place on the paper: *"Look"* or *"Copy after me."* He modeled the song while pointing to the 'Lu's, using his body at times to accentuate the musical dimensions of the song such as intensity, rhythm and shape of the melody. He asked Wilbur to *"try it together"* and sang the song with him. He criticized, complimented, explained and asked questions to make sure Wilbur understood. For instance, Dan checked in with Wilbur after singing lines 3 and 4, *"Now you get it?"* and after Wilbur sang the song by himself: *"Do you know it now?"*

The next excerpt describes how Dan models the song, invites Wilbur to sing it, gives critical feedback, models the song again, asks Wilbur to try it again, compliments, criticizes, demonstrates, then asks Wilbur to try once again. Although Dan repeats this cycle three times, Wilbur is unable to sing 'b1' and 'b2' from the second line of 'LU', which, as Figure 29 illustrates, is represented by two green 'LU's, three primrose 'LU's and a pink 'LU's.



Figure 29. Reproduction of Dan's notation at the end of Visit 2

Dan: There's a lot of LU, there's a lot of LU LU's and um.... I'm going to tell you the first version, the second version and the last version.

Wilbur: OK.

Dan: It goes *LU LU*... (chants the first line, shakes his head, says "ugh." and starts again, this time singing the first two lines as he points to each 'Lu'). Now you try it.

Dan reaches for the icepack on the table and places it on his head. Meanwhile Wilbur points to each 'Lu' as he chants the song. He stops after the two green 'Lu's on line 2 and says, "I'm mixed up a little." He starts again and is interrupted by Dan towards the end of the line, who says "No" as he gently pushes Wilbur's finger away.

Dan: OK, look (he sings and points to each 'Lu').

Wilbur: I'm mixed up.

Dan: Copy what I sing (sings Part 1 while pointing to the 'Lu's in an exaggerated fashion with his left pointer finger. Wilbur sings along). Now you try.

Wilbur sings the song alone. This time he sings the two green 'Lu's (*long long*) and the first two primrose ones (*quickquick*). He stops at the third primrose 'Lu', looks at Dan and smiles:

Dan: You got it good ... but you don't say LU LU LU LU LU. It goes (sings Part 1 again) ...like over here, it's two, you see two times at the same time (points to the two red 'Lu's on line 1) and down here (points to line 2) you say it three times (points to the first 3 'Lu's of line 2), and then down here (points to the last 3 'Lu's) you say it three times at the same time.

Wilbur: OK.

Dan: You got the top right [refers to line 1].

Wilbur sings it alone as he did the first time, singing the coloured 'Lu's exactly as written.

Dan: No then you say this one... (points to the first green 'Lu'), you don't say it two times, you only say it once [refers to the first 'Lu' of 'b1' $\sim long$]... because.. I hear you say this one 2 times.

Wilbur: OK.

Wilbur sings 'b1' like he sang it the third time: LU LU lulu LU LU. He sings the two green 'Lu's *long*, the first two primrose ones *quickquick* and the last primrose one and pink one *long long*.

Dan: I don't want to explain it (shakes his head and smiles). Can you help us?

At Dan's request, I assume the role as teacher. I ask Wilbur to explain why he is mixed up and what Dan could do to make it easier for him to learn the song. My question and Wilbur's ensuing comments trigger a process of *knowing-in-action*, as the next excerpt illustrates:

Wilbur: I'm thinking about the colours because it would be easier for me if I know those were the same colour. It would be easy...I don't understand the other ones almost ...It makes me a little nervous.

Deb: Maybe it's because.. when you sing here (I look at Dan as I sing and point to the two red 'LU's in line 1), you see there's the same colours and ...I heard you {Wilbur} sing also these two fast (I point to the two green 'Lu's in line 2).... because these are fast and they are the same colours and so someone might think that because these are the same colours they're also fast (I point again to the two green 'Lu's in line 2).....and that these are three, so these might be all together (I point to the three primrose Lu's in line 2).

Dan: I'll just (he writes over the pink 'LU' in Line 2 with a primrose marker). Yep there this one is not part of this one (pointing to the first pink 'LU' in line 3).

Deb: OK... and what about this ? (I point to the two green 'LU's) These are just the two apart together If you sing it one more time, how would you sing it ? (he sings 'b1').

Dan: No because these three are together (points from right to left to the first three'LU's in line 2)... I did a mistake on this one.

Deb: Is there something that you might change here to make it three together?

Dan: Yeah (he takes out a green marker and changes the third 'LU' on line 2 from primrose to green).

Wilbur: He told me like there's three there (he points to the three primrose 'LU's in line 2), so I thought there was only two there (he points to the two green 'LU's).

Deb: Yeah. It makes sense because it was the same colour, so maybe he made like a code, a colour-code.

Wilbur: Yeah.

Dan: I just put it like this, like a little bit here (he points to the green border he made around the original colour to make it clear that this 'LU' is now green).

Wilbur: I do that sometimes when I do mistakes.

Dan: Now you know these here are together (he points to the three green 'Lu's)

Deb: Dan, you want to try it first to test it, to see how it works?

Questioning and suggestions by Wilbur and me prompted Dan to reflect on his actions and make changes to improve the 'fit' between the *Long quick quick* 'b' groupings as he sang them and as he represented them on paper. For example, Wilbur pointed out an error in how Dan pointed to the 'b' patterns in lines 1 and 2. He also noticed a crooked 'Lu' (last one in line 3) that should be a straight one (*"This one's a little crooked from the other ones."*). Wilbur's increasing awareness of the sound:symbol mismatch and his growing confidence in expressing this to Dan, led Dan to change the colours of certain 'Lu's to more accurately represent the 'b' patterns. These changes sparked 'Aha' moments during which Dan realized that more changes were needed, whereupon he identified the changes and took appropriate action. At the same time, Wilbur began to notice the clear relationship that was emerging between the 'b' patterns as sung and the coloured groupings of 'Lu's. The next excerpt provides a vivid example of the co-construction of knowledge that began to emerge as both boys focused on making Dan's notation as song-specific as possible.

Dan sings the song and Wilbur joins in until line 3 (beginning of Part 2).

Wilbur: Oh! I got it.

Dan continues singing until the end.

Dan: Oh man I did a mistake on these two (he points to the last 'U' in line 3) ... They're supposed to be all the same colour ... {the rest is inaudible}

Wilbur: there's some... (he points to the string of five blue 'LU's in lines 3 and 4) /

Deb: Do you have some suggestions?

Wilbur: Yes, there's a whole bunch of blue 'LU's.

Dan: I know. I'm going to change the colours (he straightens the fifth squiggly 'LU' in line 3 and changes it to purple).

Deb: Does that make it simpler for you [Wilbur] to understand?

Meanwhile, Dan changes the colours of the last three blue 'LU's to purple while Wilbur starts singing the song as he points to each 'LU'.

Wilbur: What was the second one again? (he points to line 2 and sings it).

Deb: It's like a pattern the three of them (I raise three fingers and sing 'b1' and 'b2').

Wilbur sings the 'b' pattern, but is interrupted by Dan, who begins to sing the song to verify the changes he has made up to this point. Wilbur joins in and just before the second to last 'LU', Dan asks himself:

Dan: Did I make a mistake? (he looks over his paper). Oh this one is supposed to be ((hard)).

He sings the song again by himself. Immediately upon finishing, he takes a marker and changes the first 'LU' in line 4 to red to represent the last *quick* note of 'b'.

Wilbur: Sometimes he makes mistakes and sometimes teachers make mistakes.

Dan: Everybody makes mistakes (as he puts the markers away). OK I'm done.

The boys start singing the song together until the fifth 'Lu' in line 1.

Dan: Copy what I sing (they start singing again, looking at the paper, hands on their laps). Now try it by yourself.

Dan practiced the song with Wilbur, section-by-section and, as the next excerpt portrays, did not want to relinquish his role as teacher until he was assured that Wilbur knew the song.

Wilbur sings the last three notes while Dan points to each 'LU'.

Dan: OK. He knows.... He knows it (looks at me). Do you know it now? (smiles and looks at Wilbur)

Wilbur: Yeah (nods and looks at Dan).

Dan: OK.

Wilbur begins singing the song on his own. He sings the 'b' pattern four times instead of three (b b1 b2). He sings line 3 accurately. Dan interrupts him in the middle of line 3.

Dan: OK look. Try again.

Wilbur: OK (he sings the song alone while Dan points to each 'LU').

Dan: He knows it (nodding his head).

When I asked Wilbur whether Dan's notation was now clear to him, he offered his newly discovered insights. His remarks and my responsive comments helped Dan in turn articulate his own realizations about the way he notated the song. Our dialogue is presented in the following excerpt:

Wilbur: It's pretty clear now... because when it was different than the ones like the last time I didn't understand (points to the three green 'LU's followed by three primrose ones in line 2).

Deb: hmm.

Wilbur: I didn't understand.

Deb: because this shows that it is the same pattern (I point to line 2) ... because music, like we talked about it is like architecture (I look at Dan). It's like a building, it's like a drawing, it's like a pattern/[Wilbur interrupts]

Wilbur: Like the first one, I mean the second one and third and fourth is almost like the first one (he sweeps his finger across each line of 'Lu's as he speaks).

Dan: It is! It is! Over here (points to line 3), it's the same thing 'cause this is the first row, this is the second row (points to lines 1 & 2). It's the same thing (points to line 3) as the first row but the ending is different.

Deb: What you just said is that the first row is the same as the third row/[Dan interrupts]

Dan: Yeah but the last is not (he points to the last row and shakes his head).

Wilbur suggested that the *long quickquick* 3-note groupings of 'b1' and 'b2' are clear now because the three 'Lu's are the same colour. His response and my music/ architecture analogy prompted Dan to articulate his own understandings of the way the song was constructed, "It's the same thing 'cause this is the first row, this is the second row (he points to lines 1 & 2). It's the same thing (he points to line 3) as the first row but the ending is different."

The challenge of teaching the song to Wilbur crystallized into three episodes of Dan being the teacher, interspersed with moments of *reflections-on-actions* leading to self-regulated actions. The first teaching event was spontaneous and entirely selfregulated, which led to 9 notational changes or touch-ups to the tailed and tail-less 'LU's. The second teaching event led to 6 changes to the colours of certain 'LU's. The third and most dynamic teaching moment was marked by a sustained and fluid exchange between Dan and Wilbur, and resulted in 19 notational changes, which further clarified the 'fit' between song and text. Prompted by Wilbur's difficulty in singing back parts of the song and subsequent questioning by Wilbur and me, Dan made a total of 34 notational changes in the number [1], shape [8] and colour [25] of the 'Lo's. Specifically, he added a fourth and final 'LU' in line 4. He added or removed tails to 'Lu's and straightened a 'LU' that were originally squiggly. He changed the colours of certain 'Lu's / 'LU's as a result of their shifting musical functions. He also did numerous 'touch-ups' to 'LU's that had undergone numerous colour makeovers, particularly the third 'LU' in Line 2, the last two 'LU's in Line 3 and the first 'LU' in Line 4. After Dan completed the 34th and final change, Wilbur noticed that Dan seemed dissatisfied with the final 'product'. He asked, "What's the matter?" Dan replied:

Dan: I don't know (...) Can I start all over because...? (he puts the marker in the box)

Deb: What?

Dan: All this (grimaces and points to the paper).

I gave Dan a blank piece of paper. This gesture on my part triggered a series of collaborative actions between Dan and Wilbur. The following extended excerpt from my videotaped transcripts, illustrates the process by which the boys re-wrote Dan's notation and the dialogue that occurred:

Preparing to notate the song again

Dan: I need the colour orange, blue, red ... (as he takes out the markers)

Wilbur [to me]: What about he does the colouring and I can do the song?

Deb: What do you mean?

Wilbur: Like write it. He could do the first one (he points to line 1) and I could do the *LU lulu* (he sings the 'b' pattern as he points to line 2). He could colour on the first one. I could colour on the second line.

Deb: Yeah, sure. What do you think Dan. It could be like a joint effort?

Dan: Of what? (he shakes his head)

[He seems confused. Up to this point he is preoccupied with lining up the markers for his new notation of the song].

Deb: Well, you do the first line and then he does the second line.

Wilbur: And it goes on.

Co-writing the first line

Dan outlines the corner decorations in pencil, then writes the first line of 'Lu's in pencil, constantly referring to his original notation. Meanwhile Wilbur comments on Dan's 'signature' design' and on the way he writes his name:

Wilbur: My dad says do not write your name very big, because it makes your name much neater. I'm learning that (...) If I was Dan, I would make a little name because my dad wants me to make little names.. like being careful. You do mistakes and when I do mistakes with my mom, I do not erase the mistakes, so when my dad comes when I do my homework, he teached me how to erase the mistakes and then I do it much neater. I do it nice and slow (...) Dan goes very fast but I take my time sometimes.

Dan: I don't go fast.

Wilbur: Oh most of the time (he sings the song from the paper).... I like that song.

Wilbur continues talking. He notices the pencil I brought and tells me he has one just like that at home. He then says that he doesn't *"talk properly because I was supposed to live in Scotland"* (His maternal grandparents are Scottish). Wilbur's attention is refocused on Dan, who bends down to pick up an eraser from the floor, *"You did a mistake?"* Dan does not reply; he moves the paper over to Wilbur.

Co-writing the second line

Dan: OK, you do the second line. They have to be big.

Wilbur slowly draws the first 'Lu'. Dan's head is over the paper, watching Wilbur's every move.

Wilbur: Oops. I did a mistake on the bottom ... there's no tail (he looks at me as Dan erases the tail).

Dan: No tail and then you keep going, like this.

Wilbur makes another 'Lu', then erases the 'u' and replaces it with a fatter one.

Dan: And then you do another one...No more than you have to.

Wilbur: I know (he continues to write 'LU's).

Dan watches Wilbur carefully and notices a mistake with the fifth 'Lu'.

Dan: Ah this one doesn't have a tail.

Wilbur: Oops... a mistake (he erases the fifth 'LU').

Dan: Maybe you should just do the whole thing.

They look at each other and smile. Wilbur makes the last 'Lu' in line 2. They both sing line 2. Dan points to each 'Lu' and chants: $1 \quad 23 \quad 123$ [corresponding to 'b1' and 'b2']

Dan: Yes, maybe we should like/[Wilbur interrupts]

Wilbur: Make space I think.

Dan erases the last two LU's and replaces them with two other 'LU's. He spaces them out evenly so the last 'Lu' is at the end of the line.

Co-writing the third line

Dan: My second row (he constantly refers to his first notation as he writes).

Dan coughs

Wilbur: Are you OK Dan?

Dan: Yeah, I have a cold (he continues writing)...Oh no.

Wilbur: What?

Dan erases the 'u' of the sixth 'Lu' in line 3 and then counts the number of 'Lu's already done, while singing and pointing to each 'Lu'. He sings back line 3 of his original notation as he counts and points to each 'Lu' with his finger in the air.

Wilbur: Dan.

Dan: Yeah

Wilbur: Do you see a tail? (he points to the sixth 'Lu' in line 2 of the original notation, which has a tail).

Dan: Ah that's for this one (he points to the pink 'Lu' in the original drawing, which he subsequently changed to purple without a tail).

Wilbur: I see a little tail.

Dan: Yeah but I did a mistake (as he begins line 4).

Co-writing the fourth line

Dan: Did I put it a little too big?

He erases the first squiggly 'Lu' in the last line and carefully draws the last two squiggly 'Lu's. Dan: OK. Now I'm done.

Colouring the 'Lu's

Wilbur sings back the song from the new notation while Dan colours in the 'Lu's in line 1 while referring to his original notation. When Dan finishes line 1, Wilbur asks:

Wilbur: Dan?

Dan: Yeah.

Wilbur: Why did you start all over?

Dan: because it was messy, do you see (points to the original notation)?

Wilbur: Yeah it looks pretty messy to me.

Dan colours the 'Lu's in line 2 and then starts line 3. The speed at which he colours each 'Lu' and chooses the next markers, increases.

Dan: Is the bell going to ring soon?

A moment later, the bell rings. I ask if they can stay a few more minutes.

Dan: Is that OK with you Wilbur?

Meanwhile Wilbur is watching Dan closely, and as Dan puts the lid on the red marker, having completed the last 'Lu' in line 3, Wilbur asks:

Wilbur: Dan?

Dan: Yeah.

Wilbur: Can I colour the last one [line] please?

Dan: Yeah sure.

Dan gives the blue marker to Wilbur. As he traces the squiggly 'Lu's in blue, Dan points to the red 'Lu' in the original notation that begins line 4, and explains that this 'Lu' is now the last 'Lu' in line 3 of the new notation, "because these two are together." He points to the two 'Lu's in line 3, of the new notations, which represent the quickquick part of 'b' that precedes the final three LU's representing 'c'.

This extended excerpt vividly portrays the unfolding of the activity that Dan and Wilbur constructed together to create a second more defined version of the 'Lulu' song, complete with decorative corners and Dan's signature design.

The next set of excerpts illustrates the process by which 7-year-old Wayne faced the challenge of teaching the song to his classmate, Belinda, with a little help from her articulate comments and my questions. In the first excerpt, Wayne responds hesitantly to my request to "*tell Belinda what you did*":

Wayne: Um I did um... um music letters in the corners.And.... I did like the words, like the Loo Loo sounds.

Deb: Why did you do the 'Loo Loo'? What is it for?

Wayne: It's for the sounds. Like it's another person that doesn't know it, she just has to look at my paper -, and I tried to do a picture at the bottom.

When I asked Wayne if there was anything else he could tell Belinda about his notation, he said that he did not know, but, as the next excerpt illustrates, Belinda clearly knew what to say:

Wayne: I don't know how to tell her like/ [Belinda interrupts]

Belinda: Well I know. You did the diagram. You did L-o-o and a sun and a person.

Wayne: Yeah/ [Belinda interrupts again]

Belinda: with different colours.

A little while later, I asked Wayne to pretend he was the teacher, but he said he did not know what to say. The next excerpt shows how Belinda's response to my question about how to teach a song prompted Wayne to assume the role of teacher:

Deb: How could you teach her the song?

Wayne: I don't really know how to teach her.

Deb to Belinda: What would a teacher do? Do you have any ideas of how a teacher would start teaching a song?/ [Belinda interrupts]

Belinda: One part by one part, like the first part and then they all sing that song, and

the teacher would go like one sentence and then go again, and then we go to the next sentence, and then she says it and we say it.

Deb: That's a good idea. [to Wayne] Maybe you could do it like that /

Wayne: Yeah.

Deb: OK. Go for it!

Wayne stands up, leans against the table, says, "The first part is the beginning of the 'Loo Loo" and sits down.

As it turned out, Wayne could not recall what came after the first 'a b' pattern: "I don't remember the rest, like how it goes." Each time he tried to sing the song, he stopped in the middle of, or just after the first 'a b' pattern. His repeated efforts at singing the whole song for Belinda did not stop her from learning the song on her own and wondering about some of Wayne's notational symbols. In the next two excerpts, Belinda questions Wayne about the size and colour of certain 'Loo's. In the first excerpt, she asks Wayne about the 'Looo's:

Belinda: Why is it big, like these? (points to the 'Looo's)

Wayne: The big 'L'?

Belinda: No, these, the big letters (points to the 'Looo's again). Uh oh, they're small over here (she points to the first four 'Loo's).

Wayne: It's because... It's like when we do the 'Loo', it's like um very -, I don't know how to say that part/

Belinda: You go higher like a few times [refers to 'a']/

Wayne: Yeah. Higher/

Belinda: Loo Loo Loo (she sings four ascending 'Loo's /

Wayne: Like when we sing it, we have to go loud (he hits the table with the edge of his right hand), so that's why I put quatre [four] 'Loo's in the front.

Belinda points to the 'Loo's in Line 1, and says "bigger" each time, and then "smaller" when pointing to the last one in Line 1.

In the second excerpt, Belinda asks Wayne about the coloured 'Loo's and suggests a way to make the notation more colourful:

Belinda: Why are there different colours? Can't it be just the same colours?

Wayne: Cause I wanted to make just colourful.

Belinda: Well you could have just made 'L' a different colour, 'L' a different colour... (points to the first 8 L's one by one while repeating this phrase each time). It could be more brighter with brighter colours. If you show it to the other people (moves her hands from the paper towards her eyes) it'll be like colourful.

The next three examples illustrate how my questions addressed to Wayne elicited responses from Belinda. In the first example, when I asked Wayne to explain why he made 'Loo's of different colours, Belinda thought she detected a pattern. She pointed to the coloured groupings, starting with the three yellow LOO's, followed by the three purple ones and so on: "5, 3, no like 3, 3, 4, 3, no look ...yeah 3, 3, 3, 4 no 6...5 orno no! 5, 6." When I asked Wayne if he thought about making a pattern, to which he replied, "No not really", Belinda interrupted; she found another pattern by going down the lines: "Blue-orange-green. Blue-orange-green Blue-orange-green, then Blue-orange-purple....." In the third example, after singing the song alone, Wayne stopped at the first orange 'Loo', which corresponded to the quickquick part of 'b' ['lulu']. When I asked him how he could represent 'lulu', Belinda did not accept Wayne's response and promptly made a suggestion, which he accepted, as this excerpt shows:

Deb: How would you make a 'lulu' (I point to the last 'Loo' in line 1].

Wayne: Another O?

