

## Circumscribing Tonality



Niklas Rudbäck

# Circumscribing Tonality

Upper Secondary  
Music Students Learning the  
Circle of Fifths

Academy of Music and Drama,  
Faculty of Fine, Applied, and Performing Arts,  
University of Gothenburg



## ABSTRACT

Title: Circumscribing Tonality: Upper Secondary Music Students Learning the Circle of Fifths

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The fundamental motivation for this research project is that listening is central to all musical activities, and that semiotic means for visualizing, representing, and conceptualizing music are central to educational endeavors aimed at developing trained listening. There is, however, a lack of research on how such semiotic means are taught and learned, especially in the aural skills and music theory subjects and in secondary education. Therefore, this thesis investigates upper secondary music students' processes of learning the circle of fifths and some associated music-theoretical concepts, and how those processes relate to the practice of aural skills and music theory education they are engaged in. I ask two research questions:

- 1 How do participants introduce, reproduce, and use the circle of fifths in the educational practice?
- 2 How do the specific ways in which the circle of fifths is introduced, reproduced, and used in the educational practice facilitate learning processes?

Theoretically, the study draws on Vygotsky's distinction between scientific and everyday concepts, and conceives of the circle of fifths as an inscription. The study takes a qualitative case study approach, combining interviews with students and observation of lessons, both documented by video. The analysis focuses on how participants interact, how they use inscriptions, and on how this constitutes co-constructive microgenetic processes.

The analysis shows an educational practice where the circle of fifths is deployed as a tool for solving transposing problems, and where the ability to use mnemonic techniques to reproduce the diagram is highly valued. This focus on mnemonics and algorithms for problem-solving tends to foreground the logic of the representations, rather than the logic being represented, which makes it difficult for students to apply the algorithms on different kinds of problems. For example, circumscribing a group of chords in the diagram is used to represent a key. This makes it difficult to distinguish major and minor keys, and to conceive of key as a property of melodies. The circle of fifths is used to visualize central concepts, which are then used to explicate the circle of fifths, creating a circular conceptual system. While some circularity may be unavoidable given the previous knowledge of the students, it is proposed that the circularity is exacerbated by a lack of musical examples and formal definitions.



*This work is dedicated to my mother,  
Marie-Anne "Lantan" Rudbäck,  
who was my first music teacher.  
Yippee-ti-oh-ti-ay.*

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Niklas Rudbäck  
Gothenburg, August 14 2020





# 1. Introduction

The image of the circle of fifths[...] simultaneously illustrates the fifth-relationship between the notes, the triads, and the keys. Each and every one who wishes to continue with practical studies in music theory and harmony should therefore securely imprint the image of the circle on the retina. (Bengtsson, 1964, p. 98)<sup>1</sup>

The quote above is from Ingmar Bengtsson's *Från visa till symfoni* (approximately: *From Tune to Symphony*), a classic Swedish popular introduction to music theory and music-listening, based on an educational radio series produced in the mid 1940's. I do not remember how, where, or when I was first introduced to the circle of fifths, but I remember that reading Bengtsson's book, in my late teens or early twenties, was when I first got excited about this little diagram. Bengtsson introduces the circle of fifths as "a magical circle" (Swedish: *En magisk cirkel*, p. 97), and to me it truly seemed that way. In a single visual representation, Bengtsson could show

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<sup>1</sup> Original quote: "Kvintcirkelbilden[...] åskådliggör i den här valda uppställningen på en gång kvintsläktskapen mellan tonerna, treklangerna och tonarterna. Var och en som vill fortsätta med praktiska studier i musikteori och harmonilära borde därför inpränta bilden av cirkeln så att den sitter säkert på näthinnan."

relationships between keys, between chords, and between notes within a chord, all at the same time. It seemed to frame (or circle, or circumscribe) a fearful symmetry in music itself.

This thesis is about students learning of, about, and with the circle of fifths in the context of aural skills and music theory education in upper secondary school. To the best of my knowledge, there are no other studies in music education that has focused on this diagram, although some have touched upon it in the pursuit of other research foci. This is a bit surprising, considering how widely used this diagram is. The circle of fifths is commonly found in music classrooms, in textbooks, and, not least, online. A Google search (July 15, 2020) for “circle of fifths” (in quotation marks) yields about 1,370,000 results, almost 500,000 videos and 43,000 books.

Nevertheless, this research project did not originate in an interest in the circle of fifths. Instead, it originated in an interest in aural skills, in Swedish *gehör* or *gehörslära*. I should note here that by these terms, I mean something distinct from the ability to play by ear. Here, I understand aural skills as a discipline, a subject, a body of knowledge and skills that is taught. Aural skills in this sense is about developing trained or professional listening. This includes, but is not limited to the ability to hear something *as* something, for example to hear a major chord *as* a major chord. In other words, there is a conceptual element to aural skills in this sense.

Already during my own training as a music teacher, I was frustrated by my own lack of understanding of how students learn aural skills in this sense, and of how it could be taught. This only got more pronounced while working as a music teacher, and especially while teaching the subject *Gehörs- och musiklära* (approximately Aural Skills and Music Theory, but music theory should be understood with a focus on basic terms, concepts, and symbol systems rather than major analytical systems such as schenkerian analysis or set theory), where this gap in my understanding could hardly be ignored.

The idea of connecting music-theoretical concepts, aural skills, and musical experiences is present in the Swedish National Agency for Education’s (*Skolverket*) course plan for *Gehörs- och musiklära 1* in upper secondary school (*Skolverket*, 2011). Firstly, in the name

of the subject, connecting aural skills (*gehör*) and music theory (*musiklära*). Secondly, in several of the learning aims connected to grading, e.g. for the grade E, the lowest passing grade: “The student makes simple evaluations of his/her own music-making using music-theoretical concepts”<sup>2</sup> (Skolverket, 2011, p. 8, *emph. omitted*, my translation from Swedish). And for grade C: “The student connects aural skills and music theory in their own music making[...]<sup>3</sup>” (Skolverket, 2011, pp. 8–9, *emph. omitted*, my translation from Swedish). The common denominator between my teacher (and student) experiences and the demands of the curriculum is the connection between practical music making, aural skills, and theory, and how that relates to evaluating and understanding one’s own musical practice as well as musical events and structures in general.

This study’s interest in the circle of fifths, and the music-theoretical concepts related to that diagram, is based on the assumption that learning music-theoretical concepts, models and ways of representing music is not an end in itself, but rather a means to develop one’s ways of relating to music, and ultimately one’s ways of listening. This means that despite the prevalence of listening and *gehör* in the discussion above (and also in the following), this thesis is not really about listening and *gehör* per se. Rather, it is about the conditions for developing *gehör*, understood as trained listening. Listening is central to all musical activities. In this sense, a desire to better understand trained listening is an important motivation for this study.

Based on my experiences as a teacher, I believe that a project providing some such clarification could be of use for both music teachers and music teacher students who want to develop their practice. As I will argue in the following chapter and in the upcoming section, such a project will also address some concrete gaps and contribute to ongoing discussions in the music education research community.

---

2 Original quote: “Eleven värderar med enkla omdömen sitt musicerande med hjälp av musikteoretiska begrepp”

3 Original quote: “I sitt musicerande kopplar eleven ihop gehör och musikteori[...]

I.1 CONCEPTUAL-SYMBOLIC KNOWLEDGE  
AND MUSIC EDUCATION

The interest in aural skills as trained listening above could easily be framed in terms of well-worn dichotomies in music education scholarship: formal and informal, theoretical and practical, tacit and explicit, knowing and doing, thinking and feeling, authentic and inauthentic, sound-before-sign or sign-before-sound. The list goes on. Indeed, when I first attempted to formulate my research problem, I did so in terms of students with informal music backgrounds, and an opposition between theoretical and practical knowledge. Such dichotomies are tempting, partly because they seem to capture real tensions in our conceptualizations of music as a field of knowledge, but also because they are connected to important ways in which we justify music education. I will briefly discuss one such strategy of justification which, if left unaddressed, risks undermining the relevance of a project such as the present thesis. Conversely, by addressing this issue, I believe I can further strengthen the case that studies like the present one are needed.

The inclusion of music, and art-subjects in general, in publicly funded educational endeavors is sometimes justified by music (and/or art) as a unique way of knowing. Musical knowledge and experience are presented as mysterious, tacit, ineffable, and only accessible through specifically musical forms of engagement. In this line of argument, the very act of questioning the importance of music shows that the questioners do not know what they are talking about, since the essence music cannot be verbalized. Fiske (2012) sums up this argument succinctly as “the tendency to cloak the meaning of musical understanding within a tautology, mystifying musical ability as something beyond the purview of the nonmusician” (p. 308–309). To paraphrase what Louis Armstrong allegedly said about Jazz: If you have to ask what music is, you’ll never know.

When this argument is put together with certain assumptions about young people’s artistic competence, the importance of the music teacher as a specialist is sometimes put into question. For example, Mellor (1999) compares generalist teachers’ and trained music teachers’ responses to children’s compositions, and argues that:

[...] a way forward for music teaching might be to step back from the model of the expert who perceives and values music in technical terms. Instead, we should take the lead from ‘novice’ music teachers who have retained their intuitive edge, as a means of recapturing and reinstating the feeling for the personal value of music and connecting more closely with young people. (p.147)

On this view, the ability to engage with music through a technical vocabulary dulls the “intuitive edge” which allows the non-specialist to engage with young people’s musical expressions on their own level. Implicit in this argument is a view of students as fully formed artists, who only need teachers to get out of their way in order to flourish. Similar assumptions are visible in an article by Stewart Rose and Countryman (2013), where they seek to problematize the (admittedly somewhat problematic) focus on “elements of music” in (American) official and hidden curricula. Their argument is wide ranging and I will not address all of it here, but focus on only some of the underlying assumptions. Stewart Rose and Countryman’s critique centers on what they call *academicking*,<sup>4</sup> i.e. how music teachers “make pedagogical decisions that morph a naturally holistic, non-linguaged content area into one that mimics pedagogies from ‘academic’ courses” (Stewart Rose & Countryman, 2013, p. 47). This leads to musical knowledge being presented as “atomistic, static and transmittable” (p. 47) despite students knowing that music is in fact “personal, emotional, physical, unnameable, complex, connected and enormously diverse” (p. 47). The ineffable—non-linguaged and unnameable—nature of music is taken for granted, and the consequences of this assumption are developed further in a note:

Given the non-linguaged nature of music, it is important to recognize the limits of using language to talk about it. Metaphors, terms and other representations created to assist with verbal communication can be helpful, but are limited to the people who share the constructed understandings of their use. (Stewart Rose & Countryman, 2013, p. 63, note 4)

---

4 Presumably a play on *musicking*.

In the context of a paper arguing that music educators should *not* teach elements of music (i.e. terms or concepts such as pitch, duration, timbre, melody, harmony, rhythm, etc.) this is an interesting statement. Stewart Rose and Countryman are admitting the usefulness of music terms, and that this is dependent on having been introduced to “the constructed understandings of their use”, i.e. on having been taught what they mean. But simultaneously, they are saying that we should not use basic music terms because people do not already know them (i.e. “share the constructed understandings of their use”). What remains for the music teacher to do is to affirm what students already know about music, “using *their* ‘elements’” (Stewart Rose & Countryman, 2013, p. 54, emphasis in the), and respecting their interpretative rights. Again, the underlying assumption is that the students already know everything they need to know, and the teachers’ job is to get (themselves and bothersome terminology) out of the way.

There is an important kernel of truth in the arguments such as Mellor’s (1999) and Stewart Rose and Countryman’s (2013), namely that it is important for teachers to meet the students where they are, to help them start from a foundation of what they already know. Perhaps equally important, the teacher can help the students become aware of how much they already know. But to imply that this should be the extent of the teacher’s involvement is to devalue the teacher’s expertise. In general, the teacher is more knowledgeable in the music domain than the students (although that may not be true when it comes to familiarity with specific genres, artists, or instruments). This is not only in the sense of being a more proficient musician and a more experienced listener, but also by virtue of having access to conceptual and representational means that make it easier to generalize competent musicianship across contexts, genres, instruments, etc. Such conceptual and representational means are part of what Nielsen (1998) called the *Scientia*-dimension of the music subject.

If the *Scientia*-dimension forms an important part of the music teacher’s musical competence, and if we can agree that in some sense part of the reason for letting students have music lessons with a music teacher is that they should benefit from taking part of that musical

competence, it seems downright counterproductive to banish the overt use of the *Scientia*-dimension of the teacher's subject matter knowledge in music-educational practice. As pointed out by Wallerstedt and Pramling (2015), this will only lead to the expectation that students pick up such knowledge without explicit instruction:

[...] the teacher does not listen to the recording in order to help the bassist know what to play; she already knows that the G chord in this genre means that bass may alter between the root and the fifth. Her previous conceptual knowledge in music theory serves as a mediating cultural tool (Vygotsky, 1997). In the teaching practice that is studied here, this kind of knowledge is seldom made explicit but rather it seems to be taken for granted that this is something that the pupils should pick up as they go along. However, even with increasing possibilities to use Internet sources to learn to play new songs (by using smartphones, for example) conceptual musical knowledge will still be important. (Wallerstedt & Pramling, 2015, p. 16)

As Nielsen (1998) points out, the *Scientia*-dimension of the music subject also plays an important part in how teachers plan their lessons and in how they motivate their choice of content to stakeholders (e.g. politicians, the public, school leaders, parents, and students). Hence, by robbing students of access to this aspect of musical knowledge, they are also robbed of avenues for influencing their own education. In the long run, this also makes music education advocacy difficult. Georgii-Hemming and Lilliedahl note that "the marginalization of aesthetic subjects may correlate with a difficulty and a reluctance to verbally describe the essence of music and thus specify the value of music education" (2014, p. 142, cf. the quote from Fiske above). If the general public does not have access a minimal shared language in which such arguments can be made, this avenue of music education advocacy is closed.

If one drops the assumption that music education is primarily about releasing latent creative abilities in young people, and instead assumes that musical competence is something that can be taught and learned (regardless of whether that happens inside or outside school), Mellor's (1999) and Stewart Rose and Countryman's (2013) arguments turn out to be based on a conflation of subject matter and didactic strategies. If trained music teachers' perception and valuation

of music in technical terms come in the way of connecting with their students' musical experiences, that need not mean that such understandings of music have no role to play in music education. It could just as well mean that the teachers need to do a better job at bridging the gap between their students' understanding of music and their own, for example by teaching the students some of those technical terms. Similarly, if music curricula focused on elements of music misrepresent the holistic nature of music and fail to connect to students' musical experiences, that need not mean that such basic concepts should not be taught. It could just as well mean that teachers need to do a better job teaching them in a nuanced and culturally sensitive way, including explaining their limitations when it comes to musics outside the narrow Western art music canon. Hence, these lines of argument seem to originate in both a lack of understanding of the role that conceptual and representational means can play in musical learning, and a lack of knowledge about how such means are taught and learned. This thesis could contribute to that body of knowledge.

## 1.2 A BRIEF INTRODUCTION TO THE CIRCLE OF FIFTHS

The circle of fifths (Swedish: *kvintcirkeln*) is a diagram showing the tonics of the twelve major or minor keys ordered a fifth apart along the periphery of a circle. Arranging them in a circle, rather than as a spiral or along a line, becomes possible within a tempered system and allowing for enharmonic equivalence at some point in the series, usually at F-sharp/G-flat. The entries in the diagram are usually read as representing keys or chords. It is common to combine major and minor keys/chords in the same diagram, with minor along the inner rim and major along the outer rim of the circle, so that relative keys/chords are opposite each other (Drabkin, 2001; "Kvintcirkel," 1977). This creates a symmetrical system, organized according to two intervals (the perfect fifth between adjacent positions along the periphery of the circle and the minor third along the center-periphery axes), which will yield the same structural relations to all other points



## I. INTRODUCTION

in the diagram regardless of which point one selects as one's reference point. This version of the circle of fifths, with major along the outer rim and corresponding minor relatives along the inner rim is the kind of circle of fifths that is used in the educational practice studied in this thesis, and is illustrated in Figure 1.