Deb: An O here? /

Belinda: No maybe like for *Loo Loo*...[she sings 'a b' as an arpeggiated dominant seventh chord =C E G Bb, getting louder with each *Loo* and stressing 'lulu'). Like here 'lulu' (points to the last 'Loo's in Line 1), you could have put a triangle so you could know 'lulu' (she looks at Wayne as she moves her hands forward, her thumbs, pointer fingers and middle fingers touching each other to accentuate 'lulu'). And then when there's another 'lulu' (she gestures in the same way) you could put a triangle (looks at me).

Deb: You mean a triangle instead of an O?

Belinda: Yeah.

Wayne: I'll put like a triangle like Belinda said.

Belinda pointed to the 'Loo's with me while Wayne replaced the last 'o' of every 'Loo' with a triangle. The recurring 'b' patterns were now clearly defined and for the first time, Wayne sang the song from beginning to end in a clear and confident manner. When he sang the final 'Loo', his finger was on the first yellow one in line 4. He quickly realized that he did not need the two remaining 'Loo's. In the next excerpt, Wayne and Belinda decide together what to do with them.

Wayne: Those I don't need /

Belinda: And then he goes softly to silent (she slowly lowers her right hand towards the table to embody the way he got softer as he sang the last three notes)

Deb: You don't need these?

Wayne: Yeah those two.

Deb: What would you do?

[Belinda slides the paper in front of her and sings 'c']

Belinda: You do that long, like that (she sings a long 'Loo' while sliding her finger across the last two yellow 'Loo's)

Wayne: Like a wall that is coloured yellow, like a wall.

Belinda: Just cross it out. Just cross it out.

Wayne: Yeah cross it/

Belinda: Or no. Maybe just leave it there but you know to stop at this (she points to the first yellow 'Loo')

Wayne: Yeah put the /

Belinda: A line here.

Wayne: Yeah a line/

Belinda: to stop, with the pencil. Here.

She leans over and points to the pencil on table. Wayne leans over, takes the pencil and draws a line.

Evident in this series of excerpts is Belinda's role in helping Wayne refine his notation in ways he may not have done alone. Belinda helped him to express himself more clearly and become more animated. She questioned several aspects of Wayne's notation, such as why some Loo's have an extra o, what made him change colours as well as the reason for having different colours. She also offered constructive feedback: *"Well you could have made L and a different colour for each of the two 'o's. It would be more colourful."* To represent the 'b' pattern, Belinda suggested putting a triangle after the circle to represent the *quickquick* part of 'b'.

Wayne welcomed her suggestion, reflected on what she said, and implemented her suggestions. "*I'll put a triangle as Belinda said*." Specifically, he made six notational changes. He added an 'o' to Loo' to represent the first note {long} and he transformed

'Loo' to $Lo\underline{A}$ to more clearly represent the *quickquick* part of 'b', namely 'lulu'. As a result of these changes, the three yellow 'Loo's at the end no longer represented the last three notes of the song; rather the first yellow 'Loo' corresponded to the last note of the song. Both Wayne and Belinda realized that the function of the 'Loo's had shifted and the last two 'Lo's were no longer needed, but they decided not to cross them out, and instead, mark the end of the song with a penciled line after the first 'Loo'.

By the end of the third visit, Wayne's notation more clearly represented the 'Lulu' song, which was also reflected in his singing, which was more defined rhythmically -a good example of singing shaping text shaping singing. Compare a reproduction of his notation at the end of the second visit, as illustrated in Figure 30, with the final product in Figure 31.





Figure 30. Wayne's notation at the end of Visit 2 Figure 31. Wayne's notation at the end of Visit 3

As illustrated in Wayne's notation at the end of the third visit, there is a 1:1 sound:symbol correspondence for the 'a' and 'c' patterns. The recurring 'b' patterns are clearly represented - the 'Looo' represents the first note of 'b' and the LoA represents the *quickquick* part. The line after the first yellow 'Loo' marks the end of the song. When I pointed out to Carol, the school principal, how Wayne and Belinda dealt with the two extra 'Loo' s, she responded: "*That's cute, that's an interesting solution. I love this kind of stuff when kids invent their own thing!*" Carol's remark reveals another aspect of her social constructivist stance, which I illustrated in chapter 3.

The following data excerpts illustrate the process by which 9-year-old Earl taught the song to Kim, and in the process became increasing involved in the task at hand. Like Wayne, comments from his classmate and questions from me prompted Earl to refine his notation in ways he may not have done alone. In the first excerpt, Earl tells Kim what we did during the first two visits. He smiles as he speaks and looks at Kim now and again. We sang the song and then the other time we came, we wrote the song down and we had to get it like -, we had to <u>think</u> and then write it down as best as you can and <u>here's my</u> <u>mistake</u> (he points to 1^{st} notation) and <u>here's my good</u> one (he smiles and points to the second notation).

When I asked Earl to teach the song to Kim, he at first seemed self-effacing, but had no problem showing Kim how the song was constructed. The next excerpt illustrates how he sang the song and then explained to Kim how he drew his 'Lo's to show duration, rhythm and phrasing.

Ah (he puts both hands on his face). It's hard. Well (...) I don't know how to <u>explain</u> it! (he places right hand on face). It goes *Lo Lo Lo Lo Lo Lo Lo Lo Lo* (he sings 'a b' while he points to each 'Lo'). You see these two (he points to the 6th & 7th Lo {*quickquick* of 'b'} and one with the <u>two</u> o's ? They go longer than one with the one 'o' (he smiles and looks at Kim). It doesn't go long (he looks at her) and there's four here (he points to the first four Lo's in line 2) and this is the ending so you know how to end it.

With some prompting from me, he practiced singing the song with Kim. He modeled the song, instructed, ("*OK*, *sing it*") imitated her monotone manner of singing then demonstrated how the song should be sung. Then he questioned, explained, evaluated and offered feedback, and seemed to do all this in one breath!

Do you want help? These are <u>long</u> (he points to the Loo's). You sang Lo,Lo... (he tries to imitate how she sang it as he points to the Lo's)

With increased melodic and rhythmic clarity, Earl sang with Kim while pointing to each 'Lo' and continued to offer constructive feedback (e.g. "*the third one you go high*").

Prompted by Kim's difficulty in singing the song accurately and my challenging him about the absence of any indication of melody/pitch in his notation (e.g. "You can't really see it on the paper"), Earl began to add a musical note above each 'Lu' to "tell you that it's a tune." As the next excerpt illustrates, Earl provided a running verbal commentary of what he was doing. For each musical note that he drew high above the 'Loo's (representing the *long* note of the recurring 'b' pattern) he said "high" and for each musical note that he drew just above the 'Lo Lo' (representing the quickquick part of the recurring 'b' pattern), he said "low."

Earl: but I could take the pencils (he pretends he's picking up a pencil) and make the little <u>music</u> signs (he points to the space above each 'Lo') to tell you that there's a <u>tune</u> (talking to Kim)

Deb: yeah

Earl: Now you know there's a tune (he takes a pencil and writes a musical note above the first 'Lo'). Ah (he looks up at the notes in his first notation). Yeah that's right. [he approves of the note he just drew]. There's a tune, tune, tune, tune. then it goes <u>high</u> (sustains the 'Loo' sound)

Earl: OK it goes high, then low, then high, low, high, low (he draws musical notes above the grouping of 'Loo LoLo' that represent the recurring 'b' patterns)

Earl: I'm doing a little tune (as he draws the notes in Line 2 up to the last three 'Loo's) and these (refers to the last three Loo's), they need a tune too (as he draws a note over each of the last three 'Loo's \sim 'c')

This series of self-regulated actions is in contrast with previous moments where I guided him closely. He was now ready to resume his teaching role with increased assurance.

Earl instructed Kim with a smile, "Now sing the <u>tune</u>!" He evaluated, "You're supposed to slow down at the end." He explained, "It still has a tune at the end. It continues just like I make it a long line" (as he sweeps his hand across the paper). When Kim said, "I can't get the tune at the end", Earl sang the song alone at first while pointing to each 'Lo'. As he reached the last three 'Lo's, he looked up at Kim and she sang the ending with him. When they finished, Earl smiled, clapped his hands and said, "Bravo." Kim responded by 'bowing' to him with her right hand. As she left the room, she called out to Earl, "Bye bye, you're a great teacher."

Earl's willingness to act on my prompting led him to take more responsibility for his role as teacher, which in turn, resulted in a stronger sense of agency. After drawing musical notes to indicate that *"there's a tune"*, Earl resumed his role as teacher, seemingly more confident about his written representation of the song, despite the fact that the notes he placed high above the 'Loo's or just above the 'Lo's actually indicated intensity of sound (loud/soft) rather than pitch (high /low).

The following excerpts depict the camaraderie between Karen and Nancy that was evident from their smiles, giggles and lively interactions. Both girls seemed at ease and self-assured in the research context. Although Nancy seemed a little uneasy when singing the song with Karen for the first time, she often initiated conversation and expressed herself frequently and confidently. In the first excerpt, Karen provides a clear explanation for using 'Lou' to represent each sound, and why: *"they're all different colours."* She models the song as she points to each 'Lou' and checks in to ensure Nancy is following her. Karen: We were doing a song called the 'Loulou' song. That's why the only word you see is Lou

Nancy: Funny (chuckles)/.

Karen: And the reason why they're all different colours except for these ones and these ones (points to the pink Lou's then to the black ones) is because these are the same, like notes (she points to the 'a b' pattern in line 1 and to the corresponding pattern in line 2)

Nancy: Uhum

Karen: Yeah? (she looks over at Nancy) so it goes like this. *Lou Lou...* (she sings the song and points to each 'Lou'. She stops at the end of line 1).

Karen: How is that? OK? (she looks at me and continues singing to the end of the song. She looks at Nancy and they both laugh).

Karen: OK so...I thought it would be easier if I put it <u>up</u> because these go up and down because it's /

Nancy: higher and lower

Karen: Yeah, and yeah, and I put these different colours (points to the 'Lou's) so yeah, I know, *HeeHeeHee* (she giggles, covers her mouth and puts her head on the table).

This second excerpt illustrates the strategies Karen used to teach the song to Nancy. She models the song and sections of it. She guides, supports and applauds Nancy's efforts, and even prompts her physically to get her to sing the song

Karen: You want to try it?

Nancy: (smiles and whispers) I don't know it

She starts singing quietly: Lou Lou Lou and motions for Nancy to sing with her.

Karen: Try it

As they sing together, Karen exaggerates the quickquick part of 'b'.

All the while she looks at Nancy and when she chants 'b2' in a low monotone, Karen puts her left hand under Nancy's chin as if to say open your mouth and sing! They both giggle.

Karen points to the pair of pink 'Lou's in the middle of line 1 and, in a high-pitched voice, sings 'LouLou' twice. Nancy sings it and then continues to the end of the song as Karen points to each 'Lou', looking at Nancy as she sings.

Karen: Yeah! (she claps her hand)

I ask Karen if she thought Nancy did well. She nods, giggles and says:

Karen: Better than the first time I did it

Deb to Nancy: How did you think you sang? -

Nancy: I had a weird feeling in my stomach/

Karen: Butterflies (she points her finger to her stomach and moves them as if miming the action of butterflies flying around).

Nancy: Yeah, 'cause when I sing I get all like (she makes the same butterfly action as Karen just did).

I picked up on what Nancy said and pointed out that sometimes people find it difficult to talk or sing in front of others without a text in front of them. I suggested that she imagine that she is 'reading' the music and singing it as she 'reads' it. Following my suggestion to Nancy on how to overcome her nervousness about singing in front of others, Karen, in turn, realized that what distinguished her notation from words was the fact that the 'Lou's go up and down instead of staying on one line. Karen explains:

Karen: But if you're <u>reading</u> the music it's like: *Lou Lou Lou Lou ...* (she rhythmically chants the whole song). That's what I would feel if it was all on one line, that's how I would think someone would find the writing.. how it would sound because/

Nancy: it would sound the same/

Karen: Yeah it would all sound the same (giggles).

Karen was clearly aware of the distinction between reading music (on different lines) and reading words (on one line). Imagining that all the 'Lou's were on one line, Karen chanted the song in a rhythmic monotone. She recognized the need to represent music differently from words because of the melody going up and down. They sang the song together one more time at my request *"with the melody this time, and the rhythm."* In the next excerpt, the teaching event transforms into a collaborative learning event, a co-construction of knowledge:

Karen: OK. 1-2-3 (she looks at Nancy and moves her hands like a conductor)

They sing in unison often looking at each other without pointing to the 'Lou's.

Deb: That's very good.

Deb to Nancy: Do you think that the way she [Karen] put the sounds of this song on the paper/

Nancy: I found it made it easier to do the tune and the melody.

Karen: The reason how I knew that I needed to put it up because when I'm using my flute, I have this book and the highest one, the little note, is high on the line, so I knew we had to do it something like that /

Nancy: If you made the lines /

Karen: Yeah, you go like this, 1-2-3-4-5 (she whispers as she traces the lines with her right pointer finger)

Nancy's comment "*if you made the lines*" contained within it an implicit suggestion that Karen picked up on. She traced five lines while counting "1-2-3-4-5." Eventually she drew five lines with a black marker. The next excerpt illustrates how Nancy's use of the term "*jumping up and down*" led Karen to add more musical clues to her notation:

Nancy: Are these the same notes? (she points to 'a' in lines 1 & 2)

Karen: and that's a pattern (she covers all but 'a') 'cause it goes din din din (points to each of the ascending 'Lou's)

Deb: So just by looking at it you see that the song is in two parts. And what else do you see about the two parts? Are they all the same?

Karen: No

Nancy: I see like it's jumping up and down up and down up and down (she points to pink and black 'Lou's respectively in line 1)

Deb: Hmhm... and here is it jumping up and down too? (I point to pink and black 'Lou's in line 2)

Karen: This one is jumping up and down till up here (with right pointer finger, she traces an undulating line until the second pink 'Lou' in line 2) and then it jumps down and then it's just the same (she points to the last three 'Lou's)

Deb: OK

Karen: Like this (she starts at the beginning of her notation), it's like going <u>upstairs</u> and then it will go like that, and then it will go like *wooo*.. (makes a sliding sound {glissando}), then your voice goes down (she points to first dark blue 'Lou').. and up up, <u>down</u>, up up (...) I should've... when I was taking my pencil, I should've gone like this (again she traces a continuous wavy line over the 'Lou's in line 1).

Deb: Is there something that you would like to change or add to your drawing? Do you want pencil or marker?

Karen: I'll use the purple pen. Hee, purple pen (she removes the cover and makes a continuous squiggly line above the 'Lou's)

As I illustrated in chapter 2, Karen not only appropriated the term "*jumping up* and down" to describe the movement of the 'Lou's on her paper, but she also explained it in her own words: "*like going upstairs and then it will go like woo*" (makes a sliding sound). She then traced a wavy line in the air above the 'Lou's with her pointer finger to embody the term and finally she concretized it in the form of a continuous squiggly line which she drew first in pencil then traced over with a purple pen. After making the squiggly line above the 'Lou's, Karen drew arrows in pencil along the line. Watching Karen draw the arrows, Nancy imagined what it would be like if the arrows went the opposite way. Karen embraced the idea and tried to sing the song backwards:

Nancy: You could go backwards (she points to Karen's paper and moves her left pointer from right to left)

Karen: Yeah. You could think that I was going crazy and I was doing as the Japanese go. They go that way (she moves her right hand across her body to the left hand).

Karen: Well if you <u>really</u> wanted to, you could go like this (she sings the notation backward from right to left moving her head to highlight the high and low notes).

Karen: If you wanted to, you could! (she giggles)

After a brief exchange about the pets they have had (!), Nancy still did not understand something about Karen's notation, that is, when she looked sideways at the paper, she thought the 'Lou's of the 'a' pattern were on one line. When she expresses this to Karen, a dialogue emerges, as the next excerpt illustrates:

Nancy: I still don't understand. Wait. Oh I thought it was all on the same line (she points to the 'a' pattern in line 1)

Karen: No

Nancy: When you look sideways, it kinda looks as if it was all on the same line.

Karen: Yeah, when you look at it fast, because this is -, like here (she holds her right pointer finger in the space between the first two pairs of pink 'Lou's, then takes a yellow and black marker from the box, and places them in front of her). This is what I think would be better. I'm going to put lines (smiling and nodding, she traces lines with her right pointer finger)

Nancy: Yeah that would be really good

Karen: And <u>this</u> (she looks at the yellow marker she is holding) is just to make the arrows better.

Meanwhile, Nancy watches intently as Karen reaches the first set of pink 'Lou's.

Nancy: When you go down, are you going to put it black?

Karen: Hmhm

Nancy: It should be high high go low then high... (she whispers the melody while tracing its shape in the air with her left pointer finger)

Nancy's observation of the notation from a different perspective prompted Karen to highlight the penciled arrows in yellow for the ones going up and in black for the ones going down, just as she had done moments earlier with her finger. She drew black lines with a ruler to distinguish the pitch relationships of the different 'Lou's. In so doing, she enriched her representation of the 'Lulu' song. As I mentioned earlier, of all the children's notations, Karen's representation of the 'Lulu' song was the most symbolic of the language of music.

In contrast to Karen's exemplary role as teacher and the fluid interaction that evolved between her with Nancy, Ned needed to be prompted every step of the way, except when explaining his notation to Norm, as this excerpt illustrates:

OK.... Well, we did a song. It starts like uh <u>soft</u> (he taps pointer-finger on first 'lu') after it's louder after it goes down (he looks at Norm), it's get(ting) louder and louder, after you go down soft (he points to the first three 'lu's after the second peaked lu), after softer, softer and softer, after it's all the same thing (he taps his finger quickly up the extra ascending 'a' pattern) and after it goes like loud for three times (he points to each of the last three 'lu's and then looks at Norm).

Ned focused on the dynamics of the melodic contour of the song as he traced his finger along his undulating line of 'lu's. It seemed as if Ned considered this sufficient information to convey to Norm. The next excerpt illustrates some of the prompts I used to motivate Ned in his role as teacher.

Prompt #1

Deb: If you are going to teach it to him, does he need to have more information?

The boys look at each other.

Ned: I don't know

Deb: Does he need to hear the song? (I scaffold - gently suggest)

Ned: yeah (he sings the song pointing to each lu).... that's the song.

Norm: OK

Ned: That's it.

Prompt #2

Deb: Imagine you're the teacher, so the teacher sometimes starts out by showing the student what has to be done which is what you did. You just sang it and now ...

Ned: I started not too loud, after a bit louder, a bit louder and a bit louder, after loud, after like it goes down down down , after it goes like more loud and for three times.

Prompt #3

Deb: Maybe he can sing it with you now.

Ned: I don't know.

Deb: Well ask him if he wants to sing it/

Ned: Do you want to sing it?

Norm: Yeah (nods his head).

Ned: OK.

Deb: Perhaps you can point as you're doing it. Ned points to the 'lu's but does not sing. Norm tries to sing.

Prompt #4

I ask Ned to sing the song with Norm. They sing together. Ned points to the notations.

Norm follows Ned, but he gets no guidance or support from Ned. At one point during the song, Norm looks at me. I ask if they want to do it again. Norm shrugs his shoulder.

Ned nods "Yeah, I don't know"

Deb: When you're doing it, point again.

They sing it together. This time Ned does not point to each 'lu' in a deliberate manner. He keeps his finger on the paper, gliding up and down the 'lu's as he sings. He adds an extra 'lu' to the 'c' pattern.

Deb to Norm: Did you get an idea of the song?

Norm: Um.... I don't know. (....) not really you know.

At this point I asked Norm how Ned might modify his notation to make it easier for him to learn the song. He implied that singing to 'la' might be easier. Ned, who up to this point only spoke in response to my questions, became animated, as this excerpt shows:

Deb to Norm: Do you think that it [the song] might need something more to make it easier for you to know the song?

Norm: Um... um... Lalala? (as he points in the air with his finger, all the while smiling questioningly at me).

Deb: Why do you say that?

Norm: cause it's like easier /

Ned: it's easier to know/

Norm: Lalala to say la /

Ned: to know to follow /

Deb: uhuh ... than lu ? In what way?

Deb: What's the difference between the la and the lu?

Norm: 'cause la you could follow, the lu it's hard to follow.

Ned suggested that Norm write the song using 'la' on the other side of his paper. I proposed that he "*just sing it and think of 'la'*." After singing it in this way, Ned decided to add a 'la' under every 'lu'. Norm watched closely and smiled approvingly, When Ned finished, they sang the song together one more time to 'la'. Their singing was strong and robust. For the first time, Ned's voice became increasingly louder when singing the last long 'la's.

In Sue's case, despite the ease and creativity with which she used a variety of strategies to teach the song to Pat, her classmate, Sue was faced with a dual challenge: 1) teaching the song to someone who was not very responsive and 2) teaching the song with ineffective teaching tools, including a confusing notational system as well as an unstable image of the song and inconsistent pointing to the 'na's as she sang back the song. A number of factors helped her face these challenges. First, she was a caring teacher who was able to criticize her own actions. Second, she was gradually able to benefit from my questions and guidance in a way she was unable to do during the second visit with me alone. Pat's suggestion on how to represent the recurring 'b' patterns helped Sue to more clearly define the overall structure of the song by the end of the third visit. The first excerpt characterizes her natural ability as teacher. She explains her notation, embodies the musical dimensions of the song using gestures and sings the song while pointing to the 'na's, and she did this all in one utterance!