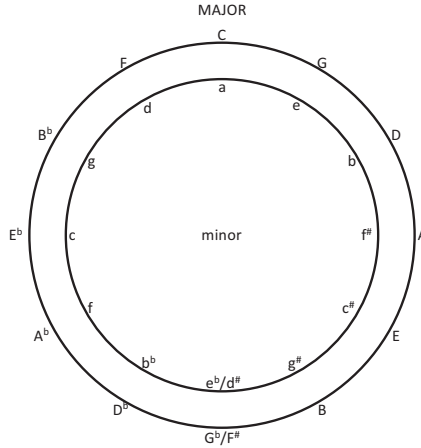


Figure 1: A circle of fifths. Major keys/chords along the outer rim of the circle, and their minor relatives along the inner rim. Circularity is achieved through the enharmonic equivalence of F-sharp/G-flat and their relatives at the bottom-most position.

It is worth noting in this context that the symmetry of the circle of fifths makes it possible to automate quite a lot of conceptual work by combining a circle of fifths and a rotating overlay. With such a simple computing device, akin to a slide rule though less complex (see Figure 2), one can, for example, get the roman numeral for the chords of each key, automate transposing, etc.

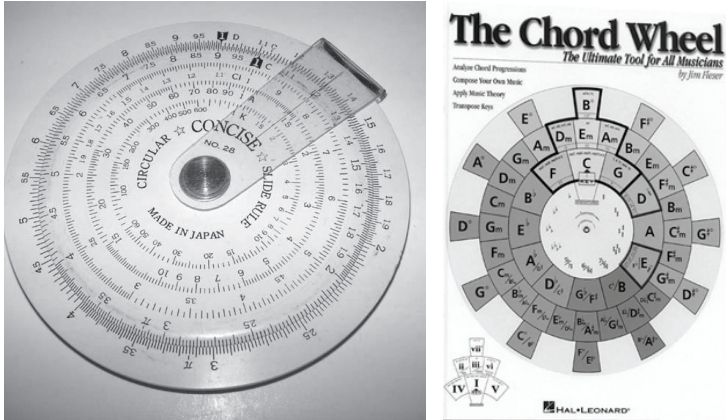


Figure 2: Left, circular slide rule. Right, the Chord Wheel™. The Chord Wheel (designed by Jim Fleser) is an expanded version of the circle of fifths with a transparent, rotating overlay which delimits the chords in a key and shows how they are related (using roman numerals/scale steps). (Slide rule image from Wikimedia commons, by user: Janke. Public domain. Chord Wheel image courtesy of www.chordwheel.com, used by permission.)

The diagram is believed to have originated in the early 18th century, when it appeared as a “musical circle” (*Musicalischer Circul*, c.f. Figure 3) in a figured bass manual by Johann David Heinichen (Barnett, 2002; Drabkin, 2001; “Kvintcirkel,” 1977; cf. Heinichen, 1711). Another circle of fifths seems to have been developed independently and earlier in Russia, although that version apparently went unnoticed (in the West) until the early 90’s (Jensen, 1992). As its origin in an instructional book shows, the circle of fifths has never been merely an abstract representation for music theorists, but also a pedagogical device (the history of music theory is rife with examples of practical and pedagogical innovations informing theory, see Wason, 2002). Barnett (2002) notes that Heinichen’s musical circle was part of a wider trend in music manuals of the time, which aimed to provide accompanists with tools for easily realizing figured bass in different keys.

The realization that a series of fifths will eventually generate all twelve pitch-classes has been around for a long time, although older tuning-systems resulted in a discrepancy between the first pitch (e.g. c) and the thirteenth (e.g. b-sharp), the so-called Pythagorean

comma. With the advent of tempered tuning systems, it became possible to avoid this problem. The diagram, or at least the way of thinking about music that it represents, developed in tandem with tempered tuning systems and the new demands they put on musicians, as an effective way to visualize the symmetry of all keys and to think about transposing.

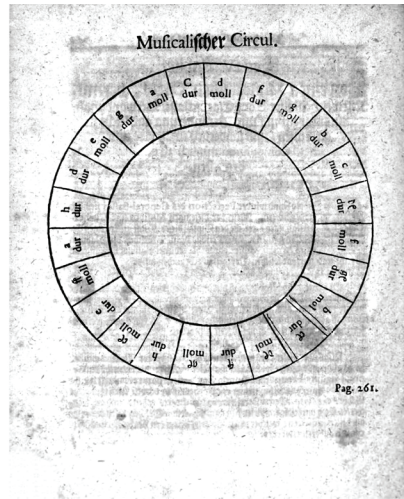


Figure 3: Johann David Heinichen's circle of fifths, or "musical circle" (reproduced from Heinichen, 1711, p. 261). This version of the circle of fifths alternated between major (German: *dur*) and minor (German: *moll*), and had ascending fifths counter-clockwise rather than clockwise as is standard today.

The cognitive economy of such a visuo-spatial representation is brought out clearly by Bharucha:

A single spatial representation such as a circle captures, all at once, the many pairwise relationships between the 12 possible major keys. Thus, instead of individually enumerating the relationship between all the keys (e.g., C is most closely related to G and F, less closely related to D and B-flat and so on, G is most closely related to D and C, less closely related to A and F, and so on, and so forth), a single diagram with the 12 keys labeled shows all the relationships simultaneously. The advantage is even more striking if minor keys are included. (Bharucha, 1994, p. 223)

Thus, in addition to communicating the symmetry of the system, the circle of fifths solves a problem with representing the system as a whole through verbal description. When it comes to complex, interrelated systems such as tonality, where every element is related to everything else, a verbal description is limited by its linearity, while a visual representation is not. It can show all relations (of a particular kind) in the system “all at once.” Bharucha is writing in the context of research on the perception of tonality, and is interested in the circle of fifths as a first approximation of how tonality is encoded in the brain. In other words, to the extent that tonality is assumed to be a psychological phenomenon (as opposed to, say, a physical or cultural one), the circle of fifths is taken to be a representation of tonal relationships.

But it is also possible to view the circle of fifths as a visual representation of conceptual relationships. Of course, the two are not mutually exclusive, given that the concepts and their relationship concern tonal phenomena. On this view, the spatial relationships between the symbols in the diagram have the potential to represent some of the relations of generality between specific named chords or keys, and concepts like *KEY*, *TONIC*, *SUBDOMINANT*, *DOMINANT*, and *RELATIVE*. The chord- or key symbols along the periphery of the circle, as well as spatial relations in the diagram can be interpreted as signifiers, assembled through social practices into a representation (Kress & van Leeuwen, 2008; Leijon & Lindstrand, 2012). In its physical form, on paper, on a whiteboard, on a screen, or as a tattoo, such a representation can be understood as an *inscription*, a concept that will be discussed more fully in Section 4.2.

### 1.3 SMALL GLOSSARY OF MUSIC-THEORETICAL TERMINOLOGY AND NOTES ON TRANSLATION

Mainly for the reader without a background in music or music education, this section will very briefly explain the music-theoretical concepts that are used most frequently in this thesis, or which are central to understanding the main points. I will also give the

corresponding concepts in Swedish, and discuss how I have translated concepts where there is not a one-to-one correspondence between Swedish and English terminology.

**CIRCLE OF FIFTHS:** is introduced in its own section above. In Swedish: *Kvintcirkel*.

**DOMINANT:** Abbreviated D (major) or d (minor). Can refer both to the pitch one (perfect) FIFTH above the TONIC of a KEY, or to the CHORD which has that pitch as its ROOT (e.g. in the key of C-major, g is the fifth to the tonic note c, and the chord G is the dominant chord). In the context studied in this thesis, using the word to refer to the chord (rather than the pitch) is by far the most common. In Swedish: *Dominant*.

**ENHARMONIC EQUIVALENCE:** In a tempered system, two notes with different names but the same pitch, for example f-sharp and g-flat.

**FUNCTION:** See FUNCTIONAL ANALYSIS, compare: TONIC, SUBDOMINANT, DOMINANT, RELATIVE. In Swedish: *Funktion*.

**FUNCTIONAL ANALYSIS:** A system for analyzing tonal harmony developed in the 19th century by Hugo Riemann, which is still widely used in German-speaking countries and in areas where German cultural influence was strong up until the first half of the 20th century, including Sweden. In functional analysis, CHORDS are named for their FUNCTION in a KEY. This makes it possible to generalize about harmonic relationships independently of particular keys. The system postulates three main functions, TONIC, SUBDOMINANT, and DOMINANT, whose paradigmatic examples are the triads built from the first, fourth, and fifth step of a diatonic scale, respectively. Other chords are viewed as standing in for, or versions of, these three main functions using terminology analogous to that used for RELATIVE KEYS in German and Swedish (*parallell*). In Swedish: *Funktionsanalys*.

**KEY:** Refers to the main set of pitches of which a piece of music makes use and implies a hierarchical relationship between them. For example, if you play *Twinkle Twinkle Little Star* starting on the note c, you will use a set of pitches from the key of C-major, which can be found in the C-major scale. But the KEY-concept also implies something more than which notes you use, it says that

there is a hierarchy between those notes, where the one the key is named after (e.g. c) is seen as the most stable, or most central, and that the other pitches in the key get their function in relation to this central pitch. This pitch is called the TONIC or KEYNOTE.

Compare also FUNCTIONAL ANALYSIS. In Swedish: *Tonart*.

KEYNOTE: An alternative term with the same meaning as TONIC (note). I have used it in this thesis when the participants use the Swedish terms *grundton* and *tonika*, which can be, but are not always synonymous, in the same episode. In these cases, I have consistently used KEYNOTE for *grundton*. In Swedish: *Grundton*.

OCTAVE EQUIVALENCE: The idea that two pitches, one or more perfect octaves apart, can be understood as in some sense the same. This is the basis of the western pitch-naming system where note-names repeat every octave. Two octave equivalent pitches are said to be in the same pitch class. In Swedish: *Oktavekvivalens*.

RELATIVE (KEY/CHORD): In English, the term relative is most often used about KEYS. A major and minor key whose scales share the same notes, for example C-major and A-minor, are named relative keys. The same word can also be used to denote the relation between the corresponding chords, e.g. C and Am, but it appears far more common to use the term submediant to denote chord a third below the tonic, and mediant to denote the chord a third above the tonic. I have opted for a somewhat unconventional use of “relative” to speak of both keys and chords, especially in Chapter 7, for two reasons: Since the participants in this thesis use functional analysis in Swedish, where the relation between relative keys and chords a third apart is denoted by the same word (*parallell*), and since the term relative can be applied not only to the relation between the tonic and its submediant/mediant. For example, in a major key and using Swedish function-terminology, the submediant (a minor third below the tonic) could be called *tonikaparallell*, the supertonic (a minor third below the subdominant) could be called *subdominantparallell*, and the mediant (a minor third below the dominant) could be called *dominantparallell*. In a minor key, the opposite would apply, so that the mediant (a minor third above the tonic) could be called *tonikaparallell*, the submediant (a minor third

above the subdominant) could be called *subdominantparallell*, and the subtonic (a minor third above the dominant) could be called *dominantparallell*. I will call these relative of the tonic, relative of the subdominant, and relative of the dominant, respectively, sometimes clarifying with “major” and “minor.” I am aware that some English-speakers working with functional analysis have adopted the German terminology and use “parallel,” but I have opted not to do the same because PARALLEL also has a different, more commonly adopted, meaning in English music terminology. I will, however, use the abbreviations P (major) and p (minor) in the data excerpts, since no one seems to use R and r this way. In Swedish: *Parallell*.

PARALLEL (KEY): In English, parallel keys are keys in major and minor with the same tonic note, e.g. C-major and C-minor. Compare notes on translation under RELATIVE. In Swedish: *Variant*.

SUBDOMINANT: Abbreviated S (major) or s (minor). Can refer both to the pitch one (perfect) fifth below the TONIC of a KEY, or to the chord which has that pitch as its root (e.g. in the key of C-major, f is a fifth below the tonic note c, and the chord F is the subdominant chord). In the context studied in this thesis, using the word to refer to the chord (rather than the pitch) is by far the most common. In Swedish: *Subdominant*.

TONIC: Abbreviated T (major) or t (minor). The central pitch of a KEY or the chord with that pitch as its root. Tonal melodies and chord progressions have a tendency to resolve on the tonic, or otherwise feel unfinished. For example, try playing *Twinkle Twinkle Little Star* starting and ending on c. Then try replacing the final note with any other note. You will likely hear the difference in sense of finality. In the context studied in this thesis, using the word to refer to the chord (rather than the pitch) is by far the most common. Compare KEYNOTE for some notes on translation. In Swedish: *Tonika*.

#### 1.4 GUIDANCE FOR READERS

In the next chapter, I will review previous research relating to musical understanding, concepts and representations, how concepts and representations are treated in (primarily) secondary schooling,

research on aural skills and music theory education, and research on learning to use music notation, graphs and diagrams. This will lead to the formulation of a research problem and research questions in Chapter 3. Chapter 4 constructs the theoretical framework for the research project. This chapter first considers the circle of fifths as an inscription, a representation, a concept, and a model, then expands upon some of these constructs, most notably *inscription* (Section 4.2) and *concept* (Section 4.3–4.5), the latter with a focus on Vygotsky’s theorizing on concept development. Chapter 4 also discusses tools and mediation (Section 4.6), development, learning, and instruction (Section 4.7–4.8), and a co-constructionist perspective on these issues (Section 4.9). The methodological and ethical considerations for the study are presented in Chapter 5, and Chapter 6 describes the methods used. In Chapter 6, the reader may also find transcription keys for the excerpts presented in the following chapter, see Figure 7 and Table 5.

Chapter 7 presents the analysis and results of the study. This chapter is divided into two main sections, Section 7.1 focuses on how the circle of fifths is introduced, remembered and reproduced, and Section 7.2 that focuses on how the circle of fifths is used. A list of all excerpts from the data material analyzed in Chapter 7, with page numbers, can be found in Appendix H (a list of figures and a list of tables can be found in Appendix I and Appendix J, respectively). Finally, Chapter 8 discusses the results based on the research questions (Section 8.2 and 8.3) and research problem (Section 8.4), in the light of an evaluation of methodological weaknesses (Section 8.1). It also tries to provide some empirically and theoretically grounded concepts that could guide the development of practice (Section 8.5), and suggest further research (Section 8.6). Chapter 9 contains an extended summary of the thesis in Swedish.



## 2. Previous Research

The three main motivations for this study are: (1) A need to better understand the processes of how musical concepts and abstract models of musical phenomena are learned. (2) A lack of research on the teaching and learning of such concepts and models in classroom settings, especially with adolescent students, and (3) a lack of research on the music theory and aural skills subjects, especially in upper secondary settings. This chapter is concerned with substantiating these claims and highlighting the research I seek to build on.

I will first consider more general challenges involved in understanding music, and how symbols, concepts, terminology, and graphic representations can help address those challenges. This will lead to a review of research on concepts, terminology and representations of music in secondary music classrooms, especially in the Scandinavian countries. After this there follows a more focused survey of the available research on aural skills and music theory education in upper secondary schooling. Most of the international music-educational research on visual representations of music has been concerned with different forms of conventional music notation, and I will only offer an overview of the most important debates in that area. Finally, I will consider research on visual representations

of abstract concepts from other subject domains (mostly STEM and telling time), and whether it is applicable in the domain of music theory pedagogy.

### 2.1 MUSIC PERCEPTION, COGNITION, AND MUSICAL UNDERSTANDING

Simply by being exposed to the music of our culture we develop very complex forms of musical understanding. The amount of complexity involved in making an auditory signal into something that is meaningful as music is staggering (Bigand & Poulin-Charronnat, 2006; Forde Thompson & Schellenberg, 2006; Jackendoff & Lerdahl, 2006; Schellenberg, Bigand, Poulin-Charronnat, Garnier, & Stevens, 2005). These complex constructive processes are easily taken for granted, since they are largely inaccessible to consciousness.