OK. Well, what we did from the beginning is that we learned a song that starts from 'Lu' (she puts left hand on the table), and goes to high (she moves right hand diagonally from left hand across her body towards the ceiling) but it's not ((words)). It's 'lu'. It goes 'Lu lu lu lu lu (she sings a semblance of the ascending 'a' pattern as she moves her right pointer finger up a pretend ladder in the air). You know, and then it goes 'Lu lu' (with each 'Lu' she thrusts her right hand towards Pat) then you have the same high, the same -, I don't know what, um, the same -, like you think of 'na na na na

{again a semblance of 'a'} (she points to the first column of 'na's) then you say it twice the same thing.. and that's what happened, and then I copied it with other sounds.

In the following excerpt, she responds to my request to "*just imagine you're the teacher*." She asks Pat to watch her as she sings the song and tells Pat how she will teach the song to her:

Sue: I wrote it here, so if it can help you to watch it, well OK.

She points imprecisely to the 'na's as she sings an ascending line of five 'na's (semblance of 'a') followed by a descending line of five 'na's (transformation of 'b'). She repeats the ascending 'a pattern and extends it [sounds like a 7-note scale].

Sue: It's in two parts, with this one this one first (points to the first two and last two columns of ascending patterns with left thumb and pinky) and then <u>that and that part</u> (with her right thumb and pinky she points to the 'nana' in the bottom squares and last three 'na's at the end). Because it's a two-part song. So that's the first part we should learn, and then the next part (points to the second half of her notation)

Next, Sue gives Pat advice on how to sing the song, namely by tapping the rhythm and accenting certain notes with your head as you sing:

OK. I'll sing it with you. If it can help you for the beat, you can tap on your legs or when it's low you go with your head down and when it's high you put your head up, you know you ((stretch)).

Sue's advice to Pat mirrored the instructions I gave to Sue and the other grade 4 children when I taught the song to them in the first visit.

Meanwhile, Pat sat quietly and was unresponsive despite Sue's impressive teaching strategies and supportive efforts to get her to sing. For example, Sue reassured Pat: "You can speak now you know. Forget she [me] is not there and the camera and the tape recorder. OK?" She was also mindful of how Pat might be feeling: "You're shy aren't you? It's normal; we were all shy at the beginning." When I intervened and suggested we sing the song together, Pat moved back in her chair, placed her hands on her lap, ready to tap the rhythm and sang with Sue and me.

After singing the song together, and then alone, Sue realized that she "*just got too* high" as she sang a high-pitched sustained note on the word high. When I asked her to compare her version of the song with the one we just sang, she said:

Yeah. Well perhaps there's more [notes] going up, and I go too high. Like I have trouble going down (lowers head) like I told you and I always went up when it was going down.

I suggested we count the number of times we sing the pattern, *Lu Lu Lu Lu LU*. I sang the ascending 'a' pattern and the first note of 'b' as I moved my left hand up in the air in a stepwise fashion. We sang it together and Sue realized that there was a mismatch between our singing of the song and her notation of it; she counted two times but she repeated the pattern four times on paper. She considered erasing the first two columns of 'na's: "*It would be nice if I wrote the song with two times. Maybe I could erase that*", but then changed her mind:

I'll leave it like that because that's how I made it and it's going to be like that. Like if someone sees it, well they'll know how I did it. I won't change it.

I reminded her that she was the teacher and suggested she only sing the third and fourth columns when teaching the song to Pat.

Perhaps I can take off this one [Part 1 as she describes it earlier] and just go with the end [Part 2] 'cause it's the same.

She placed the side of her left hand on the second column to create a margin to show that the song now begins in the bottom square of the third column. With her right hand, she swept across the third and fourth columns. She began to sing the song from the third column and was "*all mixed up now*." I guided her singing by pointing to the 'na's. As a result, she realized that there were too many 'na's on the bottom square of the third column, which now represented the beginning of the song, and not enough of them in the bottom square of the fourth column, which now represented 'b1' and 'b2'. After erasing and adding 'na's to better represent the song, she told Pat that the first and second columns are "*just a little addition part*." She was ready to resume her role as teacher: *Now we can sing it both of us 'cause now I fixed it* (giggles). *You are ready?*"

Sue moved closer to Pat who nodded faintly. I suggested that Sue move her paper closer to Pat so she could point to the 'na's. Sue asks Pat: "*Do you want to point or we both point?*" Pat shook her head. They sang together as Sue pointed to the 'na's with her right pointer finger. "*I got it! We got it!*" she exclaimed. Her singing closely resembled the song except for the string of six monotone 'na's that replaced 'b1' and 'b2'.

I suggested they sing the song again together. Again Sue sang a semblance of the 'a b' pattern and then continued chanting. Except for the last three 'na's $\{c\}$, her

chanting did not resemble any version she sang before. She evaluated her singing in this way: "In the last part I was kind of in the middle by accident." When I asked Pat to comment on Sue's singing this was her reply:

Pat: Well she could put the box bigger (she points to the bottom square of the fourth column that has six 'na's) so she could put them not so together (she traces a dotted line along the 'na's in the bottom boxes in columns 4 & 5)

Sue: Oh, she had a good idea.

Pat's suggestion to merge the bottom squares in the fourth and fifth columns to have enough room to space out the six 'na's {b1 b2} inspired Sue to make the necessary changes. She erased the 'na's in the two squares, including the vertical line separating them and wrote six 'na's in a straight line. Pat bent over the paper and watched as Sue made the changes that she suggested. Recall how Norm looked on attentively as Ned wrote 'la's under the 'lu's. Sue and Pat sang the song together two more times. Sue chanted 'b1' and 'b2' in a monotone and as before did not seem bothered by it. She did, however, criticize the way she sang the last three 'na's after singing the song together for the first time: "Instead of going high and low, I went in the middle instead of down." After singing the song for the second and last time, Sue smiled, lifted her hands up, arched her body and said, "I got it." When we were alone at the end of the third visit, I challenged her further by asking her if she could do anything else to make her notation clearer to someone reading the song for the first time: "If someone was singing it, how would they know to go from here to here?" I pointed from the highest 'na' in column 4 to the last three 'na's in the lowest box in column 6. My question prompted a series of self-regulated actions: Without missing a beat, Sue added arrows to "to know to go up and down." With a purple pen, she drew what she described as "a different coloured line" from the top of the paper right to the bottom. She wrote the word 'Extra' above the first and second columns of 'na's. She had a final idea: "How about I write-, I'll say where we finish (points to the end of song) and where we start (points to the beginning of the song) 'cause they might get mixed up." She wrote the words 'Start' and 'Finish' in the appropriate boxes. Her notation as it now stood was much more representative of the 'Lulu' song. However, the straight line of 'na's stretching across the bottom of the fourth and fifth columns remained unchanged and shaped the way Sue sang them, namely as a string of six rhythmically undefined monotone 'na's instead of two Long quickquick 'b' patterns. Singing the song back for the second to last time, Sue was aware of the problem with the six 'na's, as she expresses in this excerpt:

Here I made a mistake. I know here I made a mistake (she points to the six 'na's in a row) I stayed high... I stayed in high spaces. I stayed like I was here (she points to the highest 'na's) when I was down here (she points to six 'na's at the bottom). And I realize now I was trying to change, but I was already finished that part.

She seemed to realize that the three 'na's representing 'b' at the top of the fourth column were similar to the six 'na's on the bottom representing 'b1' and 'b2'. However, instead of modifying her notation to clearly represent these recurring patterns, she adapted her singing to match her notation. Not surprising, both girls consistently sang the six 'na's in a monotone with no discernible rhythm

Chapter summary

I began this chapter with a phenotypic analysis of the 'products' of the children's notations as they appeared at the end of the third visit. I presented an overview of what the notations revealed about the children's understandings of the musical dimensions of the 'Lulu' song. I then provided a genotypic analysis of the children's use of resources as they notated the song and sang it back. I examined the ways in which the children faced the challenge of teaching the song to a classmate, highlighting the recursive processes of *reflections-on-actions* and *knowing-in-action*. In the next chapter, I discuss these findings from a Vygotskian social constructivist perspective with particular focus on the mediating qualities of the children's use of resources and the role of the social context in generating moments of change and enhancing understandings.
CHAPTER FIVE DISCUSSION

In this chapter, I discuss my research findings from a Vygotskian social constructivist perspective. I focus on the children's use of resources as they completed the multilevel notational task and I examine the mediating qualities of these resources. I highlight certain aspects of the children's notations, and the resources they used to explain them, that reveal their intuitive musical understandings. I reflect on the role of the children's classmates and my role as researcher in providing a *field of play* for the social construction of knowledge. I also consider the culturally informed and self-revealing aspects of the children's notations.

Use of resources to notate the song and sing it back

Of the kindergarten children, only Jasmine used her singing to notate the song during the second visit. In contrast, Al's colourful shapes, Colin's line of 'L's and Joy's rows of pink circles became objects on which the children injected musical meaning through their inventive singing and fingerpointing. Their notations served as a frame of reference for singing the song, and there was little or no evidence that these children were bothered by the sound/symbol mismatch. They simply changed the way they sang the song so that it matched their notation rather than modifying their symbols to more accurately match the song. These adaptive actions were mostly self-regulated and revealed an awareness of the musical dimensions of the song's patterns, not seen on their papers. Al adapted his singing to fit his drawing by repeating Part 1 as many as five times to account for all the shapes on his page. He also varied his fingerpointing, sometimes sweeping his finger over several shapes, even an entire line to embody a long 'LU'. Similarly, he used words to inject meaning into his drawing. Like his singing and fingerpointing, Al was inconsistent in how he described the functions of the shapes to me. In the second visit, he explained that "the squares I made it for the Lu Lu Lu" as he pointed alternately with his left pointer and middle finger to each shape in line 1. In the third visit, he explained that "the squares go Lu and the triangles go Lu Lu Lu lulu'." Joy used her singing and fingerpointing to give rhythmic definition to her rows of circles.

Seven-year-old Julie adapted her singing to fit her notation. Before notating the song on paper, her singing was rhythmically accurate, but melodically and tonally 168

unstable. Singing from her notation was a different story. There were more squiggles than 'Lu's so she simply modified her singing of the song by repeating Part 1 before moving on to Part 2, which she sometimes shortened or lengthened. She did not appear to be aware of the discrepancy between her singing of the song with and without her notation. Rather, she compensated for the lack of musical cues in her notation by injecting musical meaning into her fingerpointing. For example, she sometimes stayed longer on some Lu's or went faster over others with her finger or tip of the marker to 'point out' the rhythmic pattern of 'b'. She often lifted the marker or her finger off the page after the first note of each 'b' pattern to show that it was longer and more accentuated than the ones before and after it.

Most of the children in Grades 2 and 4 used their singing to establish a 1:1 sound: symbol correspondence, encode the musical dimensions of the song, such as duration, rhythm and phrasing, and verify what they did. Occasional questions or comments from me prompted them to reflect on their actions, become aware of certain sound/symbol discrepancies and take action. Genotypic analysis of the children's actions as they notated the song and sang it back allowed me to examine how every added, deleted or modified notational symbol necessitated a re-assigning of its musical function in relation to the whole which entailed, at times, a modification of the shape, size and/or colour of the other symbols. In the case of 7-year-old Dan, each change in the way he pointed to his symbols while singing back his notation required a shift in his frame of reference. At first he adapted his singing and pointing to account for missing 'Lu's by tapping on one 'Lu' twice and singing 'lulu'. However, when his fingerpointing became more defined, that is, when there was a 1:1 correspondence between his singing, notational symbols and fingerpointing, the discrepancy between song and notation became evident, and his singing assumed a guiding role as it had when he was notating the song.

Nine-year-old Sue's four columns of ascending 'na's corresponded to her version of the song, namely 'a b b1' sung four times, followed by 'c'. When she finally agreed to disregard the first two columns of 'na's to more accurately represent the song, the musical functions of the 'na's in the bottom squares of the third and fourth columns shifted. Consequently, when I guided her singing, I left my finger in the bottom square of the fourth column while tapping rhythmically to the 'b1' and 'b2' patterns before singing the ascending 'a' pattern. She also left her finger there; this made her realize that the three 'na's already there were not enough: "*I need to put more 'na's here 'cause it didn't go up right away*" [referring to 'a']. She erased the two extra 'na's in the bottom square of the third column, and she added na's to the bottom square of the fourth column.

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Ned's singing of the song from his notation while pointing to his 'lu's prompted him to add, erase and re-position them to capture the symmetrical shape of the rise and fall of the melodic contour. He explained to me that he erased the last 'lu' "*'cause there was no more place for <u>that</u> one and <u>that</u> one (he points to the two small 'lu's before the final three big ones) so I erased them (he points to the last three 'lu's). I pushed them like more to <u>there</u> (he points to the end of the line) and I put them there" (he points to the two small 'lu's again). It seemed as if he wanted to ensure that the peaked 'lu's were equal in size and positioning on the page and that the ascending and descending 'lu's were evenly spaced out. Like Sue, Ned notated the song according to how he sang the song. An accurate representation of the song would have two peaks to denote Parts 1 and 2. Ned's undulating line has three peaks, which represent his singing of the song. He sang Part 1 twice and consistently sang 'b2' as Long Long instead of Long quickquick.*

Mediating qualities of resources

Singing while pointing to each notational symbol was an effective mediational strategy for reflecting on and verifying the sound/symbol correspondence. Most children pointed to each symbol or above it with a pointer finger, pencil or marker. Ned would sometimes glide his finger up and down along his undulating line of 'lu's. Seven-year-old Ruth sometimes pointed to each 'Lo' with her right pinky and slid along the 'Lolo's. Some children were more expressive in their use of gestures. Karen moved her head forward with each 'Lo' that she sang. Dan cocked his head to the left or moved his hands up and down rhythmically to articulate the *quickquick* part of the recurring 'b' patterns. Wayne marked time in the air with both pointer fingers, as a conductor would , like the 'teacher' in his picture. Sometimes he marked time with his hands, palms facing down, just above his lap. Joyce tapped the rhythm on her lap, gently while singing 'a' and harder while singing the *quickquick* part of the recurring 'b' patterns.

In these examples, the children's use of fingerpointing, tapping, and hand and facial gestures reinforced aspects of their musical awareness already seen in their notations and heard in their singing. In other cases, the use of gestures revealed other dimensions of their musical and meta-cognitive understandings. For example, some children used fingerpointing strategies to think ahead as they notated the song. Jasmine, Dan and Wayne pointed to imaginary 'Lu's before writing them. After drawing the first circle, Jasmine tapped on the table five times with her left ring finger while silently singing 'a' and the first note of 'b'. She then pointed to the circle and to the space beside it. She drew another circle, sang the first three 'Lu's while pointing to the two circles and the

space beside it, drew a circle in that space and so on. Wayne developed a strategy for notating the *quickquick* part of 'b'. He would point to the 'Loo' representing the first note of 'b' and, with his finger in the air, point to his paper in rhythm to the *quickquick* part of 'b' before writing two more 'Loo's. Karen traced her finger in an undulating fashion over the 'Lou's before doing the same thing with a pencil. Similarly, she traced four lines with her finger before drawing them in black with a ruler to define the melodic aspect of the song.

McNeill (1992) states that "each new gesture is the breaking edge of an inner discourse that we but partially express to the world" (p.2). Gestures not only present thought in action. Gestures shape and refine thinking and in turn lead to action and more refined understandings, or *knowing-in- action*. Bowman (2004), music educator and proponent of an embodied view of cognition, contends that "knowing is inseparable from action: knowing is doing, and always bears the body's imprint" (p. 46). He argues that bodily experiences "function as structural and organizational templates" (p. 30) for other experiences and are therefore indispensable to all human knowledge. In the case of 9-year-old Karen, the very act of tracing her finger in a squiggly, undulating fashion over her 'Lou's prompted her to concretize her actions, namely to do the same movement but this time with a pencil. In a similar fashion, she arranged and rearranged the seven markers on the table according to the order in which she intended to use them, namely from the lightest to darkest colours.

Along with singing and gesturing, children also used words to shape, define and reinforce thoughts and/or actions while notating the song and singing it back. The following examples illustrate the Vygotskian notion that language in all its forms (e.g. spoken language, written language, body language, musical language) shapes and is shaped by thoughts. In the cases of Wayne and Dan from grade 2, and Earl, Joyce and Sue from grade 4, the simultaneous use of gestures and words often heightened their awareness of certain discrepancies between the song as they sang it, and the song as they notated it. These 'Aha' moments often prompted them to take action. Consider Wayne. He used words and gestures to explain the difference between the 'Loo's and 'Looo's on his paper: "Sometimes you go like Loo, but sometimes we go again like Loo Loo Looo like more long." He moved his right hand slightly to the side when chanting 'Loo' and more so when chanting 'Looo'. After singing Part 1 of the song {a b b1 b2} at my request, Wayne realized that he was missing a LOO in line 1 {a}: "I made a mistake. The long one's supposed to be there." He pointed to the last 'Loo' in line 1 and then quickly added a small 'Loo' in the space before the first 'Loo'. Joyce used self-regulated speech

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and gestures to organize her thoughts and actions, namely to think out loud, plan ahead, explain what she will do, is doing and has done (including the decisions made along the way). She also used words to correct, evaluate and criticize herself. For example, she looked in the box of markers and before taking out the green marker to draw the 'or Louuuu....' as an alternative symbol for the last 'Lu' of the song, she announced what she would do, "*I'm going to do it in a different colour. I'll do it green.*" While adding an arrow after the last 'lou' of the second line, she explained what she was doing, "*I'll make it a little bit easier 'cause it goes on.*" When Earl completed his second notation, I asked him if there was anything he wanted to add. He immediately took out a green marker and said, "*One line*" as he underlined the first row of Lo's and "*One line*" as he underlined the second row of Lo's. In a similar fashion, he took a blue marker and said "*Long*" every time he underlined each of the seven 'Loo's in his notation.

I also observed instances of 'hidden dialogicity', a term used by Wertsch (1991) to describe instances where a child poses a question and then answers it. Wertsch explains that, in these moments, "the meaning of the child's utterance can be understood as a reflection of the outside interference of another's voice" (p. 91). In the case of Dan, after singing the song back from his notation, he noted there was a problem: "*Oh I did a mistake*." He identified the problem: "*Like, um... sometime I put like a different letter and I did a mistake so I erased it*" and explained what he had to do next: "*I need to make a mistake*?" After looking over his paper again, he answered his question: "*Oh this one is supposed to be hard*" [meaning loud, accentuated = capital U].

After singing the song for the first time at my request, 9-year-old Joyce realized that the last two 'LOU's in line 3 corresponded to the *quickquick* part of 'b' and not to the two long 'LOU's before the final long one {c}: "*Oh*!" She smiled and placed her hands on her forehead: "*Yeah LouLou ... right*?" She pointed to the long 'LOU's and looked at me: "*Oops, it's supposed to be LouLou*." She tapped on each of the two purple 'Lou's in line 3 and said: "and <u>then Lou Lou Lou</u>." She tapped three times on line 4 and then looked up at me again and said: "*Oops!*" This 'Aha' moment was followed by a series of notational changes accompanied by self-regulated speech.

Nine-year-old Sue began notating the song by asking herself a question, verifying the answer and then using her own response to plan ahead: "So how many 'Lou's?" She sang the 'a b' pattern while counting the number of 'Lou's on her fingers: "So there's five 'Lou's that go up." She lifted her left hand, fingers outstretched: "and there's two

that stay up. "She began writing 'Lou's in the boxes and she praised her actions, saying "Going well going well" after singing back the first ascending 'a b' pattern, and "Not bad" while drawing the last vertical line on her paper.

Sue's actions provide a good example of how singing shapes text, which in turn shapes singing. Despite repeatedly singing the 'original' version of the song with my guidance, she seemed intent on matching <u>her</u> version of the song with her notation. From the moment she heard the b1 and b2 patterns as being low, she represented them as such on her paper and allowed her singing to be guided by her notation. Specifically she chanted six monotone 'na's as they appeared on the bottom of the fourth and fifth columns. Although she seemed to be aware that <u>her</u> version of the song, as represented by her notation of it, was different from the <u>original</u> version, she did not make changes to her representation of the recurring 'b' patterns other than spacing them more evenly on the bottom of her graph at her classmate's suggestion. She might have been constrained by the framework she herself created. Whereas Sue's notation confused her, Earl's notation allowed him to 'find' the tune as I discuss shortly.

With the exceptions of 7-year-old Wayne and 9-year-old Sue, the children in Grades 2 and 4 used their singing as a resource to shape their notations. For most of the children in grades 2 and 4, notating the song and singing the song back involved a recursive movement between the text-as-written (e.g. invented notation) and text-as-read (e.g. notation-as-sung) with fingerpointing and words to guide them. Children activated their internal image of the song to create their notation and they retrieved the song by 'reading' the notational symbols that they themselves created. There was a sense of agency - a knowing where you are going. When a child begins to take control of his own learning, the process of internalization is accelerated for it is likely to "be placed along the routes that are connected to one's own way of intellectual travel" (Bruner, 1979, p.96). In the case of my inquiry, not only did the child get it, they were also able to carry it. In so doing, they became increasingly involved emotionally and intellectually in their own learning. Earl, whom I introduced in chapter 1, is a case in point. He seemed to have difficulty in retrieving his sound image of the song, which might have accounted for the hesitant manner in which he notated the song the first time. Eight minutes after he began, he said: "I'm think I'm done." Apart from the last three long 'Loo's of the song, which he underlined, his notation did not convey clear information about the song. By adapting his singing to his notation, he realized that it did not match the 'Lulu' song, which he sang accurately before notating it on paper. Knowing that he had a sound image of the song from the first visit, I invited him to try again. The second time, he sang the song as

he notated it. He verified what he had done after every 'Lo' or two, by singing them and pointing to each one for a total of 12 self-regulated verifications. In addition, he provided a running commentary of what he was doing and what he would do next. He also noted when he made a mistake.