A parallel with language comprehension can be illustrative: In both language and music we hear a lot of things that go beyond the auditory signal. In language, it can be things like word boundaries and phonemes, or the impression that the word “music” said with and without a pipe in one’s mouth is still the same word. In music, it can be phrase segmentation, a metrical structure made up of stressed and unstressed beats, the sense of tension and release in a D<sup>4</sup>–<sup>5</sup>–T progression, or the impression that variations on a theme are actually variations on *the same* theme. In other words, music perception and musical understanding are constructive, a point repeatedly made by Jeanne Bamberger among others (Bamberger, 1995, 1996, 2006; Bamberger & Brody, 1984; Jackendoff, 2009; Jackendoff & Lerdahl, 2006; Lerdahl & Jackendoff, 1996; for a contrary position, see Clarke, 2005).

The point here is that music perception and the capacity for experiencing music *musically* are constructive and complex, even in people without much formal music training. That this constructive aspect of music perception and understanding cannot be taken for granted is clearly illustrated in cases when such construction breaks down. In *amusia*, a rare acquired or congenital condition, the capacity for perceiving music is impaired, roughly in parallel

to how language is impaired in *aphasia* (i.e. the sound is heard but not made sense of as music, Patel, 2003; Peretz & Hyde, 2003). The neurologist Oliver Sacks quotes a conversation with an amusic patient, who when asked what music sounds like to her gave the vivid description: “If you were in my kitchen and threw all the pots and pans on the floor, that’s what I hear!” (Sacks, 2008, p. 112).

Bigand and Poulin-Charronnat (2006) review several studies from their laboratory attempting to show that persons without formal music training are still “experienced listeners,” with capacities for musical understanding which are in many cases equal to those of persons with formal music training. These capacities include judging tension and relaxation in melodies and harmonic progressions (in a western tonal music idiom), anticipating changes in music based on subtle manipulations of underlying structural elements, and ascribing affective qualities to music. Bigand and Poulin-Charronnat point out that many of the studies showing big differences in musical understanding between musically trained and untrained persons rely on explicit use of specialized music terminology or use tasks that are very close to commonly taught strategies in specialized music education.

A core assumption of the authors is that there is an underlying musical capacity that can be experimentally separated from musical capacities that rely on specialized training. This assumption is problematic, not because it is necessarily wrong, but because the authors believe that the differences that do depend on training “might not be relevant to understand the true nature of musical competence” (Bigand & Poulin-Charronnat, 2006, p. 103). This entails that specialized musical training does not affect “true” musical competence, creating an artificial distinction between musical competence that is the result of mostly implicit learning (people are not born with an understanding of say, Western tonal music, or Javanese Gamelan), and musical competence that is the result of explicit music training. Nevertheless, the general results are in line with other sources of evidence. For example, Jeanne Bamberger (et occasional al.) shows in several studies how there are organizing constraints on aspects of musical understanding such as segmentation into phrases, or figural

and metrical “hearings” of simple rhythms. These arise seemingly without explicit instruction, in what she and Brody terms *instant perceptual problem-solving* (see especially Bamberger & Brody, 1984; but also Bamberger, 2006, 1995).<sup>5</sup>

Bamberger’s understanding of musical development stresses that it is not a question of going from, for example, concrete to abstract or whole to part, but rather one of expanding one’s repertoire of ways of hearing (and implicitly, mastering their application). In Bamberger’s (2006) view, different ways of hearing are dependent on different *organizing constraints* (e.g. figural and metric hearings of rhythms, cf. Bamberger, 1995), and musical development is driven by creative resolution of conflicting organizing constraints. In particular, Bamberger distinguishes between *situational* and *abstract* organizing constraints.

*Situational organizing constraints* make sense of musical events based on their embeddedness in specific musical contexts. Thus, an A-minor chord occurring in two different places in a piece may be experienced as different because it serves as the ultima in a deceptive cadence in one place, and in another place as part of a circle progression. Conversely, two different chords can be heard as the same if they serve a similar function in their respective contexts. *Abstract organizing constraints* instead serve to isolate and abstract properties of musical events from their immediate contextual embedding. According to Bamberger (2006), this process is dependent on perceiving events “in relation to a generalizable outside, fixed reference structure” (p. 72) such as a scale or a metrical structure. Bamberger views abstract organizing constraints as essential to the ability to refer to music: “Extracting properties from their context is necessary to giving them invariant names and reciprocally, the mental construction of fixed reference structures is necessary to understanding the referents of conventional symbols” (Bamberger, 2006, p. 72).

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5 Bamberger and Brody’s (1984) IPPS has much in common with the concepts of *Aktualgenese* and microgenesis (cf. Diriwächter, 2009; Valsiner & van der Veer, 2000; Wagoner, 2009), see especially Section 5.1.4.

This has interesting implications for what it is we talk about when we talk about music. Core concepts in music theory often refer to, or make use of, such reference structures, rather than phenomena that exist in the auditory signal, independently of a listener (cf. Section 4.5). However, we must simultaneously be aware of how a schooled understanding of music is shaped by concepts and symbols in music theory, and that our units of description do not always match unschooled units of perception or apprehension (Bamberger, 1996; Bamberger & Brody, 1984).

Since the publication of Lakoff and Johnson's *Metaphors We Live By* (2003, originally published in 1980), a large body of work which theorizes musical understanding in terms of conceptual metaphor has developed (see Zbikowski, 2008, for an overview). In some ways, this research spans the gap between work on unconscious and conscious, conceptual understandings of music. Plainly, metaphors abound in both formal and informal ways of talking about music (e.g. spatial metaphors for pitch, tactile metaphors for timbre). Conceptual metaphor theory offers an explanation for that, as well as a research program starting from such observations and connecting them to phenomenological, cognitive, and neuro-cognitive levels of analysis (see Lakoff & Johnson, 1999, for an outline of such a research program). Conceptual metaphor theory has been more influential in the philosophy, psychology, and cognitive neurosciences of music than in music education. Nevertheless, it has influenced studies focused on how teachers and students conceptualize and communicate about music (e.g. Antovic, 2009; Antovic, Bennett, & Turner, 2013; Davis, 2010; Jestley, 2011; Schippers, 2006; Wolfe, 2019; Woody, 2002).

While these studies serve a purpose in mapping metaphorical language in music education, they tend to be useful in furthering knowledge the development of musical understanding only to the extent that they do not rely on conceptual metaphor theory. There is, as Pramling (2006) points out, a circular argument lurking in the conceptual metaphor literature: "linguistic 'evidence'" is "being used to derive 'cognitive structures' (conceptual metaphors), which are then confirmed or verified by linguistic evidence" (p. 46). Since the

basic assumption of this theory is that (musical) understanding is fundamentally metaphorical, mapping of musical metaphors either confirms previously hypothesized metaphorical source domains, or discovers new ones which can be assimilated into the theory. The notion of “using” a metaphor also easily slides into a non-dynamic understanding of metaphor (Christensen & Wagoner, 2015). Their meanings are perceived as static, so that they can be retrieved from a person’s “metaphor storage” (p. 528) and used in a consistent manner. Mapping metaphors based on cognitive linguistic theory will therefore be difficult to combine with an interest in learning and development—they are already *fait accompli*.

Thus, from an educational perspective, the mapping of metaphors in use mainly gives some guidance as to which metaphors may be beneficial starting points in creating common ground for further learning. In order to understand the role of metaphorical language in developing musical understanding, one needs to study not only which metaphors are in use and how they are used, but also how usage changes. It might therefore be more interesting to ask how metaphors are introduced, and how they are (or are not) taken up by students as a means of organizing thought and learning, rather to use them as windows into what students (presumably) already know.

## 2.2 CONCEPTS, TERMINOLOGY, AND GRAPHIC REPRESENTATIONS OF MUSIC

The importance of concepts and terminology in music education, and especially in teaching/learning musical listening, has been recognized for a long time. During the early seventies, especially in America, attempts were made to develop quantifiable measures of elementary school childrens’ musical concepts (Andrews & Deihl, 1970), as well as high school students’ verbal descriptions of music (Zimmerman, 1971). This research was motivated in part by an increased curricular focus on music listening, musical elements, and the conceptualization thereof, which (in the American context, at least) was driven by Bruner’s spiral curriculum-model in *The Process*

of *Education* (Bruner, 1960; cf. Stewart Rose & Countryman, 2013; Tan, 2017). To Zimmerman (1971), measuring verbal descriptions of music was a way of indirectly measuring listening skills, but Zimmerman also considered language's role in structuring listening:

Since man has created a verbal world, it was suggested that many persons acquire the ability to think of music in verbal terms. Anyone who talks about music he has perceived[...] is demonstrating the apparent necessity of verbal skills to think about music and to communicate about it. (Zimmerman, 1971, p. 423)

Andrews and Deihl's (1970) test,<sup>6</sup> designed for elementary school children, as well as experiments with first grade children by Hair (1977) and with younger children by van Zee (1976), recognized that not all musical knowledge may be readily expressible in verbal language. Indeed, the children in van Zee's (1976) study were generally more successful in demonstrating their understanding of music terms (provided by the experimenter) on a simple keyboard instrument, than they were in applying those same terms to relevant music examples. In Hair's (1977) study, the children were generally more proficient in imitating a melodic contour, than they were at describing it orally in their own words, or in judging similarity between pairs of rising and falling melodic fragments in a written two-choice test. The children were also more successful in the written test than in the oral test. In the written test, the children were required to answer "yes" or "no" to whether two "groups of sounds[...] move in the same way" (Hair, 1977, p. 200). In the oral test, the children were asked in what direction "the sounds" move, but left to their own devices in coming up with a suitable answer.

It seems typical of several of these older studies that the findings are not put into a wider theoretical framework. Instead, the focus is on finding out how it is and what works, and to do so in

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6 Andrews and Deihl's test included written parts, but also manipulation of simple instruments and body movement to music (Andrews & Deihl, 1970).

ways that yield quantifiable results. Initial assumptions are treated more as common sense than as theoretically motivated, and there is little attention given to empirically capturing processes and mechanisms of development. An exception to this tendency is the work of Pflederer (e.g. 1964), which attempts to adapt Piagetian concepts, especially *conservation*, to musical development. Pflederer develops musical conservation tasks involving transformations of musical materials which she views as analogous to Piaget's tasks involving physical substances and shows an analogous age-dependent developmental sequence from non-conserving to conserving. As Hargreaves and North (2000) point out, however, Pflederer's conservation tasks differ crucially from Piaget's in that the children cannot observe the transformation, but only the end results. By using MIDI-based technology to address this issue, Hargreaves and North show that the age-dependent developmental sequence from non-conserving to conserving is not as clear cut as it appeared in earlier studies. They conclude that social and interpersonal context, as well as the specifics of how the task is arranged, need to be taken into account in research on stages of musical development.

Though working in the tradition of studies such as Hair's, Flowers (1983, 1984) makes reference to a wider body of literature on the influence of linguistic labels in perception and is interested in how instruction in vocabulary is related to changes in listening. In summing up work in the field of music description and vocabulary (much of it her own), Flowers (2002) points to some general conclusions. Among these are that vocabulary instruction in isolation from musical experience is ineffective, and also that responses in studies relying on open verbal replies from participants, especially with children, are not necessarily indicative of the participants' musical understanding—when asked to describe music, people will use words they know. However, while Flowers' work shows that vocabulary instruction in relation to music listening is more effective in making her participants more attentive to—or more likely to report—changes in music, the underlying mechanisms behind this effect remain largely unexplored. In my view, this is due to the mostly quantitative paradigm Flowers works within.



To answer the question of how knowledge of terms and symbols work to affect musical understanding, case studies of qualitative change are needed. But there is also a need to theorize the concept of listening and the potential didactical challenges involved in working with music as an art form. Some attempts at addressing these issues will be reviewed below, but these issues have also been touched upon in studies of invented notations.

In the late seventies, the study of invented or “spontaneous” notations emerged as a popular method for investigating musical perception and understanding. Prominent early examples include work by Bamberger, Davidson, Scripp, and Welsh. Most of this research concerns children in pre- and primary school ages; only rarely have youths and adults been studied using these methods. The early research on children’s invented notations also draws on Piaget. In the invented notation tradition, however, the inspiration is mainly drawn from Piaget and Inhelder’s studies of spatial reasoning. In both traditions, children’s drawings are analyzed based on the notion that children draw what they know rather than what they see (or in this case, hear).

Bamberger’s studies of children’s drawings of simple rhythms (Bamberger, 1995, 2013a, reporting studies originally conducted from the late seventies to the early nineties) resulted in her typology of figural and formal/metrical hearings. Studies by Davidson, Scripp, Welsh, and Meyaard also focused on representations of pitch and the interaction between invented and traditional notations (e.g. Davidson, Scripp, & Welsh, 1988; Scripp, Meyaard, & Davidson, 1988; see also Davidson & Scripp, 2001, which reports work originally done with additional collaborators in the 1980’s). As with Bamberger’s work, this research has resulted in descriptions of developmental trajectories, where children’s invented notations go from a focus on representing actions to representing musical events, and where the representation of those events go from figural to formal.

Commenting on this body of research, Barrett (2000) points out that children’s invented notations have sometimes too uncritically been conceived of as “windows” into children’s music cognition. When invented notations are viewed as windows through which

researchers can view a study participant's musical cognitions, it is easy to lose sight of the fact that representing music in a static and visual medium requires choices as to what to represent and how. Therefore, these studies tend to be most interesting when they do not stop at letting participants produce some kind of invented notation, but also use these notations in a further engagement with the participants. As will be discussed further in the theory and methodology chapters (Chapter 4 and 5), this means taking a developmental view of the research problem where developmental trajectories are not aggregate but based on qualitative change in individual cases (Wagoner, 2009).

An illustrative example of this is a study by Davidson, Scripp, and Welsh (1988). In this study, the authors conclude based on aggregate developmental trajectories from their study of invented notations of *Happy Birthday to You* that in the absence of specialized music training the complexity of invented notations seem to plateau around age seven. The most interesting result of the study, however, comes from letting children and youths with music training notate the song with an invented notation and with conventional music notation, and then letting them compare the two. By doing this, the authors can show: (1) That it was more common to make the error of letting the song start and end on the same pitch when notating it with conventional music notation—Davidson, Scripp, and Welsh call this a *concept-driven error* and hypothesize that it results from “knowing” that melodies start and end on the same pitch (compare children drawing what they know rather than what they see in Piaget and Inhelder's studies of spatial intelligence). (2) That when given the opportunity to compare their invented and conventional notations, participants who had committed this concept-driven error in their standard notations but not in their invented notations tended to “correct” the latter according to the former. That is, by involving the notations in a learning process Davidson, Scripp, and Welsh could show aspects of how perceptual or action knowledge and conceptual and semiotically mediated knowledge of music interact in musical development.

Similarly, one of Bamberger's (2013b) studies of a child building a familiar melody with Montessori bells and his attempts at notating this melody gains much of its strength from how the child's previous notations and the spatial arrangement of the bells are involved in the formulation of new problems. As mentioned above, Bamberger views the construction of fixed reference structures associated with abstract organizing constraints as vital to the ability to name and refer to music. This is ultimately because of the temporal nature of music, and lived experience more generally.

To Bamberger, the ability to represent music in words and symbols is dependent on using abstract organizing constraints "[...] to interrupt, selectively and purposefully, the natural passage of contiguous actions/events" (Bamberger, 2013b, p. 50). This means that:

[...]to construct a 'concept,' for instance, we must selectively interrupt the flow, the continuous succession of incoming sensory stimuli, to select, to pick out, and to recognize (by comparing backwards and forwards in time-space) a new succession made up of just those objects/events that are congruent with our current field of attention—all the 'middle C's' in a tune, all the numbers (selected out of the 'natural' sequential order) that are multiples of four, all the objects on my desk that I can use for writing. (Bamberger, 2013b, p. 50)

By using the notations not only as products of learning to be analyzed, but as tools by means of which new kinds of musical problems can be posed and solved, Bamberger manages to go beyond describing a notational development from instructions for actions to musical maps. While this developmental trajectory is important to the analysis, Bamberger also shows how this is mutually interdependent with changing conceptions of what kinds of entities the notations represent. The child in this study goes from conceiving of each bell in terms of its place in an action path (what Bamberger has called a situational organizing constraint elsewhere, see Section 2.1), to abstracting the property of pitch and generalizing in terms of that category in his notations.

As Wallerstedt (2010, 2011) points out, music education inevitably comes up against the problem of pointing to something invisible and transient. A lack of proper terms and concepts with

extension beyond the situation at hand can seriously hamper students' opportunities to engage in meaningful music-making (Ericsson & Lindgren, 2010; Mars, 2016a; Wallerstedt & Pramling, 2016). Bamberger (2006) highlights that naming musical elements and representing music graphically allows us to understand musical phenomena as both same and different simultaneously—the pitch-class *g* in a G-major chord is the same as the *g* in a C-minor chord, while at the same time filling a different function. In higher music education, Fanavoll Øye (2013) has proposed that the concepts of musical analysis could be used to bridge the subjects of musical performance and aural skills, viewing these concepts as scientific concepts in Vygotsky's sense. Drawing on Vygotsky, and socio-cultural theory, it seems clear that the differences documented in studies such as Hair's (1977) above, are explainable in terms of the differences in scaffolding (Wood, Bruner, & Ross, 1976) provided by the experimenter. That is, the experimenter helped mediate the children's listening, for example by providing relevant terms for the children, and reducing the complexity of the task from requiring open-ended answers to a structured two-choice question.

In research on aural-skills in higher music education, as well as in research on music listening in music education and music psychology more generally, there have been efforts to differentiate between more developed, conscious or active forms of listening, versus less developed, less conscious, and passive forms of listening (Lehmann, Sloboda, & Woody, 2007; Reitan, 2013; Wallerstedt, 2010, 2011). Reitan (2013) points out that a distinction between *hearing* as passive and *listening* as active goes back at least to Mursell's *Psychology of Music*, originally published in 1937. Bamberger (1995, 2006) develops a related concept in viewing the development of musical expertise in terms of the ability to choose between different "hearings" of the same piece. Yet another, similar distinction, made by Ilomäki, is between aural awareness, being the "ways wherein people aurally perceive, anticipate and remember music in connection to their musical activities" (Ilomäki, 2013, p. 118, note 1), and aural skills, being the formal discipline. This distinction makes aural awareness the broader ability that training in aural skills is supposed to further develop.

Lehmann et al. (2007), Reitan (2013), and Wallerstedt (2010, 2011) talk about professional listening, or professional ways of hearing, in Wallerstedt's case in parallel to Goodwin's concept of professional vision (Goodwin, 1994). In several studies of children in pre- and primary school, Wallerstedt and associates (Pramling & Wallerstedt, 2009; Wallerstedt, 2011, 2013; Wallerstedt & Pramling, 2012; Wallerstedt, Pramling, & Säljö, 2014, 2015) have applied a sociocultural perspective to listening in this sense. Drawing on Vygotsky (e.g. 1997a), *listening* is conceptualized as a higher mental function, and contrasted with *hearing*, which is viewed as a lower mental function. Listening, as a higher mental function, is tool-mediated hearing, and as such can be volitional as well as focused on particular aspects of the music. This distinction is only partially overlapping with Ilomäki's (2013): Both hearing and listening are part of aural awareness, but on the other hand, training in aural skills would seem to per definition be training in listening.

Understood as a tool mediated activity, the development of listening is dependent on adequate tools being introduced by social others, and on support in using and appropriating such tools. One major point of this work is that while the communicative tools that are used in developing listening skills in these studies are based in several different modalities, conceptual tools are exceedingly important in that they can mediate a transcendence of the situated activity in which they are introduced and used (Pramling & Wallerstedt, 2009; Wallerstedt, 2013; Wallerstedt & Pramling, 2012, p. 137; Wallerstedt, Pramling, et al., 2014). But since the focus in these studies is more on the development of *listening* than on the development of the *concepts* that mediate such listening, more work remains to be done.

Particularly close to the topic of this thesis is a study by Wallerstedt, Pramling, and Säljö (2014) where the authors describe a potential developmental trajectory of the ability to discern and account for differences in musical time, based on a qualitative cross-sectional analysis of interviews with 6- to 9-year-old students. Because of its relevance to this study, this article will receive a relatively thorough review here. The study relies on the aforementioned distinction

between hearing and listening, but also expands it to a distinction between, on the one hand, perceiving and discriminating between differences in music, versus, on the other hand, discerning and being able to account for such differences. Like listening, discernment is viewed as a higher mental function, mediated by the same communicative tools that allow the children to account for the differences being discerned. Hence, to Wallerstedt, Pramling, and Säljö, “[...] there is no point in distinguishing between what someone is able to discern and what he/she is able to account for” (Wallerstedt, Pramling, et al., 2014, p. 382).

The developmental trajectory the authors describe moves from not being able to notice a difference, via *perceiving* a difference without being able to account for it, through being able to account for it in *ad hoc* terms, to *discerning* a difference and being able to account for it in the relevant terms (in terms of time signature and beats to a bar in this case). This trajectory can be viewed as describing the development of a higher mental function, discernment, that is mediated by (among other things) scientific concepts in Vygotsky’s (2012) sense, although Wallerstedt, Pramling, and Säljö (2014) prefer the term institutional concepts. This very interesting study invites follow up for several reasons. There are two main methodological limitations that could be addressed:

Firstly, the developmental trajectory is based on a cross-sectional comparison of several children. While the trajectory is theoretically plausible, further studies—following development over longer stretches of time—are needed to ascertain whether any individual learner will actually follow it. Since the model presented in the study is explicitly not an age-based model (Wallerstedt, Pramling, et al., 2014, p. 369), this could conceivably be done with older participants, who would be more likely to tolerate longer periods of engagement.

Secondly, using older participants could also potentially address another methodological problem, which is how to get a good understanding of what the participants actually notice at the points in the trajectory where they are not yet verbalizing. There is a risk that the theoretical perspective employed in this study blinds us to the importance of this. While e.g. clapping and playing on drums

were possible means of expressing non-verbally mediated understanding in the interviews, with children this young it might be difficult to separate lack of the requisite motor skills from lack of understanding. A study with older participants, ideally participants who has some proficiency on a musical instrument, could allow us to better separate these factors.

There are also issues of interpretation and its relation to theory. The first step in the trajectory (not noticing any difference between two versions of the same song in different time signatures) is, in my opinion, not well substantiated. The child that is put forth as an exemplar of this step is quoted as saying about the two versions that “they sound *almost* the same” and “*rather* the same” (Wallerstedt, Pramling, et al., 2014, p. 373, Excerpt 1, turns 42 and 44, emphases added). With the caveat that I have not seen the original recordings, these qualifications, “almost” and “rather”, imply to me that the child may very well have noticed a difference. This problem of interpretation is exacerbated by the point made by Halldén, Haglund, and Strömdahl (2007), that deriving what a person does *not* know from this kind of study is problematic. Hence, the first step in the trajectory appears to be more theoretically than empirically justified.

The study is commendable in that it tries to open up the *processes* of appropriation for analysis. To me, this aim is pursued most fruitfully in the analysis of scaffolding in Olga’s interview. Here, the authors describe how the participants “talk themselves into a position that serves as a platform for continued scaffolding” (Wallerstedt, Pramling, et al., 2014, p. 380, cf. p. 382), by involving proto-tools—locally relevant expressions—introduced by the child as well as bodily performance of time. In this analysis, I would argue that it is possible to see the units that make up, and are transformed by entering into, the system of a higher mental function (cf. Toomela, 2010, 2015, 2016) making possible discernment of time in music. However, it seems to me that the full potential of this analysis is not realized, which has to do with the authors’ theoretical-methodological assumptions. In particular, by assuming that there is no reason to distinguish between what a person is able to account for (which is observable) and what they are able to

discern (which is only inferable), the authors close the lid on the black box of the appropriation process again (cf. Valsiner & van der Veer, 2000, pp. 416–418). This may be true when the mental function is already developed, but in studying the developmental process in which the semiotic tools used in accounting are learned and turned inwards, we can, and I would argue must, analytically separate the two.

Arguably though, there is a reason for this in the knowledge-interests of the sociocultural tradition in which the authors situate their work, where the main focus is on mediated activities and situated practices. If the listening skill is a higher mental function, and higher mental functions are understood as starting out as inter-mental (e.g. as a pedagogical conversation), it makes sense to understand the appropriation of the practice *as the practice turning into a skill*. What is missing from this analysis is the question of how the tools, when they are not ready-made artefacts (e.g. a drum) but signs (e.g. the term “musical time”), are reconstructed by the learner. I will return to similar problems in the next section (see also Section 4.6), when reviewing other studies drawing on sociocultural theory, for example those by Mars (2015, 2016a, 2016b).

### 2.3 CONCEPTS, TERMINOLOGY, AND REPRESENTATIONS OF MUSIC IN SECONDARY MUSIC CLASSROOMS

The recent music education literature on teaching and learning in secondary school or concerning adolescents, especially in the Swedish and Scandinavian contexts, has a strong focus on ensemble playing and other music-making in practice (e.g. Asp, 2015; Backman Bister, 2014; Edberg, 2013; Falthin, 2015; Wallerstedt & Hillman, 2015; Wallerstedt & Pramling, 2015; Zandén, 2010). Other prominent topics include problematizing the formal/informal divide and the movement from *school music* to *music in school* (Wallerstedt & Lindgren, 2016; Stålhammar, 2000; Georgii-Hemming & Westvall, 2010; on formal/informal, see discussion in Folkestad, 2006), and a focus on social, power, and identity issues, often in relation to the introduction of new forms of content and informal pedagogical



practices (e.g. Borgström Källén, 2014; Borgström Källén & Lindgren, 2017; Danielsson, 2012; Ericsson & Lindgren, 2010; Hentschel, 2017; Kvarnhall, 2015; Persson, 2019; Weider Ellefsen, 2014). Several studies cover all these fields at once to some extent. At least in the Swedish and Scandinavian contexts, this is consistent with a long-standing interest in identity issues and the tendency toward conceptualizing learning in terms of social practice, identified already (more than) ten years ago by Olsson (2005, 2008).

Regardless of the underlying reasons, the consequence is that issues of the teaching and learning concepts and terminology, and how representations of music are taught and learned, are rarely made the explicit focus of music education research on secondary schooling and adolescents. In the rest of this section, I will review research on musical teaching and learning in secondary education where such issues are in focus, or at least treated somewhat extensively in the pursuit of some other research problem.

In a recent review of the literature, Tan (2017) surveys research on concept teaching in instrumental ensembles in schools. Several of the studies reviewed are conducted at the secondary level. Tan concludes from his review that there is both theoretical and empirical support for the claims that concept teaching in instrumental ensembles leads to higher quality of musical output and to more transferrable musical skills and understanding. It is possible to see a gradually declining interest in concepts in music education research from a peak in the late 1960's and early 1970's, which is also visible in the reference list of Tan's review.

Tan's review mainly draws on American research, and hence focuses on *Band* as a subject or format of music education, which means the results are not always easily transferrable to a Swedish music education context. To an extent, however, the pedagogical challenges and implicit goals of Band are comparable to different forms of ensemble based music teaching practices common in Swedish secondary schools (cf. Skolverket, 2015, for the prevalence of ensemble-based teaching in Swedish compulsory schools). In particular, Tan (2017) argues that many high school band directors model their teaching practices more after professional conductors than after

teachers, resulting in the *teaching* of concepts being downplayed in comparison to the *application* of concepts in producing a passable musical product. This might be somewhat corroborated by Bononi's (2000) study of a chamber music quartet at the upper secondary (high school) level. These students transitioned from Band to more independent and student led forms of musical practice, and while they modeled their practice on previous band-practice, they showed great difficulty in explaining musical concepts. Bononi concludes that the students' previous band education had not provided them with the conceptual means to transfer between contexts.

In a Swedish music education context, the model is less frequently the orchestra and its professional conductor, and more frequently the garage band and its informal leader. However, several studies of Swedish music education practices at the secondary level suggest that there is a similar problematic at play (Ericsson & Lindgren, 2010; Lindgren & Ericsson, 2010). In the Swedish National Agency for Education's most recent evaluation of the music subject in Swedish compulsory schools (Skolverket, 2015) the authors see a tendency that music is increasingly taught as a practicing-subject (*övningsämne*, that is a subject where the main activity is practicing to reinforce different motor skills), where evaluatively listening to the sounding results is of secondary importance.

In Zandén's (2010) study of upper secondary music teachers' conceptions of quality in ensemble classes, teacher intervention is viewed as detrimental to quality and independence on part of the students is constructed as something to be displayed rather than learned. A lack of music-specific, genre-relevant professional language on part of the teachers, and an unwillingness to apply music-theoretical terminology is also noted. The result is a pedagogical (*didaktiskt*) ideal where teachers' knowledge of genre conventions forms important quality criteria, but is not to be stated explicitly. This view of teachers at upper secondary arts programs is somewhat contradicted by Nyberg's (2015) study of teachers' and students' conceptualizations of musical knowledge and learning. Perhaps because of the study's more long-term and participatory nature, and because of the study providing the kind of collegial

professional development environment Zandén (2010) is calling for, Nyberg (2015) is able to show the teachers' ability to shift between holistic and atomistic understandings of musical knowledge and their awareness of conflicting demands of authenticity and goal-attainment.

The upper secondary music students in Nyberg's study reported that they had never been asked to reflect on how they understood musical knowledge and learning. Nyberg notes, however, that this does not necessarily mean that they have not been asked to do so, it could be that they merely do not recognize it as such outside of the interview context. Nevertheless, Nyberg found that the students developed rich and nuanced conceptions of musical knowledge and learning in his group interviews, from which Nyberg synthesizes an understanding of musical knowledge as a combination of theory, practice, and emotion, summarized as *feeling* and *knowing*. What could possibly be drawn out from Nyberg's results is that upper secondary music education could benefit from increasing support for metacognitive aspects of musical knowledge. It should be noted as well, that although both Nyberg's study and my own concern upper secondary music students' conceptualizations—in a sense, metacognitive aspects of musical knowing and learning—the conceptualizations studied by Nyberg are on a more meta-level than the ones studied in this thesis.

Zimmerman Nilsson's (2009) study (to be discussed more in detail in Section 2.4) highlights how ensemble teachers in an upper secondary music program focus on craft-aspects of ensemble playing. But the teachers' interventions are frequently aimed toward getting a student's abilities up to the level where communal music-making is possible, but rarely have general extension beyond the situation at hand. The passable musical product is in focus.

Based on observing one music lesson per week in eight different lower secondary schools for about one semester, Ericsson and Lindgren (2010) argue that students do not gain access to the tools they need to work independently in small groups with creative music making and composing. When the students fail, the teacher intervenes to mask this by using his/her musical know-how to

essentially solve the problem for the students. As with Tan's (2017) conductor-teachers and Zimmerman Nilsson's (2009) ensemble teachers, the focus is on producing a passable musical product rather than on teaching the tools needed to do so. Ericsson and Lindgren (2010) observe that interpersonal issues and time management become primary concerns in student-led ensemble work, something that is also evident in Bononi's (2000) study of a more advanced ensemble at the upper secondary level.