For Earl, the experience of notating the song a second time seemed to be an empowering one, as exemplified by his actions, which were more purposeful, deliberate and authoritative. It took Earl three minutes to complete his second notation compared to eight minutes for the first one. This time he "got it" as illustrated by the way he captured duration, accentuation and a hint of pitch in his representation of the recurring 'b' motifs and the 'c' pattern. His second notation was more meaningful to him than his first notation because the way in which he encoded his 'Lou's made musical sense to him. Indeed, when he 'lost' the tune somewhere between the second and third visits, he was able to 'find' it simply by 'reading' his second notation. Earl's symbolic representation of the 'Lulu' song served as an effective tool for retrieving musical meaning. In turn, he was able to 'carry it', that is, to teach the song to Kim.

As he naturally assumed the role as a caring but firm teacher in the third visit, Earl was prompted by Kim's mostly monotone singing to add musical notes above each 'Lo' to ensure that she could sing the tune: "*'cause she just sang Lo Lo...*" as he imitated the way she sang, *"so it says higher.*" Each time Earl modeled the song or sang it together with Kim, his singing was clearer and more accurate. When he sang the song for the last time in the third visit, he did not refer to his notation. He had already internalized the song and no longer needed to use his notation to 'find' the tune. My suggestion to try again acknowledged that his efforts were a work-in-progress, and that it was okay if, at first, he did not succeed. I supported his efforts, and in so doing, helped trigger a series of self-regulated actions that revealed to me and, more importantly, to him, what he was capable of doing. The next two excerpts illustrate Earl's *knowing-in-action*. In the first excerpt from the second visit with me, he compares his two notations:

Earl: This one is better than that one (he points to his first notation and then to the second one)

Deb: In what way?

Earl: I made just a 'Lo' with just one 'o' (he points to the first 'Lo' in his second notation) and a 'Loo LoLo' like that (he points to the first grouping of the 'b' pattern) with two 'o's, and <u>this</u> one (he points to his first notation) I did everything just one 'o'. *Explains to me in Visit 2*

Alone with me towards the end of the third visit, Earl drew on his experience of having taught the song to Kim to reflect on his first notation: "*I just did Lo Lo, only L-o, and no-one would know what it is... Lo Lo Lo ...*" He chanted in a low-pitched monotone.

For Vygotsky (1962), consciousness is akin to awareness, or *knowing-in-action*, that is stimulated during tasks that are appropriately challenging and socially-mediated. The Vygotskian idea of "activity" as a generator of consciousness (Tviritenova, 1999) was well illustrated in Earl's actions as teacher and Kim's contribution to his *knowing-in-socially-mediated-action*. In the next section, I discuss the co-construction of knowledge that emerged in the cases of some of the child/classmate dyads and I highlight the role of the social context in providing opportunities for meaningful learning to occur.

Knowing-in-socially-mediated-action: Classmate as social resource

The narrative portraits I presented in chapter 4 depict the resourcefulness with which the children in grades 2 and 4, and one child in kindergarten, Jasmine, used their singing, gesturing and speaking to teach the 'Lulu' song to their classmate. I also examined the possible factors that may have constrained the ability of the kindergarten children, including Al, Colin and Joy to teach the song to their classmates.

Initially, my focus of observation was on the ways children used their resources to teach the song to a classmate and the factors that enabled or constrained their ability to do so, including the sound image of the song and the musical clues embedded in their notations. I observed that in the cases of Dan, Wayne, Earl and Karen, it was their classmates who were able to move them forward towards greater musical understandings in ways I was not able to when alone with them in the second visit. Specifically, the classmates' manner of singing the song, as well as their questions, observations, spontaneous comments and/or explanations of the notational symbols prompted the children to modify their notation to improve the sound/symbol 'fit' and/or talk about their notational symbols and/or sing the song in a more precise manner. When these interactions were sustained, the line between child as teacher and child as learner became blurred. Teaching moments were interspersed with reflections-on-actions that were in part prompted by the classmate's singing, questions and comments, in addition to my facilitating strategies that I describe in the next section. Reflections-on-actions led to a process of knowing-in-action, during which children made changes to their notations to make them more representative of the song. With these changes, the children resumed their role as teacher with increased confidence and, in most cases, with more active

involvement from the classmate. What emerged were dynamic examples of collaborative problem-solving in action.

Misunderstanding and questioning: Opportunities for learning

Gadamer (1975) contends that "questions always bring out the undetermined possibilities of a thing (...). From a dialectic, Hegelian perspective, uncertainty and ambiguity can be a catalyst for learning because it invites new possibilities for making meaning or *knowing-in action*. Asking it opens up possibilities of meaning" (p. 338).

Several researchers have examined the role of classmates in the learning process. In their ongoing investigation of the process by which children solve math problems together, Zack and Graves (2002) found that disagreements and misunderstandings among peers played a critical role in learning. In the context of my inquiry, the classmates' difficulty in reading the notation and subsequent questioning led to a series of changes to improve the 'fit' between sound and symbol. The case of Earl provides a good example of misunderstanding as a catalyst for learning. When Earl's classmate, Kim, chanted the song on one note while 'reading' his notation, he realized that he might not have conveyed adequate information about the song, so he drew musical notes above each 'Lo' "to tell you that there's a tune." Kim's inaccurate 'reading' of Earl's notation led him to add musical notes above each 'Lou' "'cause she just sang Lo Lo ..., so it says higher" as he imitated her singing the song on one note. Masny (2005) contends that a critical reading of texts allows for questioning which points to a sense of "between-ness, an indication that a space is opening" (p.1981). In Earl's case, listening to Kim sing back his representation of the 'Lulu' song provided a space to reflect on what he had written, which in turn led to changes to improve the sound/symbol 'fit'.

Dan's arbitrary colouring of the recurring *Long quickquick* 'b' patterns made it difficult for him to consistently remember how to sing them in the second visit. Consequently, Dan was unable to teach Wilbur how to sing them at first. Because of Wilbur's questions and comments, as well as Dan's singing the song from his notation at my request, he became aware of the discrepancy between the 'b' patterns as sung and the 'b' patterns as written and took action to ensure that there were three coloured groupings of three 'Lu's each to clearly represent the 'b' patterns. Dan was now ready to teach the song to Wilbur ("*Now you know these here are together*", as he pointed to the clearly defined 'b' patterns) and Wilbur seemed intent on learning it. What emerged serves as an exemplar of the co-construction of knowledge to which I now turn.

At first Wilbur was compliant ("OK. I know") and even apologetic ("I'm sorry") for making "mistakes" while attempting to sing the song from Dan's notation. Although the relation between the song and Dan's written representation of it was questionable, neither Dan nor Wilbur took action. However, as Wilbur became increasingly motivated to learn the song, the more he began to realize that there was a mismatch between the 'b' patterns as Dan sang them and notated them. Furthermore, with each recurrence of Dan's role as teacher, the more Wilbur evaluated his own actions. The first time Dan assumed the role as teacher, Wilbur did not make any self-evaluative comments. The second time, Wilbur made two comments. The third time Dan resumed his role as teacher, Wilbur made four comments (e.g. "I didn't get it"; "I don't know it", "I'm mixed up a little"). Wilbur also criticized and questioned Dan about the way he wrote certain 'LU's and, in so doing, led Dan to notice certain flaws and, in turn, correct them. Wilbur implicitly suggested that all the 'Lu's in each of the three 'b' patterns should be the same colour: "There's a whole bunch of 'Lu's" while pointing to a string of five blue 'Lu's in lines 3 and 4. Without missing a beat, Dan replied, "I know, I'm going to change the colours." When Wilbur said, "I don't get it, I don't get that one (...) This one's a little crooked from the other ones", pointing to the fifth 'Lu' in line 3, Dan promptly responded, "Maybe I'll just make it straighter." He straightened out the fifth and sixth 'LUs in line 3 and the first one in line 4. As Dan and Wilbur dealt with the challenge of making the notation easier to 'read', a reciprocal learning and teaching occurred. For instance, Dan guided Wilbur in learning the song, and Wilbur guided Dan in redefining his notation. By questioning and challenging Dan's logic behind his symbols, Wilbur unintentionally helped him to reflect on the way he encoded his 'Lu's (e.g. colour, size, shape). Moments of uncertainty and Wilbur's misunderstandings helped create a space for Dan to clarify his reasoning, make his implicit knowledge explicit, and consequently be a more effective 'teacher'. Mary, Dan's grade 2 teacher, remarked when I described the changes Dan made to his original notation and then showed her Dan's second more refined notation:

And this is the way we work in class, too, you don't just....nobody is able to sit down and work perfectly on their first draft. Nobody is expected to do work without wanting some changes.... So you do your work. You ask for other's opinion or other's help. Then you do a good copy that you feel confident to submit or present. *Conversation with Mary*, 29/4/03

Mary's response provides insight into the value she places on peer learning, experimentation, self-discovery and learning through mistakes. She recognizes the importance of the personal and social construction of learning in the classroom. She values doing and re-doing work using classmates and the teacher as resources. In this way, children begin to understand that learning is not about getting it 'right' the first time. Rather, it is a recursive process of doing, reflecting, redoing and consulting with others. When I asked her about the goals of education, she replied, "Socialization, cooperation, interdependence with the children.... Hopefully they learn to read and do some math, and write, but they learn it in a cooperative setting." Mary's remarks about my research project highlight the benefits of providing opportunities for children to play the role of teacher:

I think this is really, really interesting for the children to do. I think it's great that they have the opportunity to have that one-on-one with you and the group with you to learn the song and then for them to be able to be the teacher to appear, so that they know whether or not what they're doing works, because otherwise just doing it and saying, 'Oh isn't this a lovely piece of paper and I've done a good job'. That's great. Now let's see what you really have and by teaching it to someone else, they know if it works or not.

Conversation with Mary, 25/4/03

Mary's stance is clearly social constructivist. The challenge of being a teacher lies in being able to communicate knowledge to others, hence the need to make implicit knowledge explicit. Indeed, explaining something to someone who does not know the song requires clarity of thought and language, either spoken or written.

Peer-peer learning: A motivating force

Findings from this study suggest that the peer-peer situation is a motivating force for empowering and eliciting self-regulated learning. With the exception of the kindergarten children, there were qualitative differences in the ways children used their resources to notate the song, sing it back and explain the notational symbols to me in the second visit, and to teach the song in the third visit. These differences revealed a greater depth of sensitivity to the musical dimensions of the song when teaching the song to a classmate. The notion of a *field of play* as an interactive, intellectual zone, that is, a zone of proximal development, filled with potential for new understandings, is pertinent here.

The children's verbal explanations tended to be more articulate and detailed when explaining and teaching the song to their classmates. Five-year-old Jasmine was more articulate in explaining why she used circles and triangles to represent the patterns in the song. In the second visit, her explanation was not song-specific; her decision to use circles and triangles seemed to be intuitive at first: "*It's because I didn't want to mix it.*" However, when I asked her to explain to her classmate, Kelly, in the third visit, why she used circles and triangles, she replied, "Because this is the same part, as she pointed to lines 1 and 3, "and this is <u>not</u> the same part", as she pointed to line 2, "so I put triangles." Whereas Jasmine's drawing suggested a link between the shapes and their musical functions, namely circles for 'a' and triangles for 'b b1 b2', there was no indication of this relationship in her initial verbal explanations. By asking her again to explain why she used circles and triangles, this time in the presence of her classmate, I gave her the opportunity to verbalize what she already revealed in her notation. Perhaps there was a consolidation of understanding by the end of the third visit because she had several opportunities in two different social contexts - with me alone and with Kelly – to explain her notational symbols. Nine-year-old Ned was more expressive in his use of gestures and singing in the third visit when he explained to me why he drew bigger 'lu's, as illustrated in these two excerpts:

When you do like 'lu lu lu lu lu '(he sings 'a' pattern and stresses the fifth note), it'sgetting louder so it's going to be bigger.Explains to me in Visit 2

It goes like louder (he extends fingers of both hands and moves them towards me like when you surprise someone suddenly) *lu lu lu lu <u>lu</u>* (he gets louder with each 'lu'). You say it loud. *Explains to me towards the end of Visit 3*

Furthermore, when singing with Norm, Ned's singing was increasingly robust and expressive, and for the first time, he got louder with each ascending 'Lu' in the 'a' pattern and emphasized the last three 'Lu's. Five-year-old Jasmine sang slower and more accurately than before so that Kelly could sing each 'Lu' with her. The second time they sang the song together, they both pointed to the notational shapes as they went along. There was a slight pause between each 'Lu'. Perhaps Jasmine was waiting for Kelly to sing the next 'Lu' or perhaps Kelly was waiting for Jasmine. Regardless, the result was that they sang together in unison and listened closely to one another. The last time Jasmine sang the song alone at end of the third visit, she did so with the most assurance and precision. Quick by nature, 7-year-old Julie modified her way of doing things to ensure that Cathy would learn the song. Her singing was considerably slower and her fingerpointing more defined than in the second visit. For example, Julie used her fingerpointing as a teaching resource. Before teaching Cathy a section of the song, she sang that section to herself. She pointed to each squiggle with her right thumb, held it on the last squiggle of the section she was teaching and then, with her left pointer finger, guided Cathy's singing by pointing to the line of squiggles in rhythm to the song. After teaching the song section-by-section in this way, she sang the whole song with Cathy, and for the first time she sang 'a' accurately both rhythmically and melodically - a good

example of practice makes perfect. The responsibility of teaching the song also prompted Julie to pay more attention to the ascending melody of 'a'.

Seven-year-old Ruth pointed to each 'Lo' in a clearer, more defined manner while guiding Marla's singing in the third visit than when notating and singing back the song in the second visit. Nine-year-old Joyce's gestures were more elaborate. The first time she sang the song with Nina, she pointed to each 'Lou' with her right pointer and tapped the rhythm on her lap with her left hand – a noteworthy example of the simultaneous use of resources to teach the song (e.g. singing, fingerpointing and laptapping). Joyce seemed intent on providing Nina with ample musical information about the song.

Situated learning

This study supports sociocultural developmental theories that explain that learning is socially and culturally situated. The social context seemed to be an important factor in accounting for the qualitative differences between the children's use of resources. In the second visit, the children were alone with me whereas in the third visit, a classmate was also present. The classmates' questions and comments challenged the children to clarify their thinking in ways that were not necessary when explaining the song to me. Perhaps it was because the children were more concerned with helping their peer learn the song, rather than with finding the correct response to a question posed by someone like myself who knew the song, as if the knowledge was 'out there'. Conveying what they knew, in their own way, triggered a process of *reflections-on-actions*, understanding what could be done to improve the sound/symbol 'fit' and finally taking actions that showed their *knowing-in-action*.

Teaching the song to a classmate required that the children not only 'got' it, that is, derived meaning from the experience, but they were able to 'carry' it, that is, they were able to convey meaning to someone else. This might explain why some children including Jasmine, Julie and Sue, practiced the song alone to make sure they knew it before they were ready to explain the song and teach it to their classmate, It was as if they intuitively realized that, as 'teacher', you have a responsibility to make sure that you know what you are talking about or singing about. Seven-year-old Julie, for example, looked over her paper, whistling the song silently to herself and then singing it twice out loud before inviting Cathy to sing with her: "OK 1-2-3-go."

Findings from this inquiry suggest that factors such as age, title, and whether or not the addressee has special knowledge of the area of communication might have accounted for the differences in the children's use of resources with me alone or in the company of a classmate. I also observed that the nature of my request to the children to explain their notations to me or to a classmate elicited differences in the quality of their verbal responses. For example, in the second visit, I focused on a particular aspect of the children's notations (e.g. *"Tell me about the long 'Lou's"*) and I was the addressee. In contrast, in the third visit, my request was more open-ended and directed towards the classmate as the addressee (e.g. *"Tell ______what you did with me in the second visit"* or *"Tell ______something about your notation"* and later on *"Imagine you are the teacher and teach the song to ______*." Children in grades K and 2 were more likely to respond in a concrete manner by saying something about the product, namely their invented notational symbols. Children in grade 4 tended to talk about both the product <u>and</u> the process. For example, Earl told Kim, *"This one was a mistake and this one is the good one."* Joyce and Karen offered their own critical analyses of the processes by which they created their notations.

In the cases of Julie, Dan, Karen, Joyce and Earl, being the teacher provided opportunities for them to use their resources to improve their notations and, in the process, perfect them. Exercising their role as teacher also revealed aspects of their character not typically called upon in classroom teaching practice. Julie, by nature quick, slowed down when singing the song with Cathy. She also showed a caring and attentive side, praising Cathy's efforts and assuring her: "If you get any mistakes, I'll correct you." Like Julie, Karen praised Nancy's efforts: "Better than the first time I did it." Ned showed flexibility and consideration for Norm's desire to sing the song to 'la' instead of 'lu'. When I asked him why he wrote the 'la's under the 'lu's, he replied, "so it would be easier for Norm." Recall that in the second visit, Sue drew four columns of ascending 'na's despite my numerous modeling of the song and pointing out that the ascending 'a' pattern occurs twice. When she became aware of this mismatch, she decided against erasing the first two columns: "I'll leave it like that because that's how I made it and it's going to be like that. Like if someone sees it, well they'll know how I did it. I won't change it." Changes made in the third visit to improve the sound/symbol 'fit' provided evidence of her ability to be flexible, use constructive feedback and be guided by others.

Sociocultural developmental theories of learning underline the importance of exploiting the children's natural interests in each other. Carol, the school principal, emphasized the critical role that schools should play in addressing the social and emotional needs of the children:

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We're primarily social and school is an <u>extremely</u> social situation, which is why so many kids have trouble with it because they don't have a lot of social skills and that sometimes we <u>expect</u> them to have social skills, or <u>demand</u> it of them, or bemoan the fact that they don't, but that's part of what we have to do (...) That's a bigger and bigger and <u>bigger</u> part of what we have to do, but if we have to, that's what we do.

For Carol, socialization should be the number one task of the school. According to her, many students are stressed at school because they do not have the necessary social skills and they lack self-confidence. More care and attention should be given to nurturing these skills. Problem-solving music-based tasks such as the one in this doctoral inquiry, where children are called upon to interact in creative and novel ways with each other, should be an integral part of the school curriculum. As I illustrated in chapter 4, empathic, caring and playful relationships emerged among the children. Dan and Wilbur, Karen and Nancy, Wayne and Belinda, Joyce and Nina shared a common goal of representing the 'Lulu' song as clearly as possible on paper. Dan and Wilbur informed, criticized, encouraged, watched, listen to and guided each other. Both were attuned to the detail in the other's actions and, with each repeat of the recursive cycle - teaching, reflecting-onactions, knowing-in-action - there was a heightened level of self-agency, which Klein (1999) defined as knowing where to go. There seemed to be a genuine interest in the task and in each other. Sometimes Wilbur chided Dan for getting dressed so slowly after gym ("Why are you slow?") or too quick to write the first line of 'Lu's in the second notation ("Dan goes very fast but I take my time."). He criticized Dan for writing his name too big ("My dad says, 'do not write your name very big, because it makes your name much neater.' If I was Dan, I would make a little name."). By asking Dan "What's the matter?" as he made the 34th notational change, Wilbur provided a space for Dan to express his displeasure at his messy paper. This resulted in the co-creation of a second more refined notation. Like Dan and Wilbur, Karen and Nancy were attentive and caring partners, particularly in the ways they completed each other's thoughts. The next two excerpts illustrate the caring and attentive relationship between Karen and Nancy. In the first excerpt, Nancy talks about being nervous when Karen asked her to sing the song from her notation:

Nancy: I had a weird feeling in my stomach/

Karen: Butterflies (she moves her fingers as if miming the action of butterflies flying around {in one's stomach}/

Nancy: Yeah, 'cause when I sing I get all like (same butterfly action as Karen).

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In the second excerpt, Karen explains how she showed melody in her notation: Deb: ...and how did you show going up and down here, I mean the pitch/ Karen: the colours...the lightest one was the highest one and then it got down and / Nancy: the darkest ones are the lowest (points to the black Lou's) Karen: yeah so it's <u>dark</u>, lighter, lighter, lighter, lighter, lighter

There was also a playful quality to their interactions as Nancy looked at Karen's notation in different ways. This prompted Karen to shift her own ways of seeing what she created.