Students' lack of tools for organizing independent music making is not the main focus of Ericsson and Lindgren's (2010) study, but is followed up in a more recent study of year nine ensemble practice in a Swedish school by Wallerstedt and Pramling (2016). This study focuses on problems encountered by 9th grade students who are divided into rock-band sized groups and supposed to learn to play a simple rock/pop song together. Much of the work in these groups is done independently while the teacher works with other groups. The most common problems concern coordinating the horizontal aspects of music (e.g. tempo, rhythm) and the vertical aspects of music (e.g. chords, arrangements). The authors single out two examples, one each from these most common problem-areas, for a deeper analysis. These analyses show, above all, the lack of appropriate conceptual tools in the studied practice:

Throughout the analysed episodes it is evident how the students struggle with problems that could fairly easy [sic] have been solved if they had had access to some basic music-cultural tools, such as 'bar' and some conceptual understanding of how chords are constructed (including minor and major chords, intervals and the name of notes). (Wallerstedt & Pramling, 2016, p. 394)

When the teacher intervenes, this is not done by providing such music-cultural tools, but by helping the students orient themselves in different notations, on different instruments, and in the sounding music using mainly deictic reference and other locally functioning communicative means. "Consequently," Wallerstedt and Pramling conclude, "the students are not introduced to, and supported in appropriating, cultural tools with an extension beyond the present situation and problem" (2016, p. 394).

Presumably, the teacher's ability to intervene in this manner is mediated by such conceptual tools, but much like with Tan's (2017) conductor-teachers, the application of the tools (in this case tacit) remains the teacher's business, not the students'. Backman Bister (2014) admirably shares a telling example of this from her own practice analyzed in her dissertation. She reflects on telling her students that they should play a D-major chord leading over to a refrain in G-major, and notes that by not telling them why it is that this works, they are not given the tools to independently solve a similar problem in the future.

Whether or not the reliance on locally functioning kinds of communication by music teachers in the context of ensemble-type activities in Swedish music classrooms is seen as problematic or not by music education researchers, seems to depend on the specific question being investigated and the theoretical perspective applied. For example, writing about multimodal communication in music-making in lower secondary music classrooms (i.e. a practice very similar to that investigated by Wallerstedt & Pramling, 2016), Falthin concludes that (verbal) language was not "central, or even necessary" (Falthin, 2015, p. 241, my translation from Swedish)<sup>7</sup> in order to convey and confirm musical knowledge.

On the other hand, Mars (in a compilation thesis, 2016a, where the articles 2015, and, 2016b, are of particular interest here) who investigates small-group composing and ensemble practice in lower secondary school, like Wallerstedt and Pramling (2016) taking a sociocultural perspective, shows a great interest in the role of writing and subject-adequate vocabulary. In Mars' (2016b) study, the lack of "a vocabulary to express musical thoughts and progression" (p. 13) became most apparent in peer-to-peer interactions. As in Wallerstedt and Pramling's (2016) study, students could often not define or solve musical problems on their own because they lacked the conceptual tools to do so. Mars (2016b) shows how this lack of vocabulary can sometimes be compensated for by the kind of

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7 Original quote: "centralt, eller ens nödvändigt".

non-verbal interaction that Falthin (2015) studies in more detail. Although Mars does not make the point explicitly, it becomes apparent from one of her examples that this kind of communication does not afford opportunities for students' conscious awareness of their own musical knowledge: When two students develop a specific rhythm and synchronize their rhythmic playing, both are unaware of how the process unfolded (see Mars, 2016b, p. 14, the episode with Isabell and Billie). Analyzed in terms of the theoretical framework to be developed in this thesis, this is because conscious awareness depends on semiotic mediation.

Unlike the teacher in Wallerstedt and Pramling's (2016) study, however, the teacher in Mars' (2015, 2016a) study *does* introduce a number of conceptual tools—most notably for the purposes of this thesis, the circle of fifths. The circle of fifths is introduced by the teacher as a framing device for a composing task in Mars' (2015) study, and her interest is in its function as tool to limit the choice of chords when coming up with chord sequences. Because of this focus, the article reveals very little about how the diagram is introduced, and to what extent its conceptual content is elaborated upon. It seems however, that proximity in the circle of fifths is used as a way to focus attention on whether chords sound “right” or “wrong” in context. Mars (2016b) also illustrates how students imitate the teacher's methods and use of tools such as notations when engaging in peer-to-peer teaching (similar applications of teachers' strategies have been noted by Bononi, 2000; Kullenberg, 2014), but notes that: “Although the students used the same tools as their music teacher, it was apparent that they did not understand why and how to use them to the same extent as their teacher” (Mars, 2016b, p. 20).

Backman Bister's (2014) study of music teachers' individually adapted teaching in whole class ensemble in secondary schools is based on and expands upon Hultberg's (2009) cultural-psychological model of musical learning. Like the sociocultural perspective of Wallerstedt and Pramling's (2016) and Mars' (2016a) studies, this theoretical framework puts tools in focus. Because of its focus on teacher-student interactions, however, the problem of students'

access to and ability to apply concepts and terminology in contexts where the teacher is absent becomes less salient in Backman Bister's (2014) study. Instead, the problem appears mainly in the guise of how teachers' different forms of adapted notations can be connected to forms of notation used in musical practices outside of the classroom.

Backman Bister notes that the teachers adapt notations to the individual levels of students by creating hybrids of music-cultural tools and educational-cultural tools. These locally working sign systems do important instructional work in that they scaffold the students' and teachers' ability to work on music-making in the classroom context. But they are also potentially problematic since what is learned in the school-context ends up being useable only in that context. As Wallerstedt and Pramling (2017) point out, widely used forms of notating popular music such as sheets with lyrics and chords are difficult to play from without an understanding of bars, meter, and periodicity. Backman Bister's (2014) contribution is interesting because it highlights how adapting music-cultural tools such as notations to make ensemble playing possible risks making the skills learned non-transferrable, but also how the teachers in her study have thought out strategies to bridge the gap between simplified, local forms of notation and more widely shared—and often less explicit—ways of representing music.

As can be seen from the above, recent research on concepts, terminology and representations of music in Swedish secondary classrooms has mostly conceptualized these in terms of tools. This research leaves a gap in our understanding of how these tools are taught and learned. Either because it concludes that they are actually not used, taught, or learned in the studied context, or because the conceptualization of these phenomena as tools leads to a focus on the use of tools, rather than the question of how students learn to use the tools in the first place, and in the case of psychological tools such as concepts, how the students reconstruct the tool itself.

For example, Mars (2015, 2016a) writes about the teacher *lending* tools to the students or students borrowing tools from the teacher, without opening up that process analytically and asking

what *borrowing* e.g. a concept from someone would entail. This lack of analysis of the mechanisms of—to use sociocultural parlance—appropriation is surprising in the light of Mars' (2016b) own observation (quoted above) that the students do not understand how and why to use the tools to the same degree that the teacher does.

Backman Bister (2014) also writes about borrowing knowledge in the context of the zone of proximal development, and the turn of phrase is important in Hultberg's (2009) theory, which Backman Bister is building her work on. In Hultberg's theory, the focus is on the learning that happens in the interaction between a learner/musician and musical works. That interaction is mediated by music-cultural tools, which thus play an important explanatory role in the theory. But the objective of the theory is not to explain how the learner/musician gains access to and learns how to use the music-cultural tools in the first place. Therefore, the tools can be treated as readily available in a cultural toolkit. When, as in Backman Bister's study, part of the problem-field is how learners go from not being able to use a tool to being able to use it, this conception of a shared cultural toolbox becomes problematic, which might be why Backman Bister primarily focuses on teachers' adaptations of tools rather than students' learning.

An exception to this tendency to blackbox the process by which musical concepts are learned in Swedish secondary music education is the work of Peter Falthin. In two articles (Falthin, 2011a, 2014), making up the empirical part of his licentiate thesis (Falthin, 2011b), Falthin explicitly sets out to study the conceptualization processes of a small group of upper secondary music students engaged in composing electro-acoustic music. Both in regards to its subject matter and its theoretical assumptions, Falthin's research is very closely related to the present thesis. Although Falthin's studies are partly classroom studies, in the sense that they take place in a school and partly consist of observations of classroom activities, these activities are to quote Falthin "a rigged setting" (2014, p. 147). They consist of a special task designed by the researcher to elicit access to the phenomena he intended to study. Therefore, Falthin's studies will receive further treatment in the upcoming section.



2.4 MUSIC THEORY AND AURAL SKILLS AS  
SUBJECTS IN MUSIC EDUCATION

In higher music education and the conservatory tradition, music theory and aural skills have often been taught together (Ilomäki, 2011). This is the case also in the Swedish upper secondary school curriculum, where Aural skills and music theory is taught as one subject. Although there are differences in naming, focus, and subdivisions (such as whether sight singing and dictation are considered separate subjects) between German-Scandinavian, Anglo-American, and Romance educational traditions, Ilomäki argues that the different traditions are united by “the idea, dating back to the establishment of nineteenth-century conservatories, that performing musicians need specific courses to develop their musical awareness and music literacy” (2011, p. 12).

While traditionally aural-skills training in higher education has been centered on dictation, sight-singing, and recognition tasks, both Herbst (1993) and Ilomäki (2011, almost two decades later) identify a growing trend of critique over the last four decades, based in constructivist perspectives on education and learning. This critique stresses the need to make aural-skills training congruent with current educational research, especially in regards to viewing knowledge as actively constructed rather than transferred from teacher to learner, and the importance of meaning and interpretation in that construction process. Another direction of change in aural-skills training in higher music education is a movement towards using more authentic music and a will to integrate aural skills more closely with musical performance (Fanavoll Øye, 2013; Ilomäki, 2011, 2013).

There are few studies on music theory and aural skills education at the secondary level, and even fewer from a Swedish context. I have only found two studies that actually give us a look at how teaching and learning happen inside secondary music theory and aural skills classrooms: One Swedish and one American. A partial exception to this is Peter Falthin’s licentiate thesis (2011b), mentioned above, which studies the course Arranging and Composition (*Arrangering och komposition*) in Swedish upper secondary school. In

the Swedish curriculum, this course falls under the umbrella subject Music Theory (*Musikteori*). While the practice studied by Falthin is different from most aural skills and music theory classrooms, I will include it in this section, since it focuses on conceptualization processes more than on artistic expression.

The only other Swedish research on this topic is Zimmerman Nilsson's (2009) dissertation on music teachers' choice of content in a Swedish upper secondary music program, where *Gehörs- och musicklära* (aural skills and music theory) was one of the subjects studied. The study is qualitative and limited in scope, and it is conducted before the most recent round of curricular reform in Sweden. Therefore, it should not be taken as representative of teaching in *Gehörs- och musicklära* generally in Sweden today. Nevertheless, at least in this study, it appears as if the effort of integrating musical performance and authentic music has not spread from tertiary to upper secondary education. Music was used in these lessons to exemplify the generalizability of music-theoretical concepts and rules, rather than to show how these rules and concepts may offer an enriched understanding of dimensions of music. This is reminiscent of Ilomäki's (2011) observation that the aural skills literature (on higher education) has tended to focus on reproductive tasks—identifying, reproducing, describing or analyzing given and preexisting music, rather than elaborating or engaging creatively with it.

Zimmerman Nilsson's (2009) study compares the subjects *Ensemble* (including choir) and *Gehörs- och musicklära*. One of her main results is that in the former subject, the form of the lesson tends to decide the content, while in the latter subject, content tends to decide the form of the lesson. In both cases, the focus is on technical aspects and on music as a craft. In music theory and aural skills:

The content gets the character of a toolbox where the teacher instructs the students on how to use the tool so that a 'correct' answer is produced. The relation between the specific tool and its use and musical dimensions is toned down in the lessons. (Zimmerman Nilsson, 2009, p. 118, my translation from Swedish)<sup>8</sup>

The content is treated as a self-contained system, and rarely connected to a larger musical whole, to the students' musical practice, or to artistic and aesthetic aspects of music.

Zimmerman Nilsson's thesis also contains variation-theoretical analyses of how different learning objects are constituted in the music theory and aural skills classroom, which clarifies what she means by content being treated as self-contained systems. Using Zimmerman Nilsson's analysis of a lesson sequence about the chromatic scale (2009, p. 120ff.) as an example: In this lesson sequence, the teacher varies the way in which the chromatic scale is represented and instantiated, but does not contrast the chromatic scale with other scales. Its distinctive feature of consisting only of semitone-steps is mentioned, but by not contrasting this feature with how other scales are constructed, the teacher misses the chance to make the structure of different scales a critical aspect. Because of this, the chromatic scale is presented bereft of a wider systematic framing, as a self-contained entity.

Reformulated in the theoretical terms of this thesis, the teacher does not provide superordinate concepts with which the students can conceive of the chromatic scale as a particular *type* of scale, whose abstract structure can be described using the same general terms as other scales. Compare Vygotsky's (2012) point about number systems: As long as there is just one system that a child can operate with (say the decimal system), that system is taken for granted and mathematical thought is in a sense caught within it. When the child learns another system (say, binary), and the superordinate concept "number systems", that provides the conditions for conscious awareness of the decimal system as well.

The aural skills and music theory teaching in Zimmerman Nilsson's (2009) study is characterized by the teacher demonstrating the correct solution of a problem, solving the task for the student.

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8 Original quote: "Innehållet får funktionen av att vara en verktygslåda där läraren instruerar eleverna att använda verktyget på ett sådant sätt att ett 'korrekt' svar levereras. Relationen mellan det enskilda verktyget och dess användning och musikaliska dimensioner är nedtonad i undervisningen."

The wider context of the problem-solving tools and techniques introduced in the lessons is not focused, nor the students' understanding of why tasks should be solved in this manner. The focus is on the application of prescribed rules rather than on understanding the tools in a way that allows their creative use in relation to musical content. Zimmerman Nilsson considers this to be potentially problematic for transfer to less pre-structured problems outside the lesson context.

In an American context, Buonviri and Paney (Buonviri, 2018; Buonviri & Paney, 2015) point out that there is a lack of research on music theory and aural skills education at the secondary (high school) level. Their judgement is the same as mine: most of the extant research has been conducted at the tertiary level. In order to address that lack, they have conducted studies of teachers' approaches to teaching melodic dictation in Advanced Placement<sup>9</sup> (AP) Music Theory in American high schools (Buonviri & Paney, 2015 (survey); Paney & Buonviri, 2014 (qualitative interviews)), and on technology use in the same subject, especially for aural skills training (Buonviri & Paney, 2020 (survey)). Their most relevant result to the topic of this thesis might be that the teachers generally stress the importance of training students in the use of (key-general) pitch naming systems highlighting tonal function, e.g. moveable *do* or scale degree numbers.

Some teachers' reasons for this are elaborated in Paney and Buonviri's (2014) report of interviews with twelve high school AP Music Theory teachers. In general, these teachers stress the importance of conceptually mediated listening strategies, although Paney and Buonviri do not theorize it in this way. The seven teachers who talked about the moveable *do* and scale degree approaches stressed

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9 Advanced placement subjects in American high schools offers instruction at an accelerated pace and often the opportunity to earn tertiary-level credits by passing a centralized advanced placement exam. Note that American high schools also offer "regular" music theory courses. Buonviri and Paney's (2015) choice to study AP-courses is based on them having more easily comparable curricula.

the importance of helping students listen for pitches' relation to the tonic, which they felt helped students apprehend the melody as a contextualized whole rather than as a sequence of isolated intervals. This observation is in line with Bamberger's (2006, discussed above) research on musical development, stressing the importance of reference structures. The teachers also held that using these kinds of pitch naming systems helped trigger previous theory knowledge, which in turn could help students anticipate standard forms, eliminate implausible transcription attempts, and in other ways check their own work. In this context, several teachers also stressed the importance of verbalizing observations about the melody.

In a later article, Buonviri (2018) takes more holistic view of the music theory subject in a case study of a highly successful AP Music Theory teacher and his lessons. The study can be understood as attempting to highlight good practices when teaching music theory and aural skills. The case was selected based on the teacher's good reputation and his students' good average scores on the centralized AP Music Theory exam. Buonviri followed two of this teacher's lessons per week for fourteen weeks, collected "instructional artefacts," and conducted interviews with the teacher.