Belinda and Wayne provide an interesting example of two classmates, where the more capable one (Belinda), who has the ideas and is a quick thinker, is just one step ahead of the less capable one (Wayne). That is, the more capable peer is already in the other's ZPD and so unwittingly brings the less capable one into it. The narrative vignette in chapter 4 illustrated the caring relationship that emerged between them. Belinda completed Wayne's sentences, challenged him and at times, interrupted him. Wayne not only accepted her suggestions but he was quick to apply them. For example, after Wayne finished replacing the last 'o' of the 'Loo's representing the *quickquick* part of 'b', with a triangle, Belinda criticized his lack of attention in clearly representing the musical dimensions of the song. This time Wayne completed Belinda's sentence with 'lulu': "If he took his time to do this. He didn't watch out for the lulu."

Wayne was stimulated by Belinda's presence and in the process became more confident and animated. He was less reliant on my approval than in the second visit. When he sang the song with Belinda for the second to last time, Wayne leaned forward, his left foot on the ground and right knee on the chair and, for the first time he sang the song from beginning to end without my help. When I asked him to comment on Belinda's suggestions, he offered this explanation with a little help from her:

Wayne: Some ideas are really good that she had.

Deb: Which ones?

Wayne: the little squares, like the lulu..... [replacing the second 'o' with a triangle to represent the *quickquick* part of 'b] ... I guess for the big ones [adding an extra o]... that's it

Belinda whispers to Wayne: What about the line?

Wayne: Yeah I put a line too

Towards the end of the third visit, I asked Wayne to describe his experience with Belinda. He said he liked the idea of "having someone else and it went really fast", whereas it was "more quiet and more patient when we were alone last time."

Researcher as facilitator / social resource

As I discussed in chapter 3, a key epistemological principle of my social constructivist stance is that educators and researchers have active roles to play in facilitating children's self-regulated actions and in providing a playspace, what I refer to as a *field of play*, for collaborative problem-solving. An overriding goal of this inquiry was to elicit implicit knowledge the children could use as resources or mediational tools for subsequent actions.

An interesting finding was that the manner in which I modeled the singing of the song in the first visit seemed to influence the way the children understood it. Specifically, I moved my body, arms and hands to reinforce the musical dimensions of the song. I slowly lifted my head while singing the ascending 'a b' patterns. I then thrust my head forward and downwards on each of first 'Lu's of the 'b' patterns as well on the final three 'Lu's of the song, 'c'). Dan described the last three notes {'c'} as very low. Karen colourcoded the first note of the 'b' patterns as well as the 'c' pattern dark blue and placed them lower than all the other notes. Ned's oscillating waves seemed to reflect the rise and fall of my head movements. In the next excerpt from the end of the third visit, Karen reflects on the experiences of writing the song on paper. She comments on how I embodied the musical dimensions of the song, namely the rhythm, pitch and melodic contour, as I taught the song in the first visit. She describes how my body movements helped make it easier for her to learn the song and then to create her notation with attention to pitch and phrasing. The ascending line of 'Lou's on her page mirrored the way I lifted my head while singing the 'a' pattern. The low-lying Lou's mirrored the way I moved my head and body forward on the first 'Lou' of each 'b' pattern and tapped the long quickquick 'b' patterns on my lap:

Karen: It's cool. It was kind of weird at first because I didn't know what we were doing, but then after, after I sang the song a few times, I kind of understand that you have to get the tunes right or else the song wouldn't be good, 'cause if -, . like if you <u>all</u> have it <u>all</u> on one line, you would think it's all the same note and then it won't be good and then-, yeah, so that's why that I think the reason why you were going like this (she lifts her head up and down)

Deb: Is that what I was doing?/

Karen: Yeah you were going *Lou Lou Lou Lou Lou Lou Lou* (she sings 'a' and the first note of 'b' while gradually lifting her head higher with each 'Lou' and then down on the first note of 'b'). You were moving your head up and down and that was helping and that's how I thought it was a little easy because sometimes people when they teach you a song, all they do is just sing the song and then you have to learn the song in a week and then it's hard....it's harder but you actually made it easier.

As I illustrated in chapter 4, Karen appropriated my gestures when singing the song to Nancy, that is, she used her embodied knowledge of the song to teach it to Nancy. These findings have implications for educational practice. When teaching a song, educators might offer a variety of resources, on which children can draw so that they might be as resourceful and self-regulated as learners and teachers.

One of the challenges I experienced as participant observer was to assess the children's zone of proximal development for the task. Indeed, my role as facilitator was to decide when to step in to move a child into his ZPD and when to step back to allow for self-regulated actions. These moment-by-moment decisions were determined in large part by the child's grasp of the song, the type of questions, if any, such as seeking guidance, asking a task-specific question, and his apparent level of interest and involvement in the task. For example, I considered it inappropriate to challenge 5-year-old Colin on the evident lack of musical clues about the song in his line of 'L' or to ask 5-year-old Al to teach the song to Pierre because of the gap between his singing and his notation of it. In contrast, I found it appropriate to ask Joyce to tell me more about her tri-coloured 'Lo's or to point out to Julie and others about the mismatch between their singing and their notation.

I also used other strategies to facilitate the children's self-regulated actions. For example, I clarified the task following initial instructions at the child's request by adding words or gestures (e.g. "As you write it, you might want to sing the song in your head or out loud...to help you"). I sang the song alone or with the child to guide their singing and reinforce their internal image of it. I sometimes pointed to the children's notational symbols while they sang alone. I asked leading questions with embedded suggestions in order to encourage further self-regulated actions. For example, Joy made a pink circle in the middle of the paper towards the left, said, "circle" and giggled. She looked at me as she put the lid back on the marker. I asked her, "Is that the first sound?" She nodded. I sang 'Lu' and inquired: "You have to do some more circles for the song?" I offered a suggestion: "While you're doing it you can also sing it, so for each circle it could be 'Lu'." I also challenged the children by seeking clarification about what they said, and thus implicit knowledge was made explicit. I asked Joyce to talk about the colours of her

'Lou's, "Well I really like, blue and red. But brown because Lou...the u, you could hear it really pounces out at you, so I put it in brown (...) to make it more colourful!" Because she was asked to clarify this statement, she was able to explain the rationale for using different colours for the 'a' pattern.

I validated, acknowledged and/or clarified a child's response by adding my own comments. In the next excerpt from the second visit, Joyce talks to me about her last three 'Lou's and I comment on the ending which she represents as 'Lou / Louuuuuu':

Joyce: These (she points to the last LOU's) are harder than these (she points to the black LouLou's). They go lower.. and.. they're at the end (giggles).

Deb: It's like to announce the ending!

Joyce: like the 'a' of Jessica is the ending! (I sing a long 'a')

Deb: You could say Jessica or Jessicaaaa

The children's classmates were social resources for me in the third visit. Specifically, I asked them questions about the children's notation, singing or role as teacher. I asked them if they had any questions to ask their friend and I sometimes responded to their comments. For example when Wilbur said *"I'm all mixed up"* because he was unable to sing the 'b' patterns from Dan's notation, I asked him to explain why he was mixed up. Wibur's comments led Dan to reflect on the coloured groupings of 'Lu's that did not match the recurring 'b' patterns. His *reflections-on-actions* led to *knowing-inaction* as he embarked on a series of self-regulated changes to the colours of certain 'Lu's. The next excerpt, from the third visit with Wayne and Belinda, illustrates how a question addressed to Belinda and her response helped Wayne assume his role as teacher with confidence:

Deb to Belinda: What would a teacher do? Do you have any ideas of how a teacher would start teaching a song?/

Belinda: One part by one part, like the first part and then they all sing that song, and the teacher would go like one sentence and then go again, and then we go to the next sentence, and then she says it and we say it.

Deb to Belinda: That's a good idea.

Deb to Wayne: Maybe you could do it like that /

Wayne: Yeah

Deb: OK. Go for it!

Wayne stands up, leans against the table and states: "The first part is the beginning (he sits down again) of the Loo Loo."

By indirectly asking Belinda how she would teach somebody the song and by acknowledging her response, I helped activate Wayne's role as teacher.

Use of gestures, words and singing to explain notations

The following examples illustrate the children's simultaneous use of resources to explain their notations to me or to their classmate. At times, the children's gestures, words and singing were consistent with what was already seen in their notations. Other times, these resources uncovered dimensions of children's musical understandings that were not seen in their notations. In some cases, children's verbal explanations not only revealed what they knew about music, but how they appropriated words from drawing (light/soft; dark/hard), writing (paragraph, sentence, word, capital/small) and math (take away, numbers, addition). Five-year-old Joy explained to me in the third visit that she left spaces between her circles "because if you stick them together it won't be a song." To make her point, she put the palms of her hands together and said, "stick them together." She opened her palms and shook her head and said, "it won't be a song." Dan embodied concepts such as high/low, loud/soft and capital/small to explain his notational symbols. The capital 'U's represent loud and slow sounds. The small 'u's indicate sounds that are softer and faster. The next three excerpts illustrate Dan's use of words and gestures to explain to me his rationale for using 'Lu's, 'LU's and squiggly 'LU's at the end. In the first excerpt, Dan explained his reasons for putting small 'u's and capital 'U's:

I put these small (he points to the 1^{st} five 'Lu's in line 1) and these <u>capital</u> (he points to the last two 'LU's in line 1) because when you're doing these, it's kinda like you have to do it really loud like 'LU' (he sings 'LU' loudly). Explains to me in Visit 2

In the next excerpt from the third visit, Dan distinguishes the Lu's with tails (small 'u's, lower in pitch) from the ones without tails (capital 'U's, a bit higher):

The ones that didn't have the tails that means like it's kinda like high and the ones that have the tails are like... little....lower and the ones that don't have a tail are a little bit higher (he points to the 'LU's on lines 1 and 2). *Explains to me towards the end of Visit 3*

The tailed 'Lu's in lines 1 and 3 symbolize small or little sounds, which Dan embodied by cupping his hands as if he was holding a small object. They represent the melody of the ascending 'a' pattern. The tail-less, capital 'LU's represent the accentuated 'b' patterns. The next excerpt illustrates Dan's use of words and gestures to explain how he represented the three squiggly 'LU's at the end:

At the ending I put it like this one because it's kinda like a different version, like it's kinda, it's going like a low version (he makes a low sustained sound, palms of his hands facing the ground to reinforce the concept of a low sound)..... you have to sing low (he motions with his head)..... It's kinda like, as though you have to put your voice like really *low* (he gently puts his left hand on his throat, lowers his head, moves the palm of his hand downwards and chants "low" in a low pitched voice). *Explains to me in Visit 2*

Like Dan, Julie was very resourceful when explaining the musical dimensions of her notation. She explained that the orange arrow at the end of line 2 was "for the end, so it goes Looo." She sang a long Looo as she raised the pitch of her voice while at the same time, tracing a long line in the air with her right pointer finger. Alone with me towards the end of the third visit, she again explained that she put the arrows "to go like down like Looo." She sang a long Looo, while sweeping her left hand across in front of her. as an orchestral conductor would. Before teaching the song to Cathy in the third visit, Julie explained to her that "this is one song", as she pointed to the pink squiggles with her right thumb, "and this goes to the other one", as she pointed to the purple squiggles. "These ones are only like Lo Lo" (she points to the two long squiggles before the very long one, lifts her forearms and stretches out her fingers, head moving forward with each Lo). "And this one goes all the way down" (she points to the final elongated squiggle and looks at Cathy). "So OK?" (she lifts her right sleeve up to her elbows as if she is getting ready for action). When singing the song to Cathy for the first time, Julie emphasized the final 'Lo' by sliding her thumb across the last squiggle onto the table until her whole hand was outstretched along the edge of the table. Singing the song together for the second to last time, Julie used arm, hands and finger movements to remind Cathy that the last three squiggles were "bigger and then you go down." Specifically, Julie lifted her forearms, stretched out her fingers and moved her head forward while accentuating the first two Lo's of the 'c' pattern. She lowered her right hand while saying to Cathy "and then you go down."

Seven-year-old Wayne also used words, gestures and singing to explain the Loo's and Looo's on his paper during the second visit: "Sometimes you go like Loo, but sometimes we go again like Loo Loo Looo, like more long." He moved his right hand up and down with each Loo that he chanted as if he were conducting a choir. He swept his hand to the right when chanting Looo. To describe the quickquick part of 'b', he tapped the rhythm with both hands in the air, palms down, just above his lap. He described the

squiggly lines under each Loo "*like wiggly*", while wiggling his fingers on his right hand which was parallel to the floor; "*like Loo*" while moving his hand to the side while singing a long *Looo*. In the third visit, Wayne described the long 'Looo's in this way: "*It's like when we go like up* (raises his left hand) *like more louder*."

Seven-year-old Ruth used arm and hand gestures to describe to me how the 'LoLo's should be sung, as the next two excerpts from the second and third visits illustrate:

When it's LoLo.. like fast (she makes a fast movement to the side with her right hand) ...I put like together(she points to the first LoLo in line 1). Explains to me in Visit 2

Like fast, together (she moves her hands suddenly toward each other). They're like not separated (she moves her hands, palms facing each other, sideways in a rhythmic manner) they're together (she moves the palms of her hands together).

Explains to me at the end of Visit 3

The next four excerpts illustrate Ruth's resourceful use of gestures to depict the last 'Looo':

At the end, it's like <u>Looo</u> (she smiles and bends her head forward) it's like L-o-o-o-o (she smiles and moves her head sideways, emphasizing each 'o' in a rhythmic fashion).

Explains to me in Visit 2

And at the end it's *Looo* (she produces a long sound while moving her right hand diagonally down to the right away from her body)...like long.

Explains to Marla in Visit 3

And at the end it's <u>Looo</u>....<u>all</u> the time (she produces a sustained sound; with arms crossed in front of her on the table, she moves her upper body to the left and towards the table). Explains to Marla in Visit 3

Well for the last thing, it's like Loooo (she moves her arms in opposite directions and bends her body forward). It's all the time so I put four 'o's.

Explains to me at the end of Visit 3

Ruth showed an awareness of music as a temporal and spatial phenomenon in the ways she used words and body (e.g. arm and hand) gestures to show the *quickquick* part of 'b' and the final 'Looo' as moving through time and space.

When I asked Ruth to pretend she was the teacher and teach Marla the song, she said, "I do the first paragraph." Ruth's use of the word paragraph suggests an awareness

that each section of the song is like a written text, where words are arranged in such a way as to serve a function. Like a written text, Ruth's notational symbols are clear and straightforward.

Nine-year-old Karen used words like "going upstairs", "pattern" and "take away." In the next excerpt, Karen describes her notation to Nancy in the third visit as she traces an undulating line with her right pointer finger above the 'Lou's in line 1:

It's like going <u>upstairs</u> and then it will go like that, and then it will go like *wooo*.. (she makes a sliding sound {glissando}) then your voice goes down (she points to first dark blue 'Lou').. and up up, down, up up *Explains to Nancy in Visit 3*

Karen also explained that "*your voice goes higher*", as she placed the palm of her left hand on the palm of her right hand while slowly lifting her hands and singing the 'a' pattern which she represented as an ascending ladder of 'Lu's. When I remarked that she represented the form of the song as a pattern, she quickly explained, while covering the 'Lou's representing 'a' with her left hand and pointing to the 'b' patterns with her right hand:

Yeah, it's a pattern because that's a pattern in a pattern. Well that's a pattern in a pattern. That's a pattern in a pattern and that's a pattern. *Explains to me in Visit 2*

She continues, this time uncovering the 'a b' pattern and covering 'b1 b2 c':

Up until here is the same thing (she covers all but the two ascending 'a b' motifs with her right hand). If you take away this (she covers all except 'b1 b2' in line 1 and 'c' in line 2) it's the same thing. *Explains to me in Visit 2*

Sue used the word "sentence" to describe the vertical line of 'na's. Her appropriation of the word "sentence" seemed to be synonymous with her understanding of the ascending 'a b' pattern. Belinda, Wayne's classmate, also used the word "sentence" to refer to a section of the song. When Wayne got stuck in his role as teacher, I asked Belinda if she had any ideas of how a teacher would teach a song. She explains:

One part by one part, like the first part and then they all sing that song, and the teacher would go like one sentence and then go again, and then we go to the next sentence, and then she says it and we say it.

Later in the visit, I used the word "sentence" to redirect Wayne in his role as teacher. I suggested that he consider Belinda's suggestion to teach the song "sentence by sentence."

Earl used the words "*little*" and "*high*" to refer to the notes above the 'Loo's in his second notation. He also referred to the high notes as a "*higher word*":

Some of them had double 'o's (he points to his first notation) and this one (he points to the Lo's in the first and second notation) has little notes and the L-o-o had high notes to tell that it's a <u>higher</u> word... (he points to his second notation).....and this one (he points to the first notation) I didn't.-, I just put that and that (he points to the red and turquoise musical notes in the first notation). *Explains to me towards the end of Visit 3*

Ned used words like "goes down", "softer" and "getting louder" to describe the dynamic shape of the song as he represented it by a single undulating line of 'lu's. He explains:

It starts like uh <u>soft</u>. After it's louder after it goes down, it's getting louder and louder. After you go down soft after softer, softer and softer....(he points to the corresponding ascents and descents on the line). *Explains to me in Visit 2*

In the next excerpt, Ned uses words and gestures to explain why he drew bigger 'lu's on the two peaks:

It goes like louder. You say it loud (he extends the fingers of both hands and moves them towards me like when you surprise someone; then he sings *lu lu lu* getting louder with each 'lu'). *Explains to me in Visit* 2

Compare Ned's description of his peaked 'lu's with Joyce's description of her tricoloured 'Lou's that precede the pair of black 'Lou's in lines 1 and 3. She explains:

I really like blue and red... but brown because <u>Lou</u>...the <u>u</u>, you could hear it really <u>pounce</u> out at you (she extends her right hand, fingers outstretched and palm facing up) so I put it in brown [like the colour of a bear]. *Explains to me in Visit 2*

Both Ned and Joyce captured intensity and accentuation of the *Long* note of the 'b' pattern in Part 1 of the 'Lulu' song by making a sudden forward movement with their hands, fingers outstretched. In the next two excerpts from the second visit, Joyce uses words, hand gestures and lap-tapping to explain why she drew black Lou's in pairs:

It's because they go Lou Lou (she taps her knee and accentuates each Lou). They're sort of like hard (palms facing each other vertically) and then it goes soft again (she moves her palms farther apart). *Explains to me in Visit 2* These (she points to the first pair of black 'Lou's) are like you go a little darker than these <u>small</u> ones (she points to the Lou's preceding them that represent the 'a' pattern). *Later on during Visit 2*

In the next excerpt from the third visit, Joyce uses words, gestures and singing to respond to Nina's query about the 'Lou's in different sizes and colours:

Nina to Joyce: Why did you put the letters bigger here (Nina points to the last three 'Lou's) than here (she points to the first few 'Lou's)?

Joyce: 'cause these are <u>harder</u> (she points to the last three 'Lou's). Like these (she points to the first few 'Lou's again) are supposed to be <u>light</u> like *Lou*, *Lou* (she begins to sing 'a', but is interrupted by Nina) /

Nina: then Lou (Nina leans against the table with her knuckles) /

Joyce: Lou Lou [she refers to the 'c' pattern] like you hit your legs harder (...).

Joyce used the words "*small*", "*soft*" and "*light*" to describe the tricoloured 'lou's representing the ascending 'a' pattern. She used the words "*dark*" and "*hard*" to describe the *quickquick* part of the recurring 'b' patterns and the three final 'Lou's representing the 'c' pattern and embodied them by hitting her legs harder.

In this section, I demonstrated how children's use of gestures, words and singing to explain their notations reinforced aspects of their musical understandings, as reflected in the ways they represented the musical dimensions of the song on paper. As I illustrate in the next section, for some children, their notations revealed more about their musical understandings than they were aware of or verbalized.

Intuitive musical understandings

Bruner (1971) states that "young children are said to know things without being able to put what they know into words" (p.83). Indeed, musical understandings emerge long before children's ability to reproduce or represent it on paper. For example, children are able to sing and move to a song with attention to the musical dimensions of pitch, rhythm and phrasing before they are able to represent it on paper with the same level of musical understanding. Polanyi (1969) hypothesizes that "if all knowledge is fundamentally tacit, as if it rests on our subsidiary awareness [intuitive understandings] of particulars in terms of a comprehensive entity, then our knowledge may include far more that we can tell" (p. 133). In this section, I highlight the notations, words and gestures of several children to show that they not only know more than they can tell, they tell far less than they know. I found that some children revealed an aspect or aspects of their musical understanding in their notations that were neither apparent in their verbal explanations nor in their singing. Whereas for some children, the decision to use a certain symbol or colour was intentional (explicit knowing), for others the choice seemed random, suggesting that their understandings might have been intuitive, that is, they were not aware of what they knew (implicit knowing).