Buonviri credits this teacher's successes to his work on the classroom atmosphere, his teaching strategies, and teaching to the test, both by letting the AP Music Theory exam inform his choice of content and by preparing the students for how the test is administered. The classroom atmosphere was characterized by effective pacing, student rapport, and avoiding lecture-type lessons, fostering an active, collaborative and open learning environment. The teacher's teaching strategies were highly tailored to the needs of individual students, both by working individually with each student and by selecting appropriate assignments for home- and group work. The teacher modelled effective thinking- and problem-solving strategies by means of series of questions (that is, a typical scaffolding strategy). He supported aural skills development by consistently playing through written assignments and using musical examples when introducing concepts. Buonviri also notes that the teacher addressed the problem of adapting to students' differing levels of

previous experience with the subject by giving enrolled students materials to study over the summer before the course starts.

On comparison with Zimmerman Nilsson's (2009) analysis, Buonviri (2018) is less concerned with whether the teaching connects in meaningful ways to students' musical practice or aesthetic dimensions of music. This is at least partly explicable by the authors taking their point of departure in different curricula or standards, but also by the authors asking different questions. Buonviri is interested in highlighting aspects of something that is predefined as a good practice, while Zimmerman Nilsson is agnostic on whether the teaching practices in her study are better or worse than anywhere else. Zimmerman Nilsson also has a theoretical perspective that allows her to consider learning opportunities from the learners' perspective, something that is mostly lacking in Buonviri's (and Paney's) studies, which in turn allows Zimmerman Nilsson to look more critically at the teaching practices she is studying.

As mentioned above, much of the research that touches on the subject of conceptualization in the music domain is performed either with children or college students as their studied populations. Studies involving adolescents are comparatively rare. A few studies touching on the topic of concepts in secondary music classrooms have been reviewed above in Section 2.3. Zimmerman Nilsson's (2009) thesis provides detailed examples of how concepts are presented in classroom interaction and provides a theoretically informed analysis capable of looking at learning. Zimmerman Nilsson's focus, however, is mainly on teacher's choices of and ways of presenting content, which means that the student's conceptualization processes are largely left unexplored.

Peter Falthin's (2011b, 2011a, 2014) studies of upper secondary students' conceptualization processes when working with electro-acoustic music and algorithmic composition are in some ways very close to the topic of this thesis, and I will therefore devote the rest of this section to Falthin's research. This is in order to draw on it, in order to illustrate how Falthin's research differs from the research reported here, and in order to clarify how this thesis illuminates similar questions from a different angle.

Falthin's research is not only similar to mine in regards to topic and setting, but also draws on much of the same theoretical ideas, most notably Vygotsky's concept development theory. But one of the main differences between Falthin's project and mine comes out in how Falthin deploys Vygotsky's theory in the context of his research:

Vygotskij's original theory of the concept development process is about language-based learning and the relation of thinking to language. In this context the theory is applied to musical thinking and learning, and hence, concern concepts *in* music as opposed to concepts *about* music. (Falthin, 2011b)

That is, Falthin is interested in attempting to transfer Vygotsky's concept development theory outside the domain of verbal language, to describe conceptualization processes in the musical domain. In contrast, the present research project is explicitly interested in models *of* and concepts *about* music. As will become more evident after Section 4.4–4.5, this distinction is not as stark as it might appear at first sight. Nevertheless, this difference in how Vygotsky's theory is deployed results in differences in the kinds of questions asked. Falthin's most overarching question is "How is meaning constructed in music-making and in the learning of music making?" (Falthin, 2011b, p. 18), implying a much stronger focus on musical meaning making in comparison with my research questions (compare Chapter 3 of the present thesis).

This focus on concepts *in* music also leads to differences in methodological choices. Falthin's (2011b, 2011a, 2014) research design utilizes not only previously unfamiliar abstract linguistic concepts, but also a musical genre and ways of working with music which are unfamiliar to the participants, because in order to study concept development, the concept in question needs to have some space to develop. In contrast, the research design in the present thesis relies heavily on the participants already having developed what Falthin might call concepts *in* music, and is focusing on if and how those are interacting with concepts *about* music in the concept development process. In this way, Falthin's research and the present thesis can be expected to provide complimentary accounts,

illuminating different aspects of the same kind of process. Given the similar theoretical assumptions as well as the similar contexts in which the studies are conducted, it would be even more interesting if contradictions emerge.

As mentioned above, the empirical part of Falthin's (2011b) licentiate thesis consists of two articles, one (Falthin, 2014) analyzing two upper secondary music students working with composing electro-acoustic music focusing especially on their use of additive synthesis, and the other (Falthin, 2011a) on (an unknown number of) students applying algorithmic composing methods. In both articles, Falthin analyzes the process in terms of Vygotsky's (2012) stages of concept development progressing from syncretic, via complexive, to pseudo-concepts and true concepts (compare Section 4.4 and 4.5 of the present thesis). In the 2014 article, where students use additive synthesis and compose electro-acoustic music using the resultant sounds, Falthin concludes that the syncretic phase passes quickly. He argues that the practical work with synthesizing sounds seems to have played a role in pushing the students' processes in a direction that bears similarities to Vygotsky's chain complexes: "At this point there were no overarching strategies or deep structures, and the materials and techniques were connected by peripheral features, or in the order the students apprehended the information" (Falthin, 2014, p. 155). In the 2011 article on algorithmic composition, Falthin attempts to trace the transition from associative to chain complexes more in detail, and argues that using familiar sounds to realize the results of the algorithms facilitated musical meaning making which in turn helped the students make sense of the results of tweaking the algorithms.

In common for these processes are the dependence on the perceptual field, and the concepts developing by generalizational processes working bottom up from perceived qualities. Interestingly for the purposes of this thesis, Falthin notes a parallel process in which the students "first acknowledged the concept as an assembly of information and developed an eventually conceptual understanding by recursive application" (2014, p. 155). This process, Falthin holds, resembles Vygotsky's scientific concepts. Unfortunately, this



observation is somewhat cryptic, and remains rather undeveloped in the article. Based on interviews performed toward the end of the project, Falthin concludes that the students are transitioning to the pseudo-concept stage, still a form of complex, but the one that according to Vygotsky (2012) forms the bridge between complexes and true concepts.

Both articles trace the concept development process to the pseudo-conceptual level. While Falthin argues—in my view correctly—that it is overly restrictive to constrict studies of concept development to the linguistic meta-representational level of verbal language, the question of why the studies do not document any true concepts in Vygotsky's sense is not addressed. It is a plausible hypothesis that the discursive logic that Vygotsky saw as central to the development of conscious conceptual thought is needed for the pseudo-concepts documented by Falthin to develop further into true concepts. As I will argue in Section 4.4, Vygotsky saw a theory of scientific concepts as a necessary complement to his concept development theory encompassing the stages from syncretic to true concepts, explaining the origin of hierarchically structured conceptual structure. Falthin attempts to transfer Vygotsky's stage theory to the musical domain without fully taking the theory of scientific concepts into account, and the present study—viewed as a study of scientific concepts in music—could complement Falthin's study in the same way.

## 2.5 CONVENTIONAL MUSIC NOTATIONS

Research in the use of graphic representations in music education tends to focus on different kinds of *music notation*, especially standard Western music notation. I have already reviewed some of the research on invented notations in Section 2.2, and here I will focus on enculturation into pre-existing symbol systems. Regarding standard Western music notation, there is a long history of studying the mechanics of sight reading in music psychology (Lehmann & Kopiez, 2016), and of studying learning of reading and writing music notation in both music psychology and music

education. Much of the debate in regards to learning music notation has been focused on the question of sign before sound or sound before sign, that is, whether learners should be introduced to musical practice through music notation, or to music notation through already developed musical competences. A consensus that the latter is the better option is emerging, while still warning against too orthodox interpretations of that principle (Lehmann et al., 2007; McPherson & Gabrielsson, 2002).

Blix (2012, 2015) argues that much of the (mainly cognitive-psychology inspired) research on learning to read and write music notation has been limited by an atomistic view of the sub-skills involved, and a focus on proficient musicians rather than beginners. Drawing on the literature on learning to read and write verbal language, Blix instead reconceptualizes proficiency in reading and writing music notation in terms of literacy. Literacy is not simply about decoding, but also has to do with how to orient oneself in a text, how to use it, and for what. Based on this theoretical understanding of music literacy and on studying young students in the first year of learning an instrument, Blix develops a taxonomy of strategies used by students in their interactions with written music. The taxonomy encompasses cognitive and memory-based strategies familiar from previous research, such as error detection and automating finger positions, but also social strategies such as asking for help, or support strategies such as looking at the teacher's hands or utilizing secondary notations.

In general, other types of music notation than standard Western music notation have received less attention from researchers. The topic of secondary notations is also investigated from a teacher's perspective in Backman Bister's dissertation (2014), discussed above. Backman Bister views such notations as combinations of music-cultural and educational-cultural tools, intended to facilitate music-making rather than the acquisition of music literacy in Blix's (2012, 2015) sense. Wallerstedt, Pramling, and Hillman (Wallerstedt & Hillman, 2015; Wallerstedt & Pramling, 2015) have studied students' use of internet resources in ensemble rehearsals, among other things notations consisting of lyrics with chord symbols. These studies show that due to the sparse content of such notations, teachers

often need to supply additional notational elements in order to help students make sense of the notations and coordinate playing. That is, the teachers did on an ad hoc basis what the teachers in Backman Bister's (2014) study did as part of their planning.

It is not without cause that e.g. Blix (2012, 2015) compares music and text literacy. The idea, in its most simplified form, is that notation is to music as text is to speech. Even despite the wider literacy-approach, what these studies of different kinds of music notation—standard Western music notation, invented notations, notations altered for pedagogical purposes, and lyrics with chord symbols—have in common is that they are about notation, which is intended to represent aspects of musical sounds in a way that lets users recreate sounding music with certain features. This raises some questions as to what degree the research on music notation is relevant in relation to other music-related graphic representations such as the circle of fifths. Being able to read the circle of fifths is not about decoding and reproducing what the circle of fifths sounds like; it is a visualization of conceptual relationships at a more abstract level of analysis. I am unaware of any research in music education that thoroughly addresses this kind of more abstract graphic representation, and will therefore turn to educational research from other fields.

## 2.6 GRAPHS, DIAGRAMS, AND VISUAL REPRESENTATIONS IN OTHER SUBJECT DOMAINS

The body of research on graphs and diagrams in educational contexts is dominated by the STEM subjects. Historically (at least since Pythagoras), there has been a strong connection between the disciplines of music (theory), mathematics, and physics. Today, mathematical concepts, such as ideas borrowed from set theory, remain influential in more advanced forms of musical analysis. In the educational domain, attempts have been made to apply findings from mathematics pedagogy about students' use of strategies and algorithms to the teaching of music theory fundamentals (VanHandel, 2012), although I am unaware of any empirical work testing these ideas. Interestingly,

there has been some influence in the opposite direction as well: Jeanne Bamberger's (1995) work on children's invented notations, discussed above, is acknowledged as a starting point for work on meta-representational competence in science and mathematics education (diSessa & Sherin, 2000).

Reviews of the research on graphs and graphing in mathematics and science education have long stressed the interconnectedness of learning to construct and interpret graphs (Glazer, 2011; Leinhardt, Zaslavsky, & Stein, 1990). Leinhardt et al. (1990) point out that there is a discontinuity between what graphing is intended to achieve in mathematics compared to natural and social sciences. In the former case, the important relation tends to be between curves, lines and their equations. In the latter cases, the primary task "is to determine the space in which to place information, or to identify the axes, scales and data units; then to construct a graphical representation; and finally perhaps to suggest an algebraic form for the curve" (p. 53).

In a later review of the literature on graph comprehension, Shah and Hoeffner (2001) come to a similar conclusion, arguing that graph reading skills may not transfer efficiently between abstract (e.g. mathematics) and applied (e.g. science) contexts. Context, domain-specific theory and everyday knowledge are important (Glazer, 2011). Shah and Hoeffner (2001) conclude that it is important to teach graphing literacy in the context of science and social science, and that in doing so it is imperative to explicitly connect the visual features of the graph and their meaning in the context of the subject domain and specific task. This also means that the teachers' (general and domain specific) competence in both creating and interpreting graphs is important for student learning (Glazer, 2011; Shah & Hoeffner, 2001).

In general, there appears to be three somewhat different challenges involved in learning to produce and interpret graphs. One is (a) learning the basic visual grammar of e.g. a cartesian coordinate system (Leinhardt et al., 1990), another is (b) to understand more general properties of lines and curves (Leinhardt et al., 1990; Shah & Hoeffner, 2001), and a third is (c) to understand what specific

phenomena the axes, lines, points, bars, etc. are intended to represent in each particular case (Glazer, 2011; Leinhardt et al., 1990; Shah & Hoeffner, 2001). Trying to tentatively apply this to the circle of fifths, with the major caveat that it is a visual representation that is quite different from a line graph:

- a As in a cartesian coordinate system, directionality (clockwise and counter-clockwise) and distance have general meanings (longer distance in in some sense *farther*). If a coordinate system can be understood as two crossing number lines, the circle of fifths can be understood as a line of fifths, wrapped around to form a circle (or spiral). It is conceivable to form other figures with the same basic visual grammar, e.g. a circle of fourths, a chromatic circle (of minor seconds), a hexagon of major seconds, a triangle of major thirds, a square of minor thirds, etc.
- b It is more difficult to imagine how to transfer this challenge (to understand more abstract properties of lines and curves) to the circle of fifths. Perhaps (at the beginner level at least) this aspect is particular to mathematics. As we will see, the participants in this study do inscribe smaller circles onto the larger diagram, but these seem to have more to do with the next point.
- c A difference between the circle of fifths and graphs as they are used in science and social science is that the graph-format is much more versatile; the circle of fifths has a much more limited set of use cases. The challenge of establishing adequations (see Section 4.2) between parts of the visual representation and some observable aspect of the world becomes correspondingly less complicated. Unlike a graph mapping, say, water temperature against precipitation, where only the framework of  $x$ - and  $y$ -axes will be present before deciding on units of measurement and actually plotting the data, the circle of fifths is a ready-made diagram—all the relationships are predefined—where one only has to find the signs for the phenomena one wants to operate with. In this sense, the circle of fifths may be more akin to a map or the periodic table

than a conventional graph. However, a challenge in the same vein for the circle of fifths is deciding what the entries in the diagram represent (keys, chords, pitches), depending on what is appropriate for the task at hand.

A somewhat different perspective on these issues comes from work on inscriptions (see Section 4.2) informed by science and technology studies and sociocultural theory (e.g. Roth & McGinn, 1998), and from work on meta-representational competence in a broadly constructivist tradition (see diSessa & Sherin, 2000, and the special issue it introduces). Research using the concept of inscriptions tends to stress the local and situated work through which visual representations are created and interpreted, often through tracing how observations are transferred to inscriptions, which are then transferred to or adequated with different inscriptions (Cobb, 2002; Roth & McGinn, 1998). This focus lends itself well to detailed studies of category (c) above, but risks missing aspects of category (a), which can appear to be created ad hoc in every situated instance. Nevertheless, this research illustrates that making visual representations meaningful is not a matter of simply transferring ready-made structures from teacher to student, or from context to context, but depends on representational work by the people involved (Medina & Suthers, 2013).

DiSessa and Sherin (2000) argue that a limitation of much of the work on visual representations in mathematics and science education is its focus on cataloguing children's mistakes rather than their capabilities, and its focus on a limited number of common types of graphs and tables. As with the work on invented notations discussed above, the body of research on meta-representational competence tends to be most interesting when children's (perhaps formally misconceived) attempts at representation are taken seriously and developed in collaboration towards more stringent types. By working in this way, diSessa and Sherin claim to find evidence of children having useful previous knowledge or intuitions about, for example, graphing, partially contradicting the research that claims that such knowledge needs to be explicitly taught and does not transfer well (e.g. Shah & Hoeffner, 2001), and somewhat in

contradiction with the work on inscriptions as well. The origin of this knowledge or these intuitions is hypothesized to be a result of previous drawing activities or of previous exposure to similar representations in informal settings.