Consider 5-year-old Jasmine. Jasmine's notation reveals an awareness of the distinct musical functions of the circles and triangles. However, her verbal explanations for wanting to mix shapes in a single line offer no indication of this awareness. In the second visit, she explained that she drew circles in lines 1 and 3 and triangles in line 2 "because I didn't want to mix it." In the third visit, she explained to her classmate, "it's because this is the same part (points to lines 1 & 3) and this is not (points to line 2) so I put triangles." Although Jasmine did not draw triangles to represent the 'b' pattern in Part 2, she seemed to be aware of the discrepancy of having represented 'b' with triangles in Part 1 and circles in Part 2, as demonstrated by her remark upon completing the notation of Part 2 with my guidance. As we slowly sang Part 2 together, Jasmine added two circles for 'b' and two more circles, while constantly referring to the triangles in line 2. After drawing the last circle in line 3, she pointed to the fifth and sixth circles in line 3 that represented the 'b' pattern, and remarked, "This one has circles." Perhaps Jasmine had an intuitive sense in using circles in the last line of the song to suggest the forward-moving gesture towards the finish line. To be consistent, Jasmine would have had to write line 3 like this: $OOOO \underline{AA} \underline{AA}$ (where <u>A</u> indicates a triangle). When I asked her if she wanted to replace some of the circles with triangles she said "no." However, she drew a triangle to represent the last note of the song, which was consistent with her explanations for drawing it. In the next two excerpts, taken from the second and third visits, Jasmine explains why she completed her notation with a triangle:

I wanted it to be like that because there's no triangle here (she points to the circles in line 3). Explains to me in Visit 2

Because it's not the same as these ones (she points to the circles in line 3) so I put the triangle here. Explains to me towards the end of Visit 3

These explanations do not reflect her intuitive understandings. Her finger-tapping revealed that the triangles in line 2, as well as the fifth and sixth circles in line 3, represent the recurring 'b' patterns. When singing back the song, Jasmine tapped once on each of the two triangles representing each 'b' in line 2 and the two circles in line 3. In so doing,

she demonstrated an awareness that there are two underlying beats in each 'b' pattern: one for the *long* 'LU' and one for the two *quick* 'lu's. Like Jasmine, 5-year-old Joy showed an understanding for the underlying beat by establishing a 2:2:1 correspondence between her singing, fingerpointing and her circles for the *quickquick* {lu lu} of the 'b' pattern. That is, she sang lu lu (2) as she pointed twice (2) on one circle (1). Seven-year-old Wayne, like Jasmine and Joy, showed an awareness of the underlying beat by singing lu lu as he pointed once on each of the 'o's in the 'Loo's representing the *quickquick* part of 'b'.

Metric understanding is the term used to describe this aspect of children's rhythmic understandings. In Bamberger's notational studies since 1975, she found that children with music training tended to represent the underlying beat, while children with no music training were more concerned with establishing a 1:1 sound: symbol correspondence; in other words, they were more likely to show on paper the exact number of sounds that were made rather than the temporal relations between them. Bamberger used the term 'figural' understandings to distinguish from 'metric understanding'. Findings from this doctoral inquiry demonstrate that children with no music training as young as five years of age, including Jasmine and Joy, showed intuitive metric understandings through their fingerpointing.

The squiggly lines that Wayne placed under each 'Lo' suggest an intuitive understanding of the distinction between writing a musical sound on paper and writing a word. As illustrated in the next two data excerpts, Wayne had difficulty expressing the difference verbally but had no difficulty expressing the difference through his singing and gestures. When Wayne finished notating the song, I asked him about the squiggly lines under each 'Loo'. He offers this explanation:

Wayne: Like wiggly (he wiggles the fingers on his right hand which is parallel to the floor) like *Loo* (he moves his hand which is now perpendicular to the floor, while he sings a long *Loo*)

Deb: to show that it's a musical sound and not just a word.

Wayne: Yeah.

Explains to me in Visit 2

Alone with him at the end of the third visit, I again asked Wayne about the squiggly lines. This time he explains:

Wayne: When we hear it like very, - (he makes a fist, fingers facing up; purses/puckers his lips together) like it stands out, the Loo, so that's why I did a squiggly line.

Deb: Would you say because there's an accent/

Wayne: Yeah

Deb: And if you didn't have a line, what would it sound like?

Wayne: like a <u>word</u> (he shrugs his shoulders and moves his hands further apart on the table palms upwards) just a word, like 'Loo' (a short sound)

Deb: And this shows that /

Wayne: It sounds like Loo (he sings a long Loo as he raises his head and moves his left
arms outwards).Explains to me towards the end of Visit 3

These data excerpts illustrate the ways in which children's gestures, particularly their fingerpointing, revealed aspects of their understandings that were not evident in their notations or their verbal explanations. Gestures embody knowledge and embodied knowledge can reveal more than words can express or what is shown on paper/in writing. As McNeill (1992) states: "Gestures embody words and reveal thought in action" (p.2). In the next section, I examine the culturally informed aspects of the children's notations.

Culturally informed aspects of children's notations

The children's notations also revealed something about their appropriation of the cultural conventions of writing and other discursive practices. For example, the children's choice of drawing materials revealed something about the possible influences of a school culture that tends to encourage a playful attitude to learning at first, but then increasingly distinguishes between work and play, and right and wrong as children move up the grades with fewer opportunities for using coloured markers. With the exception of 5-year-old Colin, the kindergarten children chose the colour or colours they liked best: blue for Jasmine, pink for Joy and multicoloured shapes and patterns in the case of Al. In contrast, the older children used pencil only (Ned and Sue), markers only to colour-code one or more musical dimensions of the song (Wayne, Julie and Joyce), pencil and markers (Earl) and markers over pencil (Dan, Ruth and Karen). In a preliminary study of children's invented notations of a song (Carroll, 1995), I noted that all the 5-year-old children used coloured markers and all the 9-year-olds used pencil. Apart from being a systemic influence from the institution of schooling, the children's choice of pencil seemed to serve the purposes of modifying and "correcting" their notations to fit the song, as I illustrate in the case of 9-year-old Ruth. In the first excerpt from the second visit, Ruth explains why she erased some 'Lo's in line 1:

Ruth: It's like in the 'L's, it's like I'm doing all of my L's like that (she traces an L in the air with her right hand) but now it's like a 'lolo' (she traces l-o in the air with her right hand) but aha. I'm like (she makes a face as if she's disgusted) /

Deb: like you erased this one? (I point to the fifth 'Lo' in line 1) How come?

Ruth: That one? Oh it's because I did lolo because I missed one of <u>those</u> (she points to the first 'Lo' in line 1)

Deb: Oh I get it

Explains to me in Visit 2

Ruth wrote 'lolo' first in the place where the fifth 'Lo' now stands because she thought it was the *quickquick* part of 'b'. However, while singing the song up to there, she realized that it was the first note of 'b', which is *long*, so she erased 'lolo' and replaced it with a single 'Lo'. In this excerpt taken towards the end of the third visit, Ruth again refers to the fifth 'Lo' to explain why she first penciled the 'Lo's and then traced them with a blue marker:

Because if you use pencil and you did a mistake, like you put Lo Lo Lo Lo LoLo there (she points to the fifth 'Lo' in line 1 and grimaces), but you could erase it..... and then trace it back in marker because we know the letters so it's like easy.

Explains to me towards the end of Visit 3

Children's choice of notational symbols also revealed something about how they drew on the cultural conventions of writing from left to right. A noteworthy finding was the presence of the generic text 'Lu', or a different spelling of it, in the notation of only one kindergarten child, Colin, and in all of the children in grades 2 and 4. All the children, regardless of age or whether they used their paper horizontally or vertically, drew upon their developing writing and reading skills to articulate a sense of form by writing in lines from left to right. Al organized his shapes in lines "because in my class, I write it like that in lines." Colin wrote his 'L's in a straight line because "I always write my letters in a very straight line and when I'm finished I do the other line", as he pointed to an imaginary second line on his paper. Colin's explanation seems to suggest that he compared the notational task to a writing task. Indeed, his straight line of 'L's resembles a calligraphy exercise to practice the letter 'L'. Therefore, it would seem logical that the musical dimensions of the song are absent. In these excerpts from the second and third visits, Joy explains to me why she began drawing circles in the middle of the paper:

'Cause we start from there. It's like what I do. I start from there... to the next one. Visit 2

Because my sister a long time ago she asked to write on the lines, so I did it. She started it for me because it was a long times ago I was just 5 (she raises all five fingers of her left hand) but first it was crooked ... my name. *Visit 2*

'Cause this is the starting...because I always start from there.

Visit 3

Joy's account of the lessons learned from her older sister provides insight into her own explanations for why she drew circles in lines. As the next excerpt illustrates, she makes a direct reference to writing to explain why she began her notation where she did:

Because I usually start close to the side, because there's usually a margin right down here (with the side of both hands, she moves down the left edge of the page) and I usually go a few inches.... no a few centimeters after the line so I usually start right there (she points to the first 'Lou'). *Explains to me in Visit 2*

Nine-year-old Joyce also makes reference to reading to explain why she notated the song in lines:

Joyce: I just put it in lines "cause that's how people read. They read like this (she points her finger across line 1, then line 2 and then line 3).

Deb: Yeah. Reading music is just like reading/

Joyce: a book

Explains to me in Visit 2

Karen explains how her observations of the ways people modulate their voices when speaking help to inform her writing. When she completed her notation in the second visit, I commented on how clearly she represented the recurring 'a' and 'b' patterns. She replies:

Ah... NO!.... I kind of -, What do I do ? When I'm writing a story and someone says something really high-pitched, I always have an extra line and I always put it on top (she pretends to write on the table as she speaks). *Explains to me in Visit 2*

Karen's recent experience of informally learning to read music and play the recorder from her older sister might have accounted for her creation of a pseudo musical staff on which conventional music notation is usually written.

In the case of 7-year-old Jack, with whom I explored my data collection strategies, his choice of symbols might have been appropriated by what he was learning in school. I met Jack shortly before the Jewish festival of Passover, which celebrates the exodus of Jewish slaves from Egypt. Note the possible links between the Jewish people marching out of Egypt and his colour-coded stick men that represent the movement of the 'a' and 'b' patterns, and the coloured triangles – Jack called them pyramids - to represent the 'c' pattern. Figure 32 shows the notation that Jack created.



Figure 32. Jack's notation

Noteworthy was the appearance of squiggles in different forms in the notations of the three grade 2 children and two grade 4 children. Dan made three squiggly 'lu's to represent the last three notes of the song. Julie used squiggles to represent each sound unit of the song. Wayne underlined each of his 'Lou's with a squiggly line. While looking at the notations created by her students, Mary, the grade 2 teacher, made a connection between the children's use of squiggles and the way she taught them a song to the tune of "This land is your land" as part of a recent class project to celebrate Earth Day. She used hand gestures, notably squiggly movements to show it is a song. In the case of the two grade 4 children, Karen drew a continuous squiggly line (with arrows at regular intervals) above her 'lou's to show that they were connected and moving forward horizontally and vertically (up and down) in time and space. Ned's notation is in the form of a large oscillating wave of continuous 'lu's that reflects the melodic contour of the 'lulu' song as he explains it and as he sings it.

The predominance of squiggles in five of the children's notations is interesting in light of their historic significance as the earliest form of western notation for liturgical singing. Beginning in the ninth century and up until the thirteenth century, squiggles called neumes first appeared as freeform wavy lines above religious texts to guide the singers. Figure 33 provides an example of early neumes.

range Jo unuertree ra

Figure 33. *Example of early neumes* From *Wikipedia Free Encyclopedia*, http://en.wikipedia.org/wiki/Neume

The children's use of different shapes as notational devices also has historical significance. The shape-note system is a form of notation that has been used in the United States since the 1800's to facilitate sacred choral singing. It consists of using note-heads of various shapes that correspond to the different degrees of the scale. Shape-note singing is still used in some parts of the Appalachian mountains. Figure 34 provides an example of shape-note music.

S	CALE	• O : F ···	R TT 'T. '	RS	
Trable, Counter and Ter	lior.	EIGHT NOTES		' Order a	the Notes.
F lifth line	- <u>0</u>			-	
D fourth line C third fpace	-8	0			
B third line A fecand space	- <u>0</u> 0	0_mi0 law			
F first space	-200	0-:6l-0			-fol
	- L	uraciera to wit. O 🗖 🔿 I		- y-lav -b-	- 12w
	is mig the fquare is discound is low.	fare ; the round is (al ; so	the quarter of a		- fa v zú
and the state of the state of the state	and the second s	Gran and a second s			

Figure 34. A nineteenth-century tutor on shape-note music From the Larousse Encyclopedia of Music edited by G.Hindley, p. 437. Copyright 1971 by the Hamlyn Publishing Group Limited.

Self-revealing aspects of children's notations

For Bakhtin (1986), the writing of a text parallels the activity of human existence, which is the construction of an authoring self. He writes: "The text as a subjective reflection of the objective world; the text is an expression of consciousness, something that reflects" (p. 113). Bakhtin understood text, written and oral, in the broad sense: "If the word 'text' is understood in the broad sense – as any coherent complex of signs – then even the study of art (the study of music, the theory and history of fine arts) deals with texts (works of art)" (p.103). Taking a Bahktinian view, texts are conceived as utterances that are inherently unique, and socially, culturally and historically situated. Consequently, as Bakhtin argues, "the text can never be completely translated, for there is no potential single text of texts" (p. 106). Langer (1951), philosopher and theorist, contends that music, as a symbolic form, is unique because musical symbols are "unfinished", making it possible for individuals to project themselves in the music.

Findings from this study suggest that children's notations were self-revealing in several ways. Analysis provided insights not only into what they knew about the musical dimensions of the song, but also their experience of doing the task, their sense of agency and their aesthetic sensibilities. In the next section, I examine the children's choice of symbols, colours, their concern for aesthetics and quality of presentation.

Symbol choice

Colin's choice of 'L' was a practical one: "I was thinking about like Lu Lu and it always has an <u>L</u> in it, so I started to make L L L." In the cases of Al, Jasmine and Joy, there were aesthetic considerations. Jasmine did not want to mix circles with squares, although her explanations became increasingly song-specific. Joy chose to use a circle to represent the 'Lu' sounds "because at home I <u>always</u> use circles" and "because they're round and I like them" and "because it's like something like um...eyes." How interesting! I was struck by her wide round eyes and the fact that she herself said that what she liked about circles was their roundness and that they looked like eyes! Like Colin, Dan's choice of symbol was functional. He decided to use 'LU' "because of the U, the 'LU' sounds...it sounds like a 'U'....and uh, I decided to put a 'U'." Julie used squiggles "'cause I felt like it." She elaborated on her decision to use squiggles in the third visit: "Well I just put anything (she traces a squiggly line with her finger on the table) 'cause -, well dots would be faster but I just didn't think." When I asked Julie about the pink squiggle at the bottom of her first notation, she described the conversation she had with herself before finally deciding on using squiggles. She explains: I thought about doing dots, triangles, but then I'm like no because I didn't know what to do so I did it like -, (she distorts her face, shakes her head and moves her fingers in a squiggly fashion) so I tried to do that, so I said, 'OK I'll pick that'. *Explains to me in Visit 2*

Although her decision to use squiggles seemed somewhat arbitrary, I wondered whether the manner in which I explained the task might have influenced her choice of notational symbol. Specifically, I asked her to "write the song down so that a person who doesn't know the song can sing it just by looking at the marks on your paper to show the sounds of the song." I made a squiggly movement with my right hand while saying, "to show the sounds of the song." Karen chose 'Lou' to represent each sound unit because "I just thought that's how you write 'Lou'." For Karen, the issue was not what symbol to choose but how to spell the generic text 'LU'. Joyce chose to use 'Lou' "cause I think that's how my friend spelled it and her name is Loulou (as she pointed to the first two Lou's with her right hand palms up), so it goes with the song, so I just wrote L-o-u too."

Colour and aesthetics

Whereas some children, including Julie and Ruth, did not seem to be concerned with how their notations looked, but rather with how it functioned, others, including Dan, Karen, Ned and Joyce seemed to value the aesthetic nature of their invented notations. As for Al, he created an intricate colourful notational system that represented his own creativity, inventiveness and personal style rather than the song. He did this with a sense of purpose, even though his pattern drawing was not apparently related to the 'Lulu' song. The ways in which he explained his shapes provide insights into his preoccupation for pretty patterns. For example, after completing the black triangle in line 1, I asked him what he was doing: "*I'm making a pattern*" as he slid the end of the marker along the shapes he already drew. When I asked him to tell me something about the different shapes he made in the second visit, he pointed to the first two shapes in line 2, namely the blue triangle (T) and the penciled line (L) and explained that they belong with the red square (S) at the end of line 1. This Square-Triangle-Line pattern (S-T-L) recurs five times at the beginning of his notation:

And <u>that</u> one <u>that</u> one (he points to the blue triangle and the penciled line at the beginning of line 2), and <u>that</u> one (he points to the last red square in line 1) is going with <u>that</u> (he points again to the blue triangle and the penciled line), like I didn't have place to put <u>that</u> (he points again to the triangle and penciled line) there (he points to the end of line 1) 'cause I put it there (he points to line 2) *Explains to me in Visit 2* Joy chose a pink marker because pink is her favourite colour: "*I love pink*." Dan shrugged his shoulders when I asked him about his coloured 'Lu's and simply stated, "*I just wanted to make it colourful*." Ruth chose a blue marker because blue was her favourite colour. The clarity and conciseness of Ruth's notation, with a clear reference to the recurring 'b' patterns and the final note, was also reflected in her verbal explanations and hand gestures. For Julie, colour was about defining the two parts of the song. Dan, Karen and Ned showed concern for symmetrical balance as reflected by the way their notations were balanced from side to side and from top to bottom around the center of the drawing.

For example, a sense of symmetry is evident in Dan's notations. He used the entire paper space. Four lines of 'Lu's take up the top half of the paper, his signature design is in the bottom half and there area decorative designs in each of the four corners. Upon viewing Dan's notation, his teacher, Mary remarked: *"He is quite artistic and loves to have everything quite symmetrical, which shows in this."* Dan's sense of organization and diligence was also reflected in the cumulative manner in which he taught the song to Wilbur: section-by-section, then adding and combining the sections, or *"versions"* as he called them, until he learned to sing the whole song. His mother added another dimension to Dan's strong sense of agency and search for perfection. When I asked about her hopes for Dan, she said,

He already knows the path.... he knows that after elementary school, it's high school, then college, then University, so I don't even have to tell him nothing (she laughs). By having the two sisters, he just knows the path. *Conversation with Dan's mother, 29/4/03*

Dan's mother provided insight into the careful way in which he created his notations. When I described to her how Dan used pencil before markers, erased Wilbur's 'Lu's in line 2 to make them *"more spaced out"* and made changes to his notations even after the bell rang, she offered this response:

Dan's mother: It had to be neat and perfect.

Deb: Is that typical or is that what you see here?

Dan's mother: Yes, he's pretty good, but it's probably I've been after him, like, 'you're big enough, I don't want your stuff lying around everywhere, so pick up and ... otherwise, I'll end up having a messy house.' I decided... his room... he has to wipe the furniture. I am not going to do it (she laughs). And then I want him to be... not because he's a boy... he has to learn just like the sisters. He fixes the bed. I do help him but I want him to have the habit of waking up, you leave your room nice and clean and tidy. But he has his little manners too (?). There's no way he's going to walk out of the room if

the closet is open. The closet has to be closed. So, ok I know I'm...maybe... it's him too and me too, whatever.... I'm teaching him about being tidy and neat and whatever.... it's working. On Saturdays, I'm away in the morning and when I come home, it's done. 'I did clean my room' [Dan says]. So far, so good.

Dan's mother understood his approach to the notational task as an extension of how he was at home. In her view, Dan was this way because she was teaching him to be "neat and perfect." Like Dan, Karen was interested in the aesthetic form and musical function of her drawing, as reflected by the changes she made to ensure that the recurring 'a' and 'b' patterns looked exactly alike. She also did numerous touch-ups to the bottom parts of the 'Lou's in 'a' that she accidentally might have crossed out when drawing the black lines (of her musical staff). When I commented on her wanting to get it just perfect, she replied:

Well if it's not perfect it's not good enough...like my room, it's not perfect. I have to take out all the wallpaper and redo it because it's not nice.

Ned continually erased and re-spaced the 'lu' to create a balanced undulating line with two clearly defined peaks. He seemed to be more interested in matching the number of ascending and descending in each wave of 'lu's than with establishing a 1:1 correspondence between the 'lu's as he sang them and the 'lu's on the page. In the next excerpt, Ned explains why he erased the last 'lu's:

'Cause there was no more place for that one and that one (he points to the two small 'lu's before the last three bigger 'lu's) so I erased them (he points to last three 'lu's). I pushed them like more to there (he points to the end of the line) and I put them there (he points to the two small 'lu's)

Joyce spent much time explaining to me the rationale for her choice of colours by using words like pattern, decoration and fairness (e.g. giving colours equal rights, symmetry, balance). In the next two excerpts from the second and third visits, she explains to me that she originally intended to make the 'Lou's' tri-coloured - blue, red and brown - but it did not happen that way and so she decided to make a pattern anyway:

Yeah it's 'cause I got messed up-, I put it like that again (points to the second Lou which is in blue) like the last time. I just like figured out which colour...I looked at the blue (she mimes action of taking a blue marker that she pretends is in front of her), took it.... and then I do the 'o' (she pretends to draw an 'o') and I'm like Oops . So I wanted it to make it <u>fair</u>, so it'll look, like <u>this</u> (she points to the blue, red and brown Lou's in line 1) so I put red there, blue there (she points to the first Lou of b1 and b2 and to the first Lou
of Part 2) and then after I put <u>this</u> (she points to the two black 'Lou's at the beginning of line 2), and I kept on going. *Explains to me in Visit 2*

I decided to put it blue red and brown (she points to the first Lou) 'cause Lou.... and at the end you, - like the <u>u</u> pounces out at you, so, - but then I just like took the blue by accident I did the whole word (she points to the second Lou), so I decided to go on with that. *Explains to me in Visit 3*

In the next excerpt, Joyce explains to me why she placed each 'LOU' on a separate line:

Because um... because they would all go like Lou. OK? It'll just look like it's in a <u>straight</u> line like these (points with the side of her hand to the first three 'Lou's in lines 1, 2 & 3), but if it's slanted it looks more like a decoration and it's looks better, in my opinion (looks and smiles at me) Explains to me in Visit 2

Joyce seems to have a clear sense of what she finds appealing as reflected by her decision to position the last three 'Lou's in the way she did. Earl's drawing of a happy face in the upper left hand corner of his paper and Wayne's drawing of a *"teacher teaching the song"* might have revealed something about their experience of doing the notational task. Reflecting on Sue's grid-like notation, Bev, her teacher had this to say about Sue:

She's a very strong-willed person, very small, petite. Is she a perfectionist? I don't think so, the way she does her work and organizes her desk. For her it's more of a power struggle than on being accurate. *Conversation with Bev, 25/4/03*

Based on her teachers' comments about being strong-willed and in control, it seems that, for Sue, being fussy is more about being selective in what she takes from others. As her teacher stated, "For her, it's more of a power struggle than on being accurate."