In light of this, it is interesting to consider what kinds of visual representations are similar to the circle of fifths. In many ways, the circle of fifths resembles a clock face. In addition to visualizing a set of invisible relationships, it is round, it has twelve points, each of which can be read as different things (e.g. 03:00, 15:00, or quarter past, A-major or F-sharp minor), and can represent different units (e.g. hours or minutes, keys or chords). However, when it comes to evidence about learning to tell time from analog clocks and using them in operations, the comparison to the circle of fifths is complicated by the fact that most children learn to tell time much earlier than they learn the circle of fifths.

In a study of learning to tell time, Williams (2004) identifies two different kinds of operations involved in telling time: Reading absolute time (e.g. “5:15”) and reading relative time (e.g. “quarter past five”): “Relative times differ from absolute times in that they involve expressing the current time not as a specific numeric value but instead as a relationship to some reference time” (Williams, 2004, p. 62). This makes reading relative time similar to using the circle of fifths to read the function of chords relative to a reference point (a tonic). Williams argues that the operation of reading relative time depends on a differentiation of the clock face into two halves, divided down the middle, as a way to decide if the reference hour should be the previous or the next one. The circle of fifths can also be divided down the middle, into a sharp-side and a flat-side, although this division supports different kinds of heuristics. Other differences include that the circle of fifths does not have hands, that it does not have divisions smaller than five minutes, and that the items being related are often (but not necessarily) close together.

In a study with children in grades 1–5, Friedman and Laycock (1989) investigated how well, and by what means their participants added or subtracted 30 minutes from a presented analog clock

showing  $x:30$ ,  $x:23$ , and  $x:50$ . Most children reported using a numerical strategy for solving the problem, while the least used strategy involved operations with the clock face, for example imagining movement of the minute hand. The next most common strategies were combinations of these two, for example counting steps of five or ten minutes on the clock face. The strategies were not very different for children answering correctly and incorrectly, except that children answering incorrectly were much more likely to be unable to describe their strategies. An equivalent of using addition or subtraction to solve similar problems with the circle of fifths is difficult to imagine. The combination strategies relying on counting steps of five minutes could be plausibly applied to transposing problems. A complication, however, is that the order of symbols in the circle of fifths is not as easily remembered as those on a clock face, which correspond to a number line. But if one imagines that the user of the strategy simply needs to apply a meaningful unit in which to count steps (five minutes, a fifth, a step), the comparison appears to be quite valid.

Williams (2004) points out that learning to tell time is not just about learning to read correct time-labels off a clock, which tends to be the focus of instruction in primary school, but starts earlier with the naming of different times of the day and the notion of cyclical time. As with other visual representations then, learning to tell time is dependent on the clock face representation being part of a wider conceptual system. On the other hand, the very notion of cyclical time, consisting of units that are the same across different seasons, is related to the invention of the clock and communicated by its visual design. As I have recounted above, the circle of fifths originates in, and visualizes, a version of tonality based on a similar standardization of units in the invention of equal temperament. As objects of and tools for learning, the circle of fifths and the analog clock share the property of simultaneously constituting and being products of an abstract system.



## 2.7 PREVIOUS RESEARCH IN SUMMATION

This review of the literature illustrates three different points: Firstly, it shows that there is a need to better understand how concepts are taught and learned in music classrooms, especially at the secondary level. There are indications in the literature that this is an area where Swedish field of music pedagogy could be in need of professional development, but there has also been a lack of interest in this area from researchers. Lately, attention to the role of concepts and terminology has mainly been a result of studies in theoretical traditions focusing on tools and mediation. But the attention to concepts has often been secondary in the sense that the primary focus of the study is on a (concept-)mediated activity rather than on the learning of the concepts.

Secondly, it shows that teaching and learning aural skills and music theory at the secondary level is very unexplored. Most research is conducted at the tertiary level, and on similar topics (e.g. “elements of music”) with younger children. While being a niche kind of educational practice, the aural skills and music theory subjects are promising arenas for studying the teaching and learning of concepts in the music domain. Studies of these subjects could therefore be relevant ways of addressing the lack of studies of concept teaching and learning in secondary music education in general.

Thirdly, this review of the literature shows the need for detailed case studies of concept development processes and learning to represent in music, especially concerning adolescents. Studies of symbol systems and visual representations in music education have tended to investigate different forms of music notation. There is research on teaching and learning more abstract visual models in other educational fields, but the extent to which such results are generalizable between subject domains is purely speculative. While there is a long tradition of research on learning music terminology, the majority of studies have been conducted with young children or college students as participants. This research has often been quantitatively dominated, has focused on measurement of conceptual knowledge or effects of conceptual teaching, and when learning is the focus it has often has lacked the theoretical and methodological

means to study the mechanisms underlying that learning. Research on younger children has demonstrated the fruitfulness of qualitative, sometimes quasi-experimental, case study approaches as a way to open up the concept development process for study.

The need to address these poorly understood areas is mainly motivated by the centrality of listening in all musical activities. There is much reason to believe that conscious, active or volitional forms of musical listening depend on mediation by means of symbols, terms, concepts, etc. While more unmediated forms of music perception are also very complex, qualitatively different ways of listening, or new “hearings” to use Bamberger’s term, become possible when musical phenomena are integrated into reference structures, categorized, conceptualized, and symbolized.

In research utilizing a sociocultural perspective, listening in this sense has been theorized as a higher mental function, dependent on cultural tools. This research has focused on the development of listening or discernment as higher mental functions, which in my view has left the issue of how one learns these tools underdeveloped. This is compounded by how the sociocultural tradition does not distinguish between different kinds of cultural tools. Still, there are attempts in this literature to distinguish between tools that enable a transcendence of particular situations, tools that work locally, and “proto-tools”. Hence, I conclude that there is a need for studies of *how* the tools, which mediate listening as a higher mental function, are learned. In particular, it would be of interest to study those tools that mediate a transcendence of specific situated activities, which I will argue below are concepts—and especially what Vygotsky called scientific concepts. Music-theoretical concepts and models are prime examples of such musical scientific concepts

### 3. Research Problem and Research Questions

Put in the most general terms, the problem that this thesis project aims to address is the lack of knowledge concerning students' processes of learning music-theoretical concepts and models, and concerning how those processes relate to specific educational practices. This lack of knowledge is especially salient when it comes to adolescent students and secondary-level education. Presently, a teacher at the secondary level who wants to form a theoretically and empirically informed understanding of this issue will mainly have to rely on studies that focus on younger children and university students, or on studies on learning concepts and models in other fields of study. This, of course, raises questions regarding how transferrable the findings and theoretical models of such studies are across different age groups, educational settings, and content areas.

When put in such general terms, however, this problem is far too wide-ranging to be addressed in full by any one study. Instead, what I propose to do here is to tackle this general problem through the study of particular cases. I will focus on a particular music-theoretical model, the circle of fifths, in a particular educational practice, aural skills and music theory education at a Swedish upper secondary school, and within that context, with a focus on

particular students' learning. Hence, a narrower research problem for this project could be restated as follows: *The problem this thesis aims to address is the lack of knowledge concerning upper secondary music students' processes of learning the circle of fifths, and how those processes relate to the practice of aural skills and music theory education they are involved in.*

I am aware that the phrase "students' processes of learning the circle of fifths" has a ring of rote memorization to it, and want to stress here that I am not making that assumption. It is, of course, possible that rote memorization plays a significant part in the learning in question, but that is an empirical question, not something I wish to narrow my focus to at the outset. Rather, I am using "processes of learning the circle of fifths" as shorthand for something like "learning of, about and with the circle of fifths" which quickly becomes cumbersome.

Before proceeding to the research questions, I will briefly unpack the differences between the narrow and general statements of the research problem, and in doing so attempt to clarify how they relate to each other. The most obvious change is the specification of a particular music-theoretical model situated in a particular educational context and practice. Starting with the choice of the circle of fifths as the particular model under investigation, I want to stress that this choice should not be interpreted as having any bearing on the question of whether the circle of fifths is important content in aural skills and music theory education. While I would argue that it is a genuine problem for the development of aural skills and music theory pedagogy in secondary schooling that so little is known about how students at that level learn music-theoretical concepts and models, I would be less willing to make the same argument regarding the circle of fifths in particular. In isolation, a lack of knowledge about students' learning of the circle of fifths is problematic only to the extent that teachers or curricular designers choose to include that diagram in the curriculum. Thus, the circle of fifths is in focus not because it is inherently important, but because it is an interesting case of a music-theoretical model that is conceivably connected to a set of central music-theoretical concepts.

Regarding situating the study in the context and practice of aural skills and music theory lessons at an upper secondary music program, a similar argument could be made. An important difference, however, is that there is also a case to be made for studying this particular educational context in its own right. As I have discussed above, there are very few studies on the music theory subject in (upper) secondary school. Therefore, the choice of setting can be understood on two levels: Firstly, as a particular case of music education, chosen because it is one where it is fairly certain that work with concepts and models will be in focus. Secondly, as a particular case of secondary level aural skills and music theory education, chosen because it is an especially under-studied form of music education. In summation, the narrow research problem, specifying a particular music-theoretical model situated in a particular educational context and practice, should be understood in light of the larger problem-context of the general research problem. It makes sense as a way of partially addressing that general problem through focusing on interesting cases of models, contexts, and practices.

Research questions guide what one looks for as well as where and how one proceeds to look. They are thus either implicitly or explicitly theoretical. In this project, I strive to make the theoretical assumptions woven into my research questions explicit. Therefore, I make assumptions about what to look for based on previous research and theory. In particular, I will focus on how the circle of fifths is made meaningful through how it is introduced, reproduced, and used, assuming that it is especially important to describe how both semiotic and musical means are deployed and operated upon in that process. My research questions are:

- 1 How do participants introduce, reproduce, and use the circle of fifths in the educational practice?
- 2 How do the specific ways in which the circle of fifths is introduced, reproduced, and used in the educational practice facilitate learning processes?



## 4. Theoretical Framework

This chapter starts out by trying to conceptualize the circle of fifths for the purposes of this research. I have, in the above, called it an inscription, a representation, a model, and a concept. Here, I will try to delineate what I mean by these terms, especially the two extremes—*inscription* and *concept*. This will lead to the introduction of Vygotsky's distinction between scientific and everyday concepts, as well as a discussion of some non-verbal understandings of the concept-concept. After this, I discuss the parts played by tools, signs, and mediation in this theoretical framework, and the relation between learning, instruction and development. Finally, I try to sketch a co-constructionist approach to the phenomena in question, which leads over into the chapter on methodology.

### 4.1 THE CIRCLE OF FIFTHS: INSCRIPTION, REPRESENTATION, CONCEPT, AND MODEL

Above (Section 1.2), I have briefly touched on the question how I could conceptualize the circle of fifths for the purposes of this study. At one end of the spectrum of possible conceptualizations, a circle of fifths is simply what we call a material object distinguished by a certain organization of curves and squiggles on its surface. Such objects,

often made of paper, are present in many music classrooms—printed in books, hanging on walls, or laminated and attached to tables. But we can also turn our smartphones or laptop screens into such objects, for example by typing the correct search string into a search engine. If we have access to a printer, we can make more paper objects, laminate them and attach them to more tables. At the other end of the spectrum, *the* circle of fifths is an abstraction, almost a Platonic form, of which all these arrangements of curves and squiggles on material objects are just instantiations.

Arguably, the more interesting (and productive) interpretations lie somewhere in-between. *A* circle of fifths is not simply an arrangement of curves and squiggles, but (to those who have learned to see it as such) a meaningful arrangement of lines and squiggles. And *the* circle of fifths may be an abstraction, but it has a social and cultural history, which includes being passed on by means of curves and squiggles on paper, blackboards and whiteboards. In other words, what is interesting might be the dynamics of abstraction, representation, and understanding.

In this thesis, I will use the concept of *inscription* to talk about the circle of fifths as curves and squiggles on different material objects, such as paper, screens, and whiteboards. I will discuss inscriptions more thoroughly in the next section, so here I will only say that inscriptions are material objects with signs inscribed upon them. From the perspective of multimodal social semiotics (Kress & van Leeuwen, 2008), an inscription can be understood as a material visual representation, where representation is understood as a meaningful unit of signs in different modes (Leijon & Lindstrand, 2012).

In the case of a circle of fifths, it is a combination of conventionalized symbols (e.g. C, m, #, b), a use of spatial relationships as signifiers—distance and direction organized along a circle—and the circle itself, signifying the closedness and symmetry of the system. Additionally, most of the conventional symbols are domain-specific, sometimes supervenient on a more widely established conventional system. For example, the form of the signifier “b” is domain specific (although based on a lowercase letter), “#” is too but is easily



confused with a number-sign or a sign for tagging on social media (compare “#” and “#”). The form of the signifier “C” is not unique to the music domain, where it stands for a pitch, a key or a chord, but that convention relies on an already established convention of letter-symbols signifying different graphemes.

In order to make sense of the circle of fifths, then, it is possible that one needs to be familiar with how the mode of letter-symbols is deployed in this particular context, and how letters combine with domain-specific symbols in a systematic manner. In other words, one may need to be familiar with the western conventional ways of abbreviating names for pitch, chord and key, and at least implicitly understand the rudiments of the *conceptual system* underlying the regularities in the sign-system. Additionally, one may need to be able to pick up from contextual clues whether the symbols should be read as pitches, chords, or keys. In order to make sense of how these symbols are ordered in the diagram, one may also need to be familiar with what clockwise and counter-clockwise direction, and the distance between adjacent symbols conventionally represent. On this interpretation, learning to read the circle of fifths involves not only being able to decode the conventional symbols and locally functioning signs in the diagram, but also understanding the concepts and conceptual system they represent in this particular organization and this particular domain.

The question of what the circle of fifths represents brings us to the domain of concepts. If making sense of the diagram requires more than simply identifying the referents of the signs and symbols involved (specific pitches, chords, keys), but depends on the conceptual system they are part of, a study on how students make sense of the circle of fifths needs to take their development of that conceptual system into account. Arguably, the diagram as a whole represents something more than the sum of its parts (which can be constructed as referring to particular musical phenomena, e.g. a class of major chords with the pitch-class *c* as their root, the distance of a perfect fifth between two adjacent symbols, etc.). The circle of fifths developed as a way of representing the symmetry of all keys in a tempered tonal system and as a way to facilitate

musicians' transposing to different keys. Therefore, the use of the diagram to teach and learn the conceptual system of which it is part is also of interest.

Is the circle of fifths a concept? I will write more about concepts and concept development in Sections 4.3, 4.4, and 4.5, so here I will just say that if one views it as something like a platonic form, it can be thought of as a concept. It can also be thought of as a concept in the more mundane sense of a word with a specific class of referents, that is, THE CIRCLE OF FIFTHS is a concept in the sense that we can use the words "circle of fifths" to refer to circle of fifths-diagrams. In terms of concepts, however, I find it more fruitful to conceive of the circle of fifths as a visualization of certain conceptual relationships, and that makes sense in terms of certain conceptual relationships, rather than as a concept in itself.

Although I will argue for a view of concepts where they to a large degree are constituted by their relations to other concepts, equating the circle of fifths with a concept in this sense seems to me to assume that these conceptual relations would actually be represented in the mind as a visual representation, which is at best an empirical question. Another problem with viewing the circle of fifths as a concept is that any representation will highlight some aspect of the represented phenomena and hide others. While this is one of the strengths of a representation, it also implies that internalizing the representation as such is not necessarily the same thing as understanding it. This is why I have elected to use the term *model* for the circle of fifths in framing my research problem.