Bev's observation resonates with my own, particularly in the manner in which Sue approached the task. Sue tended to be <u>in</u> control: she was self-regulated and very clear about what she knows and what she needs to know in order to continue the task, such as asking me what the starting note was or whether she should place the paper horizontally or vertically. She also was very clear on how she would represent the song and the materials she would need, namely a ruler to draw a graph, the only child to do so. Indeed, she was so intent on making a graph that she used the only ruler that she could find in the room, the blackboard yardstick. The use of the ruler to draw a graph resulted in a notational system that seemed to limit Sue's efforts to match the song, as she sang it, with her graphic representations of it. She also tended to <u>take control</u>, as manifested by the ways she sometimes interrupted me in mid-sentence or, without looking at me, asked a question or commented on something.

Quality of engagement

Most of the children were at ease with me and used me as a social resource to complete the notational task. Some children asked me to sing the song for them or with them in order to establish a 'sound' point of reference for notating the song. Others asked for help in completing their notations. The manner in which the children approached the task can be understood in the light of the school environment and the student-centred approach to teaching. Both Cedar and Victoria schools were like an extended family where everyone knew and cared about everyone else.

The children's sense of agency in their use of resources could also be understood against the backdrop of their previous musical experiences. The children's responses to my questions at the end of the third visit provided a glimpse into their music-related experiences with friends and at home with family. All the children talked about listening to music. Ruth loved to sing while listening to the radio or her CDs, which she made with her father from songs they downloaded from the internet. She explains:

Every day it's like: 'Daddy I'm going in my room (she looks up as if she is talking to her father) to listen to music...(in a sing-song voice). ... I have Laure, it's a French singer. Sometimes I listen to Avril Lavigne, and after it's like cassettes that I don't listen anymore I had when I was so small, like you know all those stories with the books? That's like most of the music I have. And sometimes I go in my dad's music and I pick some CD's and we make CD's by our own on the internet. We take, you know in the *journal*, when we take a page on every Sunday, we cut it out and there's all songs so we pick and we go on it, and if I don't like it [the song] we don't do it and if I like it we do it (laughs)... so we choose/

Some children spoke about making music. Jasmine played on her little piano for her baby twin brothers. Wayne organized music shows with his friends, which he describes in this excerpt:

We do it like put chairs and we get speakers and all that stuff. We invite persons... and we sing and we draw guitars on the cardboard things. Sometimes at the end we do a

surprise. We give out little numbers. Sometimes they win something or we do a fright house or something like that.

Sue loved watching the popular talent show *Starakadémie*, especially singing along with the 'stars' as she explains here:

I can repeat after them to help me. Like with the voice, when I hear a song that they're singing and that I like a lot, well I just repeat after them. I sing along.

Sue also sang in a trio with two girlfriends; one played the piano and the other played the drums. At her request, I listened to them play at lunchtime! Joyce played music with friends on real and 'home-made' instruments, including spoons and pots. She also sang karaoke in a neighbour's basement. In light of Joyce's musical experiences, it is understandable that as teacher, Joyce asked Nina to sing the song with her in the form of a canon, that is, "a round."

For some children, doing the task seemed to trigger associations to previous family or school experiences, awakening feelings of comfort, as in the case of 9-year-old Nancy, Karen's classmate, or sadness and longing as in the case of Joyce. For example, as Karen busily drew arrows on the squiggly lines above her 'Lou's, Nancy stared across the room, her left hand under her chin. She seemed to be thinking about something, as the next excerpt illustrates:

Nancy: I know what I should do when I'm writing my cat's lullaby.

Karen: Cat's lullaby?

Nancy: Yeah she sleeps on my bed, actually on my clothes. I made a nest with my clothes.

Karen: I have four cats (she takes the black marker and traces the arrows along the squiggly lines that move down wards towards the black 'Lou's)

Deb to Nancy: You said something about a cat lullaby?

Nancy: Uhuh. That's what I'm thinking about: Go to sleep, little cat.. With your <u>little fur</u> <u>coat</u> (she sings softly to the tune of Brahm's lullaby and pretends to write the lullaby on the table). Last night he slept in my bed and I covered him. I wrapped him up with the covers.

By showing an active interest in what Nancy was saying, I provided a space for her to express something of significance to her. This was also the case for Joyce, as I illustrate in the following narrative vignette from the conversation I had with her at the end of the third visit:

Shadow

"I made a song for my dog who died", Joyce said when I asked her if she liked to sing. She looked toward the window ledge where she left her pile of French books, got up from her chair that was placed next to mine at a low-lying table in the art room and went to the ledge. She returned to the table clutching a crumpled piece of lined paper. I continued to ask her some questions about her family, and at some point she uncrumpled the paper and began to tell me about the song she composed for her dog and that she felt sad every time she sang the song: "this song, cause I was dreaming, and I was playing the guitar, and I was singing this song. Wait! Let me just read it through my head." She reads it to herself and then out loud, while offering explanations about what she wrote: "I'm so sad that you're put down. But your friendship to me will be with me forever. I miss you [U] like that's just a word. I miss you and I hope you miss me, too, Shadow. That's my dog's name, Shadow- I think that's how you spell it. I don't know." I tell her there's a 'd' in the word shadow. She takes a marker and changes the t to d.

My empathic listening, which Lightfoot and Davis (1997) describe as the researcher's *voice as witness*, might have accounted for Nancy's expression of love and caring for her cat, and Joyce's poignant tribute to her dog.

Chapter summary

In this chapter, I discussed the children's use of resources as mediating tools to create a notational system to represent the 'Lulu' song and to teach the song to their classmate. I addressed the role of the social context in creating a *field of play* for the social construction of knowledge, particularly in the ways in which my utterances and those of their classmates served as mediators for generating new meanings for the child. I discussed the culturally informed and self-revealing aspects of the children's notations. I examined what the children's notations, and the processes by which they created them, revealed about their musical understandings and what they concealed. I also commented on the children's quality of engagement and the possible influencing factors in how they approached the task. In the final chapter, I address the implications of this doctoral inquiry for educational practice and research.

CHAPTER SIX

IMPLICATIONS AND REFLECTIVE UNDERSTANDINGS

Achieving the goal is the 'figure' of any activity, if you like, but its 'ground' is the development of, and expertise at, the learning process itself. As we learn what to do, so we change how we know, and how we come to know. (Claxton, 2002, p.21)

Significance of inquiry

My purpose in this inquiry was to examine the products and processes of children's invented notations of a song from a Vygotskian social constructivist perspective and in so doing, make a unique contribution to the research on children's written representations of music. By focusing on both the 'figure', namely the children's notations, and the 'ground', namely the children's use of personal, social and material resources to make sense of the multiple problem-solving challenges embedded in the task I presented to them, I attempted to create portraits of children's musical and metacognitive understandings. My roles as participant observer and facilitator allowed me to examine the different aspects of the children's understandings (either implicit or explicit) as revealed through their singing, fingerpointing, talking and invented notations. In some cases, words and gestures illuminated what was seen in their notations. In other cases, they revealed dimensions of children's musical understandings that were not seen in their notations.

As an art and act of discovery (Polya, 1971) and a "reflective and reconstructive activity" (Klein, 1999, p.57), problem-solving is a complex recursive activity that involves accessing and building on prior knowledge in imaginative and original ways. While I agree that one must have a sound image of a song in order to invent a written representation of it, I do not wholly agree with the Piagetian belief that invention is the inevitable result of having attained a prescribed level of development. Rather, it is in the ZPD, or *field of play* between one or more 'players' that one can "transcend one's solo limitations and expand the range of what one can learn and achieve. In the jointly constructed ZPD, one can engage productively with things that on one's own would have been beyond one's grasp" (Wells & Claxton, 2002, p.5).

This study revealed the critical role that the classmates played in enabling the children to modify their notations in ways they did not do alone or with me. For example,

when 7-year-old Dan sang the song back from his notation alone, together with Wilbur or while listening to Wilbur singing the song, it seemed that he became increasingly aware of the discrepancy between his singing and his notation. This awareness, or knowingin-action, led directly to notational changes, or indirectly via reflections-on-actions that were prompted by comments and questions from Wilbur or me. Dan's knowing-in-action is illustrated in the ways his notation evolved, from the original coloured representation as presented at the end of the second visit (Figure 35) to the modified version that he completed in the company of Wilbur in the third visit (Figure 36), to the more refined one he co-created with Wilbur (Figure 37).



Figure 35. Reproduction of Dan's notation at the end of Visit 2



at the end of Visit 3





Figure 37. Dan's notation he co-created with Wilbur

Seven-year-old Wayne did not make any changes to his notations with me in the second visit despite my efforts to get him to reflect on his [metric] representation of the quickquick part of 'b' as a single 'Loo'. However, prompted by Belinda's questions and suggestions, Wayne made six changes to his notation: he transformed 'Loo' to LoA to more clearly represent the quickquick part of 'b' and lengthened 'Loo' to 'Looo' to show that the first note of the recurring pattern was long. Wayne became increasingly animated and articulate in the company of Belinda, whose comments and suggestions helped him refine his notations in ways he did not do alone or with me. Indeed, he talked about time going faster in the third visit (e.g. "It went really fast") compared to the second visit which he described as "more quiet and more patient." Nine-year-old Karen's ongoing exchanges of ideas with Nancy, her classmate, prompted her to add an undulating line above the 'Lou's and black lines between them to make the notation more representative of the 'language' of music.

Findings from this inquiry showed that the very act of inventing a notational system to represent the 'Lulu' song and then teaching it to a classmate triggered a cyclical process of constructing, or *knowing-in-action*, evaluating, or *reflecting-on-action* and re-constructing, or *knowing-in-action*. These are cognitive processes that promote meta-cognitive understandings and enhance musical understandings. This study illustrated that teaching the song to a classmate was a learning experience for the children, as manifested by the qualitative differences between their use of resources in the second visit and the third visit. For Wayne and Belinda, Dan and Wilbur, Karen and Nancy, there was a blurring of the teacher and learner roles as both children learned from each other and became increasingly emotionally and intellectually invested in completing the task to the best of their ability. The dialogic process that unfolded led the children to a clearer understanding of what they knew and what needed to be done to refine their notations. What emerged were vivid examples of the social construction of knowledge.

By examining the processes by which children created their notations and taught the song to a classmate, I observed the enhanced quality of their engagement. The peerpeer situation seemed to be a motivating force for empowering and eliciting self-regulated learning and also for revealing facets of the children's personality that are not typically called upon in traditional classroom teaching practice, such as taking responsibility for and caring about their classmates' learning. This study supports the notion that dialogic discourse is a critical tool for the "actualizing of consciousness" (Bakhtin, 1986, p.110), Bakhtin contends that "to express oneself means to make oneself an object for another and for oneself" (p.110). As I explained in chapter 2, Bakhtin views language as the mediational means connecting the social and individual worlds, and like Vygotsky, values language, in all its forms, as the primary mediating tool for the development of a higher consciousness.

Based on the assumption that development occurs as children engage in activities that are socially and culturally situated and personally relevant, a number of researchers have adopted a Vygotskian sociocultural framework for their inquiry into children's mathematical problem-solving (Klein, 1999; Zack, 1994, 1995; Zack & Graves, 2001), children's multilingual literacy practices (Maguire, 1997; Maguire & Graves, 1997; Maguire et al, 2005) and child art (Golomb, 2002, 2004). However, there are no studies, to my knowledge, that have examined children's invented musical notations from a social constructivist Vygotskian perspective, specifically the ways in which children use their peers and teachers as social resources to make sense of the notational task. This doctoral

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inquiry shows the value of adopting a social constructivist perspective to paint a more detailed picture of children's musical and meta-cognitive understandings.

In the next section, I address the implications of my doctoral inquiry for educational and research practice as well as for adopting a social constructivist approach to teaching and researching.

Implications of this inquiry for educational practice

This study demonstrates that children without previous music training are able to notate a song on paper using invented notational systems. It shows that they use increasingly sophisticated representational strategies and that they will often refine their notation when singing back the song from their notation, explaining what they did or when prompted by an adult or a peer. As objects of discourse and reflection, children's invented musical notations (e.g. texts) can be powerful mediational tools for revealing what one knows but did not know one knew. Given opportunities to teach the song to a classmate, children are able to refine their notations and in the process improve their singing, pointing and verbal explanations in ways they would not have done without the social context. Therein, resides the value of knowledge-making, which as Bruner (1986) expresses so succinctly, lies not only in "getting it but in being able to carry it" (p. 86). The act of 'carrying it', or teaching the song to a classmate, can trigger a process of *knowing-in-action*. As Russell (1995) states: "Teaching and learning should be considered as two facets of the same experience" (p.210).

Findings from the present inquiry have important implications for the practice of music education. By using children's invented notations rather than their reproductions of formal symbols, educators might more effectively assess and nurture musical understandings. A better understanding of children's intuitive strategies for musical representation and can aid music educators in the development of more effective teaching strategies and curriculum planning for the development of musical literacy. Music educators might consider creating learning spaces, as I presented in this study, where children are given the opportunity to create their own notations, talk about what they did, and use their notations to teach the song to a classmate. In these ways, children's intuitive musical understandings are revealed and enhanced through collaborative problem-solving experiences, as this study showed. Not only do these notational challenges allow for genuine and meaningful experiences, they can also pique children's interest in learning traditional music notation and composing music, much like invented spelling has done

for young children's writing (Upitis 1992). Vygotsky (1978) notes that "teaching should be organized in such a way that reading and writing are necessary for something" (p.118). He argues that "the entire secret of teaching written language is to prepare and organize this natural transition appropriately. As soon as it is achieved, the child has mastered the principle of written language and then it remains only to perfect the method" (p. 118). Ferreiro and Teberosky (1982) point out that traditional instruction "ignores the natural progression" of how children learn to read and write by immediately introducing them to the "mysteries of the alphabetic code, believing the task to be easier if they are unveiled all at once. But doing so only contributes to the mystery" (p.279). Similarly, by imposing formal music notation on young children before they have the opportunity to learn from their own experiences of creating notational systems, music educators can turn them off to music forever.

In her examination of children's use of colour and shape as notational devices, Elkoshi (2004) concluded that music educators might consider using both colour and shape in the teaching of standard notation. Educators and researchers might minimize the standardizing, leveling influence of school culture by acknowledging and valuing children's artistry and creativity as they develop their technical skills. Interviewing children to find out how they make sense of their invented notations and then inviting them to explain their notations to each other can also be a powerful assessment and learning tool. This technique, however, is infrequently used. Teachers seem to be more concerned with the kind of information they should convey to their students than with listening to what the children have to say about their creations and how they convey their understandings to others. Several factors might explain why teachers do not foreground children's voices. These include the lack of time and space in the school curriculum and concerns about the "emotional' or 'suggestive' content of arts education that educators fear would lend itself to control problems" (Davidson, 2004, p. 209).

As with the other arts forms, music helps to access and energize the imagination, which in turn can lead to new and creative ways of listening, thinking and being. Campbell and Scott-Kassner (2006) argue that "the exercise of children's subjective, affective and divergent qualities can be greatly served through lessons in music and the arts" (p. 27). As Joyce's father succinctly stated, "*The arts help us to move beyond thinking in black and white*." The notion of music as "a self-creating force within the self" (Aigen, 1998, p.145) resonates with my strong belief that music matters. Bruner (1979) contends that knowledge is worth knowing if it satisfies two criteria: 1) it offers a "sense of delight"; and 2) it "bestows the gift of intellectual travel beyond the information

given, in the sense of containing within it the basis of generalization" (p.109). As an embodied source of knowing, music can offer a sense of delight and can bestow the gift of intellectual, physical, emotional and spiritual travel because of its ability to move us spontaneously and simultaneously on many levels in mind, body and spirit.

Indeed, the music notational task, which is a focus of this inquiry, can be seen as a model for educational practice and musical pedagogy - one that values an empathic regard, adopts a social constructivist approach to learning and honours the natural course of children's emergent literacies, particularly the range of arts-based literacy practices, such as singing, dancing, drawing, reading, pretend play and storytelling, that occur within the home and community. Educators and researchers alike might embrace a social constructivist theory of learning music where both social processes and individual meaning-making play critical roles. Adopting a social constructivist perspective would necessitate ongoing reflections not only on how best to encourage learning but also on how to avoid discouraging it (Klein, 1999). Specifically, several recommendations for pre-service teachers, classroom teachers and school music educators arise from this study.

Recommendations for pre-service teachers and classroom teachers

Adopt a social constructivist approach to teaching and learning

 Create opportunities for peer-peer interactions where collaboration is valued over competition, taking risks and experiencing 'Aha' moments is valued over doing it the 'correct' way, dialogue and debate is valued over defined role-relations and where disquieting students is valued more than quieting students

In his keynote address at the 2003 Quebec teacher's convention, Ralston Saul advised educators to spend more energy 'disquieting', or challenging their students instead of 'quieting' them, or making sure they are well behaved. Elliott (1995) emphasizes the role of teacher as "coach, advisor and informed critic, not teacher as proud mother, stern father or know-it-all big brother" (p. 234).

 Allow sufficient time for children to ask questions so they are as informed as they feel they need to be before and during a designated task. Encourage children to freely express their lack of understanding. Provide ample resources to enable children to complete the task to the best of their ability

Maximize children's natural interests in each other

- Create open and nurturing environments where children can listen, probe, reflect, show what they know in their own way and in their own time, and where they can validate each other's perspectives
- Encourage the children to move around and consult with each other
- Give children sufficient time on different occasions to develop, discuss and defend their problem-solving strategies
- Keep in mind that misunderstandings and mistakes create spaces for learning

Design innovative reading tasks that are relevant and engaging

 Based on the premise that reading must be purposeful and authentic, and that motivation to read is essential to learning, teachers might design tasks in which children create their own texts based on their own experiences, read their text to their classmates and explain what they did

Recommendations for school music educators

Adopt an embodied approach to teaching musical concepts and songs

Based on the assumption that musical meaning can be found in the human actions that produce sounds (Walker, 2000; Cox, 2001), children can more easily remember a musical concept or a song through embodied experiences. Therefore, music teachers might sensitize students to the dynamic qualities of the elements of sound (e.g. loud/soft, high/low, long/short) and music (e.g. rhythm, phrasing, form) through body movements. The children can use these musical resources to create their own notations, and in turn, understand and learn standard musical notation.

Children tend to learn a song in the manner in which it is presented to them. For example, when I taught the song in the first visit, I tapped the rhythm on my lap and accented the first note of each 'b' pattern and each of the three notes of 'c' by singing louder, moving my body forward and lowering my head. Some of the children appropriated my movements when teaching the song to their classmates; others spontaneously used terms such as 'jumping up and down', 'going upstairs' to describe the melodic contour of the song. These findings suggest that when teaching a song, educators might offer a variety of resources on which children can draw so they might become resourceful, self-regulated learners who can convey their understandings to others.

Design music notational tasks to enhance children's understandings of and sensitivity to music and its elements

- Invite children to create their own notations of a song they know, a song that is new to them, a tune they composed themselves or a 'sound play', like the one that I illustrated in the Prelude
- Ask children to interpret each other's notations, talk about them, analyze them, criticize them and teach them to their classmates
- Invite children to find ways of representing a song on paper using a variety of drawing tools (e.g. pencil, coloured markers), art materials (e.g. clay, stickers, ribbons) and food (e.g. raisins, lima beans)

Create a music-friendly environment in the classroom

- Provide opportunities at regular intervals for children to share musical experiences they have had at home, with a friend or at a concert
- Invite them to bring a favourite song or piece of music to class, sing it or play it (e.g. live or recorded) and talk about it.

Implications of this inquiry for research practice

Without external embodiment, an experience remains incomplete. It is no linguistic accident that "building", "construction", "work", designate both a process and its finished product." (Dewey, 1934, p. 51)

To better understand the nature of children's intuitive musical understandings and the social construction of knowledge, notational researchers must examine both the processes by which children represent music on paper and their finished products because, as Dewey suggests, they are one and the same. This inquiry is the first of its kind to adopt a Vygotskian social constructivist perspective to study children's notational products and how they use available resources to create their notational systems and then use their notations to teach the song to a classmate. More research is needed to shed further light on how children use their singing, speaking, gesturing and social resources to notate a song and teach it to a classmate. By adopting a social constructivist perspective with a focus on children's implicit knowledge and the external embodiment of their knowledge, the adult's or peer's guidance and the mutually reinforcing discourses of listening, speaking, reading and writing, notational researchers might obtain a complete portrait of children's musical and meta-cognitive understandings and the recursive process of their *reflections-on-actions* and *knowing-in-action*. Notational researchers might also consider the situational factors, as well as the broader social and cultural factors, that might influence the ways children approach a notational task. Similarly, neo-Vygotskian activity researchers might design music notational tasks, such as the one used in this inquiry, to examine the mediating role of children's singing, talking and gesturing in shaping their written representations of music, in addition to investigating the active role of the researcher/ teacher and fellow classmate in guiding the children's actions.

Possible directions for future research

Areas of interest for future research could include an examination of the situational, gender and socio-cultural factors of children's invented notations of a song, including the use of a generic text versus the song lyrics, the manner in which the song is taught, the notations created by girls versus boys, and the products and processes of children's invented musical notations from different cultures.

Situational factors: Previous and present research findings point to the possible constraining influences of using a generic text. Several children in this study questioned the use of 'lu', suggested another generic text (e.g. na, la) and/or expressed their difficulty in singing the song on a single sound, as was the case for Sue. She offered this remark at the beginning of the second visit when I asked her if she remembered the 'Lulu' song: "I have trouble singing out loud (rests head on left hand, elbows on the table). I am not really shy. Those notes I have trouble singing it out loud." I wondered whether her difficulty lay in remembering a song when it only has one word. I asked her if there were songs that she could easily sing it loud. She explains: It's like songs we hear in the dances... It's all different words.... If I don't remember one word, like I always think of the last note {word} and I always continue with that note." She seemed to imply that when each word is associated with a sound, that is, when there is a 1:1 word:sound correspondence, the words help to anchor the song and make it easier to remember the sequence of sounds, which create the melody. Words help to organize the sequential nature of a melody. They also define the boundary (acoustic shape) of each successive sound. Examining the use of words versus a generic text on children's notational systems might help researchers better understand the constraining or enabling influences of these two situational contexts.

This study also showed that the manner in which I taught the song seemed to influenced the children's ability to recall it, particularly in the ways I embodied the musical dimensions of the song, including the ascending 'a b' pattern, the accented first note of the recurring patterns and the last three long 'LU's. Another direction for future research could include an examination of the possible differences in children's notations of a song if the song were taught using body movements and/or rhythmic instruments compared to if the song were taught with the children seated and using head movements and clapping or lap-tapping, as in the case of my doctoral inquiry.

Gender factors: Although gender differences were not the focus of the present inquiry, I found that four of the seven boys in my study decorated their notations whereas none of the six girls did. Five-year-old Al created a decorative notational system consisting of many different shapes and shapes in the form of the shapes (e.g. circles in the forms of circles; short horizontal lines in the form of squares). Seven-year-old Dan and Wayne decorated the four corners of their page with coloured triangles (Dan) and musical notes (Wayne). In addition, Dan created, what I called, a "signature design" and Wayne drew a picture of a "teacher teaching a song" and a sun. Nine-year-old Earl drew musical notes and a happy face. Future notational research might investigate the possible influences of gender on the decorative aspects of children's invented notations.

Sociocultural factors: Examining children's invented musical notations from different cultures, including those in which children have ample access to paper, pencils and other drawing materials compared to those who do not, could be another area of investigation. Studies of this kind would be of particular interest in light of the fact that researchers of children's artwork have been carrying out cross-cultural studies for years in order to better understand the "universally innate biases and cultural influences" (Golomb, 2004, p. 355) of children's written symbolic representations. To my knowledge, there are no music notational studies that have examined children's invented musical notations from different social and cultural contexts. It might be interesting to consider the implications for sociocultural approaches to music with culturally diverse students. For example, had I done this study with culturally diverse songs, what kind of notational systems and explanations might have emerged? What resources would children use to teach familiar songs that are part of their social and cultural worlds, and how would they use these resources to teach the song to a classmate?

Chapter summary

In this chapter, I reflected on the significance of this inquiry. I highlighted the instrumental role played by the children's classmates in creating a ZPD, a *field of play*, in which the children modified their notations and refined their singing, explaining and gesturing in ways they did not do alone or with me. I addressed the need to adopt a social constructivist approach to teaching and researching in order to obtain a clearer picture of children's musical and meta-cognitive understandings. I listed recommendations for preservice teachers, classroom teachers and school music educators. Finally, I considered possible directions for future research including an examination of the situational and socio-cultural influences on children's invented notations. In the Postlude, I offer some reflections on the research process.

POSTLUDE

Reflections on the research process

As a "method of inquiry and documentation in the social sciences" (Lightfoot, 1997, p.3), portraiture emphasizes the ongoing dialectic between process (collecting and interpreting data) and product (the portrait), "analysis and narrative, description and interpretation" (p.12). In my doctoral inquiry, I paid attention to the "nuances and complexity of the aesthetic whole" (Lightfoot & Davis, 1997, p.7) not only in the manner in which I collected and interpreted data, but also in the ways I documented children's *knowing-in-action* through the analysis and interpretation of descriptive and narrative portraits of the children as they completed the notational task. In so doing, I aimed to achieve authenticity, which, according to Lightfoot and Davis, is "capturing the essence, and resonance of the actor's experiences and perspectives through the details of action and thought revealed in context" (p.12).

My challenge as researcher was not only to inform and inspire the readers with a "document that is both authentic, coded and colourful" (Lightfoot, 1997, p.243), but also to provide the research participants with a fun and challenging experience within their zone of proximal development. Lightfoot notes that there are "dual motivations guiding portraiture: to inform and inspire, to document and transform, to speak to the head and the heart" (p.243). I aimed to not only document the children's use of resources as they completed the notational task, but also to transform and enhance their musical understandings by creating opportunities for knowing-in-action. In line with neo-Vygotskian research (Lave & Wenger, 1991; Wertsch, 1985, 1991, 1998; Wertsch et al. 1995; Cole, 1995, 1999; Wells & Claxton, 2002), I recognize the importance of not only examining human action but also changing it, namely carrying out studies to provide opportunities for construction of knowledge. This approach to researching "mind-asaction" (Wertsch, 1998) is consistent with a key principle of my research methodology, which was to provide a *field of play*, a zone of proximal development, where children can construct meaning within the context of a goal-oriented socially-mediated activity. I was committed to designing an authentic problem-solving task that would be relevant as both an educational and research tool for facilitating meaningful learning experiences. Dewey's (1934) notion of experience as meaningful only if the practical, emotional and intellectual are interwoven, underscores the importance of emotion as the "moving and cementing force" of any meaning-making experience (p.42). I consider the main criterion for an aesthetic and emotionally satisfying experience to be the continuous movement between doing and receiving.

Music has a unique power to release the imagination and to reveal the unheard and unexpected. Bev, the grade 4 teacher, offered this spontaneous response to the children's invented notations: "*Wow, I'm so impressed. A different level of intellect!*" Indeed, the notational task I presented to children ages 5-9 with no previous music training, provided space for them to release their imagination and to show in their own unique ways what they knew about music as creators and problem-solvers, performers, critics, listeners and teachers. As performers, creators and problem-solvers, children used their singing to invent their notational systems to represent a song so that a child from a faraway country who did not know the song could sing it just by looking at the children's notations. As critics, children commented on their own notational symbols as well as on their classmate's singing. As listeners, children listened to their classmates' comments and questions about their notations and then acted upon them to refine their notations. As teachers, children were responsible for someone else's learning, and in so doing, not only revealed a wealth of intuitive musical understandings but also engaged in a dialogic process of *knowing-in-action*.

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APPENDIX A

ETHICS REVIEW CERTIFICATE

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MCGILL	UNIVERSITY
CERTIFICATE OF ETH FUNDED AND NON FUNDED	ICAL ACCEPTABILITY FOR FEB 13 2003 RESEARCH INVOLVING HUMANS INVESTIG
The Faculty of Education Ethics Review Committee co Nominating Committee, an appointed member from the Graduate Studies and Research) who is the Chair of t	Faculty of Education Paculty of Education substance of 6 members appointed by the Paculty of Education e community and the Associate Dean (Academic Programs- his Ethics Review Board.
The undersigned considered the application for certific Sounds and Symbols: An investigation of childr	cation of the ethical acceptability of the project entitled en's construction of meaning during a musical task
as proposed by:	
Applicant's Name DEBRA (DEBBIE) CARROLL	Supervisor's Name MARY MAGUIRE + JOAN RUSSE
Applicant's Signature/Date Dandy 19.2.03	Supervisor's Signature Wer Ance
Degree / Program / Course Ad Hoc Php/ (ulture +	Granting Agency
- Values	Grant Title (s)
The application is considered to be: A Full Review	An Expedited Review
A Renewal for an Approved Project	A Departmental Level Review
The review committee considers the research procedur application, to be acceptable on ethical grounds.	Signatize of Chair / Designate es and practices as explained by the applicant in this
1. Prof. René Turcotte — Penantment of Kinesiology and Physical Education Rene Fred Lo / 2003	4. Prof. Kevin McDonough Department of Integrated Studies in Education
Signature / date V / / / / / / / / / / / / / / / / / /	Signature / date
2. Prof. Ron Marris Department of Integrated Studies in Education Key Documents - Documents - Constants - Cons	5. Prof. Brian Alters Department of Integrated Studies in Education
Ngnature / date	Signature / date
J Prof. Ron Stringer Department of Educational and Counselling Psychology	6. Prof. Ada Sinacore Department of Educational and Counselling Psychology
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Ary H. Maguire Ph. D. hair of the Faculty of Education Ethics Review Committee ssociate Dean (Academic Programs, Graduate Studies and F aculty of Education, Room 230 ets. (514) 398-7039/398-2183 Fax; (514) 398-1527	research All All 14/03
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APPENDIX B

FORMAL REQUEST TO SCHOOL BOARD

Cover Letter

February 10, 2003

Dear Director of Educational Services,

I am a PhD student at McGill University and I am seeking the approval of your School Board's Research and Design committee to conduct a research project in your schools. This project will involve observing children as they carry out a creative musical task. I also intend to interview parents and classroom teachers. Attached you will find a summary of my research project and a copy of the informed consent forms.

I hope that this study will capture your interest and imagination. Please do not hesitate to contact me if you have any questions or desire further information.

Sincerely,

Debbie Carroll, PhD Candidate, Faculty of Education, Department of Integrated Studies in Education, McGill University

Tel.: (514) 273-0851 (home) E-mail: carroll.debbie @uqam.ca

Sounds and Symbols:

An investigation of children's construction of meaning during a music writing task

Debbie Carroll, PhD candidate, McGill University

PURPOSE: The purpose of my doctoral inquiry is to examine how children, in grades K, 2 and 4, make sense of a music writing task with the available *personal resources* (e.g. singing, writing, reading, speaking), material *resources* (e.g. paper, pencils, coloured markers) and *social resources* (e.g. guidance and support from myself as researcher). The task involves learning a song, writing it down on a piece on paper so that a child from a faraway country can sing it, then "reading" the song back their invented notations and finally explaining them to me (as researcher) and then to a classmate.

PARTICIPANTS: 15 children (5 children each from Grades K, 2 and 4), who have not been formally trained in standard music notation (e.g. no formal music education outside the school) and who attend multiculturally diverse schools, where English is the principal language of instruction (and at least the children's second language). I will also need the same number of children (their classmates) to whom the participants will explain their written notations of the song.

DATA COLLECTION PROCEDURES AND PROPOSED SCHEDULE: I will visit the children three times over the course of 4-5 weeks in February and March 2003:

VISIT 1: I will teach the song \rightarrow I will meet with the children in groups of 5, from each of the 3 class levels for 30 minutes.

VISIT 2 (one week later): I will ask each child to: 1) sing the song; 2) write it down on a piece of paper, using pencils and coloured markers, so that a child from a faraway country will be able to sing it; 3) pretend that s/he is that child from a faraway country and sing the song while "reading" back her/his notations; 4) explain her/his invented notations to me \rightarrow I will meet with each child individually for 20-30 minutes.

VISIT 3 (2 weeks later): Ask each child to explain her/his notations once again in order to evaluate the consistency of the verbal explanations with those made two weeks earlier. During this visit, I will ask each child to explain her/his drawings to a classmate. Finally, I will ask each child several questions about her/his experience, such as: What was it like for

you to create your own symbols to represent the song? What do you remember about doing it? What do you think you needed to know before you wrote the song? Is there anything you would like to change on your paper? \rightarrow *I will meet with each child for 30 minutes; her/his classmate will join us for part of this time.*

I will also interview parents and classroom teachers about their thoughts and feelings about music, how they value and see its role in their family and school. In so doing, I hope to better understand the possible sociocultural factors that impact on the children's making sense of the task.

I will videotape the encounters with the children, as well as the interviews with the parents and classroom teachers. The tapes and transcripts will be destroyed after my project is completed.

MY MOTIVATION FOR THIS STUDY: I am particularly interested in understanding the ways in which children use resources to give meaning to others. This is an area of inquiry that researchers of children's invented musical notations have not yet addressed. My guiding assumptions are that: 1) we have an inner drive to make sense of the world and to reach our potential; 2) music is intrinsically rewarding and has a "natural" appeal, and because music is part of being human, it can "move" us spontaneously and simultaneously on many levels ~mind, body and spirit; and 3) educators can help children become increasingly self-directed and autonomous in their paths of learning by listening to what they say, watching what they do, and providing them with a rich and resourceful learning environment, a *field of play*.

POTENTIAL BENEFITS FOR THE CHILDREN: Providing children with opportunities to engage in problem-solving tasks can help them become more aware of their inner resources and even inspire them to become more emotionally invested in their own learning. I anticipate that this research task will be novel, challenging and empowering for the children. There are no right or wrong answers, and the activity is rich in possibilities for making meaning through self-directed actions (e.g. singing, writing, reading, speaking) and socially-mediated activity (e.g. active listening, assistance and non-judgmental comments from the researcher). Specifically, it will provide an opportunity for children to use their singing to shape their written notations, and in so doing, become active agents of their own learning. Through their singing, children might *hear what they know*, for to sing is to make inner sound images audible. Through their writing, children might *see what they know*, for to write is to make thinking (or singing) visible.

RESEARCH DESIGN: I will use a multiple case study approach. This research design seems most appropriate for generating detailed descriptions of the moment-to moment actions of children as they make sense of a problem-solving musical task

POTENTIAL CONTRIBUTION TO THE FIELD: I expect that this inquiry will make an important contribution to the quest for an integrated picture of human cognition inspired by the arts. Whereas a growing body of researchers have examined the nature and developmental course of children's musical thinking through the "window" of their written representations of music, no studies, to my knowledge, have examined the interconnected aspects of children's construction of meaning, including self-regulation, interdependence of sounds (singing, speaking) and symbols (invented music notations), sociocultural influences and the researcher/child relationship.

APPENDIX C

SAMPLE OF LETTER AND CONSENT FORM

Letter to Parents Seeking Consent for Child's Participation in my Study

February, 2003

Dear Parents,

I am a PhD student at McGill University and I am seeking your approval to have your child participate in an educational research project that I am conducting in her/his school. The purpose of the study is to observe children in grades K, 2 & 4 as they carry out a musical task that involves singing and drawing. I expect that your child will enjoy doing this open-ended creative task, where there is no right or wrong answer.

As researcher/facilitator, I will meet with the children for 20 minutes each, three times over a period of 4-5 weeks. At the first meeting I will teach them a song. During the next meeting, I will observe each child individually as they carry out a task based on the song, and I will guide them in completing it, if necessary. During our third and final meeting, we will re-visit the task and I will ask each child some questions about their experiences of being involved in this project. All sessions will be videotaped.

What I learn from this study will be reported in my doctoral dissertation, at academic conferences and in educational journals. I expect that this inquiry will make an important contribution to the field of education by broadening our understanding of how children learn while they are involved in a creative arts-based activity.

In order to ensure your child's privacy and the strictest of confidentiality, pseudonyms will be used in place of the children's names and the name of the school in the written and oral reporting of this research. I will store the videotapes and transcripts in a secure place in my home.

I hope that this study will capture your attention and imagination. If you are interested in having your child participate in my study, please read the attached informed consent form, sign it and return it to your child's teacher as soon as possible. Your child may decline to participate at any time during the study. If you have any questions or desire further information, please do not hesitate to contact me.

Sincerely,

Debbie Carroll, PhD Candidate, Faculty of Education, Department of Integrated Studies in Education, McGill University Tel.: (514) 273-0851 (home)

E-mail: carroll.debbie@uqam.ca

Informed Consent Form for Child's Participation in my Study

This is to state that I agree to have my child ______ participate in the research project entitled, *Sounds and Symbols: An investigation of children's construction of meaning during a musical task*, and conducted by Debbie Carroll, PhD candidate, McGill University

- I understand the purpose, procedures and benefits of the study in which my child will participate
- I understand that my child can withdraw at any time from the study without any penalty or prejudice.
- I understand how confidentiality will be maintained during this research project.
- I understand the anticipated uses of data, especially with respect to publication, communication and dissemination of results.
- I give permission to have my child videotaped as s/he is carrying out the research task.

I have carefully studied the above and understand my child's participation in this agreement. I freely consent and voluntarily agree to have my child participate in this study.

Name of parent or guardian (please print)	
Signature	Date
APPENDIX D

VERBAL PROTOCOL FOR CHILDREN

Verbal Protocol for the Three Visits

VISIT 1: Teach Song to Children from Each of the 3 Grades (in Groups of 4)

I am going to teach you a song now. Next week I will come back and we will use this song to do something fun and different. You will be helping me to find out more about how people think and about what they know.

VISIT 2: Meet Each Child Individually

Kindergarten

- Do you remember the song we sang together last week?
 If they do not remember → I can start you off.
- 2. Here is a piece of paper, pencils and coloured markers. Use the pencils and markers and write down the song you just sang, in any way you want, so that someone who doesn't know the song can sing it, just by looking at your paper. That someone could be a person you know, or someone you don't know, like, say a girl (boy) from another school or another country. You can use any shapes you like to help that person sing the sounds of the song. You can use lines, circles, dots, whatever you want.
- 3. Now pretend you are that person; look at your paper and sing the song one more time.
- 4. Can you tell me about the symbols you created?

Note: I asked each child to 'write down the song' rather than 'notate' it, simply because I assumed that most children had not done this kind of task, namely, invent their own notations of a song, and therefore, would not be familiar with the word 'notate'. Furthermore, from my constructivist stance, children can only build on what they already know. However, I use the term 'music notational' task throughout the text to describe the nature of the task to the reader and to distinguish writing or composing music (e.g. a song) from notating music of a song they have learned the previous week.

Grades 2 & 4

Do you remember the song we sang together last week?
 If they do not remember → I can start you off.

- 2. Here is a sheet of paper, pencils and coloured markers. Write down the song you just sang, in any way you want so that someone who doesn't know the song can sing it, just by looking at the marks on your paper. The 'someone' could be a person you know or one you never met before, like, say a girl (boy) from another school or another country. You can use any marks you like to help that person (you are thinking about) sing the sounds of the song. You can use lines, circles, dots, whatever you want.
- 3. Now pretend you are that person. Sing the song again, this time as you sing back ("read") the symbols/notations on your paper.
- 4. Can you tell me about the symbols you created?

VISIT 3: Revisit Notations and Teach Song to Classmate

With classmate

- 1. Tell _____what you did with me last time we met. Explain your notation so they can know more about the song.
- 2. Pretend you are the teacher and teach the song to _____using your notation

With me

- 1. Can you tell me about the symbols you created?
- 2. How did you decide on this symbol system to represent the sounds in the song?
- 3. Is there anything you would like to change on your paper? OR If you could do it again would you do it differently?
- 4. Do you have any questions to ask me? Do you have any comments?
- 5. I am going to ask you a few questions

About their family: Do you have any brothers or sisters?

About their musical experiences at home, in school and in community:

- Do you listen to music at home? Where? Alone? With any other people?
- What kind of music/singers do you like to listen to? Do you like to sing?
- Do you play music? Can you tell me about any of your musical experiences?
- Do you belong to any choirs or music-making groups like a band?

Do you belong to any groups in the community (scouts, brownies, church group)?

APPENDIX E

COLOUR-CODED TRANSCRIPT EXCERPT

This excerpt appears at the beginning of chapter 3, page 59. It is taken from my third visit with 9-year-old Earl, who is trying to teach the 'Lulu' song to his classmate, Kim. While 'reading' Earl's notations as illustrated in Figure 5, chapter 1, Kim invents a melody. When she is finished, Earl imitates how she sang and asks her if she wants help. She tries singing the song but is unable to because there is not enough musical information about the song on the paper. I intervene and ask Earl a question:

	Earl: main the air with his pointer finger). (points to the fitst 2 Lo's).	rking each 'Lo' by pointing (points to the third Lo)
	Deb	
	Kim:	
	Earl: {Eureka moment}	
	Deb:	
	Earl: (pretends he's picking up a (points to the space above each Lo) Kim)	pencil).
	Deb: market	
	Earl: (as he takes a pencil and (he looks up at the notes he made in his first notation)	writes a music note).
		he draws a musical
note ea	ach time he says the word 'tune'.	

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