#### 4.2 WHAT IS AN INSCRIPTION?

I have already mentioned the concept of *inscription* in Section 2.6, when reviewing research on graphs and other visual representations in (mostly) STEM education. In this thesis, I will consider physical instantiations of the circle of fifths-diagram as inscriptions. The concept of inscription has been brought into educational research from science and technology studies (STS), especially the work of Bruno Latour (Roth & McGinn, 1998; Säljö, 2013). Latour (1987)

used the term to refer to figures and diagrams in scientific papers, and to the more rough and ready visual displays produced in the laboratory that they are based on. In fact, Latour called scientific instruments *inscription devices* since their function is to produce inscriptions (e.g. a printout, a pattern on a screen) in response to some phenomenon.

Perhaps due to its origin in STS, the concept of inscription has been applied most extensively by educational researchers in STEM education, especially in connection to ICT-use (but for examples of the concept applied in music-educational contexts, see e.g. Kullenberg, 2014; Kullenberg & Pramling, 2016; Wallerstedt & Hillman, 2015; Wallerstedt & Pramling, 2015). Arguably though, research in music education has a long history of engaging with questions concerning inscriptions without necessarily conceptualizing them as inscriptions, for example in research on learning to use music notation, or on children's improvised notations. For the purposes of this thesis, the concept of inscription becomes most directly relevant as a way of understanding the role of reproductions of the circle of fifths in the educational context being studied.

An article by Roth and McGinn (1998) in *Review of Educational Research* appears to have played a vital part in transferring the concept of inscription from STS to educational research. According to Roth and McGinn, inscriptions are “signs that are materially embodied in some medium, such as paper or computer monitors” (p. 37). They argue that the term can be understood as a subcategory of *representation*, made necessary by the historical development of the concept of *mental representation*: “the term *inscription* was introduced to distinguish representations, which exist in material form (e.g., paper, computer screen) and can therefore be shared by several agents, from mental representations, which are not accessible.” (p. 35, original emphasis.) To Roth and McGinn, this distinction is not only a handy way to distinguish a particular kind of representation from another kind; it outlines a different research program than one conceptualizing cognition and learning in terms of mental representation.

This research program is encapsulated by one of Latour's rules of method:

Before attributing any special quality to the mind or to the method of people, let us examine first the many ways through which inscriptions are gathered, combined, tied together and sent back. Only if there is something unexplained once the networks have been studied shall we start to speak of cognitive factors. (Latour, 1987, p. 258)

Roth and McGinn (1998) argue that applying this principle “leads to a change in the location of representing activity from individual minds to social arenas” (p. 37), where differences in students' performance with graphs, diagrams, and other representations are understood in terms of inscription practice rather than cognitive ability. As such, the introduction of the concept of inscription in educational research can be understood as part of the larger debate on the merits of situative and participatory versus cognitive and acquisitionist perspectives, going on in educational research around the same time (Anderson, Greeno, Reder, & Simon, 2000; Anderson, Reder, & Simon, 1996; Greeno, 1997; Sfard, 1998). Hence, it is not surprising to see the concept of inscription being taken up as a particular form of cultural tool or artifact in more explicitly sociocultural and/or CHAT-inspired theorizing.<sup>10</sup>

One example of this is Säljö (2013) who introduces inscriptions as “material tools inscribed with discursive distinctions”<sup>11</sup> (p. 51, my translation from Swedish). Compared to Roth and McGinn's (1998), definition, quoted above, Säljö's definition stresses the object (the tool) rather than the sign as primary. While this difference has interesting implications, it should be stressed that it is a difference of emphasis rather than a difference in kind. In both definitions,

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10 While sociocultural theory is strongly critical of the view of learning as hypothesis testing and theory adjustment that can be found in individual constructivist theory, it is interesting to note how a metaphor of the learner as a scientist is still at work, only now through the concept of inscription.

11 Original quote: ”fysiska redskap med diskursiva distinktioner inskrivna i sig.”

the materiality of inscriptions is essential, since it is what allows them to be shared. Although only Säljö's definition frames the inscription as a tool, examples of instrumental uses of inscriptions abound in Roth and McGinn's paper. While Säljö puts his definition in terms of discursive distinctions, these distinctions are probably understood to be achieved through signs. Nevertheless, Säljö's shift in emphasis allows him to connect the concept of inscription to a sociocultural conception of tools or artifacts as (historically developed) externalizations of human experience.

Säljö uses the concept of inscription (together with Wartofsky's concepts of primary, secondary, and tertiary artifacts) to argue that it is not fruitful to uphold the distinction between material tools and psychological tools. Inscriptions are material artifacts, working as mediators of human activity, allowing the user to benefit from the knowledge of social others as externalized in the artifact. The only difference between inscriptions and other mediational means is that they mediate action through their semiotic organization rather than through their physical properties. Hence, this conception of inscriptions becomes a powerful part of Säljö's larger argument against covert, intra-mental phenomena as units of analysis, and for a focus on overt, mediated action.

Contra Säljö, I would argue that the concept of psychological tools—that is, signs—is essential to making sense of how inscriptions are employed as mediational means in thinking and problem solving. In fact, the kinds of artifacts that could be readily classified as inscriptions are what Vygotsky used to exemplify psychological tools (when he used artifacts rather than less tangible things such as words or symbol systems as examples), e.g. “works of art, writing, schemes, diagrams, maps, blueprints” (Vygotsky, 1997b, p. 85). In other words, the fact that inscriptions do their mediational work by virtue of their semiotic organization is not an arbitrary feature, but precisely what makes them distinct from other artifacts. Inscriptions are not an example of the futility of distinguishing material and psychological tools, rather, they are an example of how psychological tools can have an external, materialized aspect (the signifier, in semiotic terms). Indeed, if higher mental functions originate in social interaction,

that must be the case, not just for inscriptions, but any kind of sign (e.g. words are materialized as sound waves in a medium).

The special nature of inscription-artifacts is not lost on Säljö (2013) when one shifts focus from their role as mediators of activity to the question of how one learns to use them as such. Both Säljö and Roth and McGinn (1998) stress that learning in relation to inscriptions cannot be reduced to simply internalizing an inscription (in the sense of being able to visualize it to the mind's eye), and that the signs or discursive distinctions of the inscription are not inherently meaningful to a learner. In order to perform their mediating function, inscriptions need to be made meaningful. As pointed out already by Roth and McGinn, this does not happen automatically, but as the result of "a considerable amount of situated, lived work" (1998, p. 41). While scientists might be able to rely on a considerable amount of shared conventions in their work with inscriptions, this is not necessarily the case in educational contexts, since that is where those conventions are supposed to be transmitted. In other words, "inscriptions become representations through their successive repurposing over time and through the range of representational practices they mediate" (Medina & Suthers, 2013, p. 60).

Roth and McGinn approach this problem in a way that parallels the STS-tradition in its concern with how sampling, experimental, and measurement activities result in and interact with inscriptions. For example, they trace how two students engaging in a science project (supported by their teacher) produce a cascade of inscriptions in their work with a soil sample, highlighting how correspondences between inscription and sample are established through social practices. This approach reveals an interest in how inscriptions come to represent something in the world. But Roth and McGinn also stress the considerable work involved in creating *adequations* between inscriptions. This term, also borrowed from Latour, refers to how different inscriptions or parts of inscriptions are constructed as representing the same thing.

In contrast, Säljö's (2013) understanding of inscriptions as mediational means tends to shift the focus toward general qualities of different types of inscriptions, e.g. organizing tables using grids,

and how these qualities can be used to facilitate problem solving. In other words, Säljö is less interested (but not uninterested) in how a particular entry in a table comes to represent some particular measurement, than in how its particular position in the table-structure comes to represent something. (In this sense, Säljö's understanding of inscriptional competence is similar to diSessa and Sherin's (2000) concept of *meta-representational competence*.)

For the purposes of this thesis, both these approaches are of interest. Looking at students learning the circle of fifths from a Vygotskyan perspective on concept development, the question of how the circle of fifths is established as a representation of tonal relationships mirrors the question of how scientific and everyday concepts interact in development. The question of how the diagram is connected to situated experiences of the musical phenomena it ideally would represent becomes crucial. On the other hand, Säljö's (2013) shift of emphasis to inscriptions as tools is useful, since the diagram may be used as a tool for solving a specific kind of problem (compare e.g. the Chord Wheel, Section 1.2). This in turn raises questions about when the inscription, as applied in problem-solving, might obscure rather than clarify the discursive distinctions inscribed upon it, by automating parts of operations which could lead to further understanding.

This view of inscriptions as tools also helps distinguish what one might call *inscriptional aspects* of tools. Inscriptional aspects are often part of the interface of a tool (a computer interface may be the clearest example). Inscriptions can thus work not only as a way of getting information from a device (printouts, screens, etc.), but as a mechanism for engaging interactively with it in a semiotically mediated way. For example, a piano can be understood as a tool for producing musical sounds, where a complicated mechanism mediates between a player's fingers pushing down keys and felted hammers beating strings, producing pitched sound. But the piano also has an inscriptional aspect in its interface, the keyboard. The organization of the piano keyboard in a repeating pattern of black and white keys is an example of discursive distinctions inscribed in an artifact—a pitch-naming system that because of its particular

historical development draws an arbitrary distinction between the natural pitches c, d, e, f, g, a, b, represented as white keys, and the rest, given names derived from these (e.g. c-sharp, e-flat), represented as black keys. The piano keyboard also represents frequency as horizontal direction and octave equivalence as repeating pattern. This means that for someone who has learned to map such a pitch-naming system onto the piano keyboard, the piano can be used not only as a tool for producing sound, but as an inscription with which one can engage in semiotically mediated problem-solving.

#### 4.3 WHAT IS A CONCEPT?

In the essay “What Is a Concept, That a Person May Grasp It,” linguist Ray Jackendoff distinguishes between two different senses of the term *concept*:

There is a fundamental tension in the ordinary language term *concept*. On one hand, it is something out there in the world: ‘the Newtonian concept of mass’ is something that is spoken of as though it exists independently of who knows or grasps it. Likewise, ‘grasping a concept’ evokes comparison to grasping a physical object, except that one somehow does it with one’s mind instead of one’s hand. On the other hand, a concept is spoken of as an entity inside one’s head, a private entity, a product of the imagination that can be conveyed to others only by means of language, gesture, drawing, or some other imperfect means of communication. (Jackendoff, 1992, p. 22, original emphasis)

In general, philosophers might be able to work mostly with the first understanding of concepts, while psychologists might be able to work mostly with the second. In educational research, however, this tension cannot be so easily resolved because both ways of understanding concepts are central to the discipline. The first understanding of concepts is one we might meet in curricula, when teachers stake out an object of learning, or when students’ grasp of a concept is assessed in relation to some standard. The second understanding of concepts is one we might meet in conceptualizations of learning, knowledge, and transfer.



In delimiting an *educational* research topic, this tension-filled, fundamentally *didactic* (in the sense of the German and Scandinavian *Didaktik* tradition, see Nielsen, 2007) understanding of concepts must be kept in mind. For example, cognitive psychologists have long since moved on from an understanding of concepts' mental instantiation as dependent on necessary and sufficient conditions (definitionism)—a theory whose roots ultimately go back to Aristotle's understanding of definitions. As I will discuss below, there are aspects of definitionism in Vygotsky's theory of scientific concepts, since they are assumed to originate in definitions. Since Vygotsky's time, psychologists have developed family resemblance-, exemplar- or prototype-, schema-, and explanation-based or theory-theories (Komatsu, 1992; Slaney & Racine, 2011). In educational research the matter of how concepts are instantiated in the mind is not the only concern. Therefore, the old understanding of concepts (as being based in definitions with necessary and sufficient conditions) must still be kept in mind, since it can influence how concepts are represented in curricula and how teachers use imperfect means such as language to convey them to students.

The first challenges to definitionism came from schema-based theories, and from family-resemblance theories. Wittgenstein's (1992) ideas about family-resemblance were used to explain that people's categorizations were a lot more diffuse than the definitionist theory would seem to predict (Slaney & Racine, 2011) and that people tend to not provide stringent definitions of concepts when asked (Komatsu, 1992). Family-resemblance concepts correspond to what Vygotsky (2012) called chain complexes in that each item included in the concept's extension shares at least one attribute with at least one other item. Thus, family-resemblance concepts rely on some sort of abstraction, in the sense that properties are abstracted and compared between instances. Still, more abstract concepts are a challenge for this theory. Firstly, because the chain of attributes constituting the concepts makes it difficult to explain concept compositionality, e.g. specifying items as belonging to two categories: PET FISH does not include all pets and all fish, but only fish who are kept as pets. Secondly, because while the family-resemblance view seems to offer a plausible

explanation for concept learning when it is based on perception of similarity, it has more difficulties explaining where non-empirical concepts come from (Komatsu, 1992; Slaney & Racine, 2011).

Prototype- and exemplar-theories can be understood as elaborations of the family-resemblance view, partly designed to help explain why some items in a category appear to be understood as more typical than others. In exemplar views, this could be explained by, for example, learning that robins are birds before learning that penguins and ostriches are. Robins become exemplars of the bird category. Categorization is then assumed to be a matter of judging similarity between such exemplars and items to be categorized. This means that exemplar theories do not rely on abstracting properties as described above (Komatsu, 1992). Prototype-theories instead tend to assume that different attributes of items in a category are weighted differently (Slaney & Racine, 2011).

But even in the perceptual domain, these theories have difficulties explaining where these weights come from.

A Great Dane and a Bedlington terrier appear to share few similarities, but they share enough so that both are dogs. But a Bedlington terrier seems to share as many similarities with a lamb as it does with a Great Dane. Why is a Bedlington terrier a dog and not a lamb?

Presumably, the family resemblance view would predict that the summed weights of Bedlington terrier attributes lead to its being more similar to other dogs than to lambs and result in its being categorized as a dog rather than a lamb. But to determine those weights, we need to know how common those attributes are among dogs and lambs. This implies that the categorization of Bedlington terriers must be preceded by the partitioning of the world into dog and lamb. Without that prior partitioning, the dog versus lamb weights of Bedlington terrier attributes cannot be determined. (Komatsu, 1992, p. 505)

This problem is eerily similar to the one Vygotsky (2012) encounters when he tries to explain how children progress from pseudo-concepts (complexes) to hierarchically integrated true concepts. The basic structure of the solution—supply the learner with pre-defined categories—is also similar, although the way in which this is supposed to happen differs. In Komatsu's (1992) account of the

family resemblance-theory, this is provided by inherent bias in our perceptual apparatus. In Vygotsky's (2012) case, the development of word meaning is constrained by patterns of use the learner's language community, which in turn prompts the expansion of his theory with the notion of scientific concepts.

Regardless of whether the family-resemblance, exemplar, or prototype theories of how concepts are instantiated in the mind are true or not, it still seems like we are able to operate with concepts *as if* something like the classical, necessary and sufficient conditions-view, was true. From an educational point of view, and especially if family resemblance- or exemplar-theories are true, it becomes very important to ask how we can learn to operate with concepts in such a way that a hierarchical and discrete system supervenes on a fuzzy and continuous one.

Another early alternative to the definitionist view is schema-based theories. Early contributors to these theories include Bartlett and Piaget. Komatsu (1992) argues that the concept of *schema* in these theories should be understood as a structure which captures the abstracted properties of family-resemblance and prototype theories, but simultaneously retains information about particular instances as in the exemplar view. What makes schema-theories into something more than another iteration of the family of family-resemblance theories is that schemata are also assumed to encode relations among attributes of instances of a concept, as well as information about how to act on and manipulate conceptual content. By assuming that schemata encode relations between attributes (other than relative weight), schema theories become better equipped than the family-resemblance theories at explaining combinatoriality and hierarchy among concepts.

The action-based understanding of concepts and conceptualization inherent in schema-theories is, as Miller (2011, 2017) points out, something that unites Piaget's and Vygotsky's theories, with the distinction that Piaget's tends to be about self-regulated action while Vygotsky's tends to be about other-regulated and mediated action. Understanding a concept, on such a view, becomes "a recipe for action":

The concept of a hierarchy or a theory of exploitation requires that we ‘think’ about ‘ideas’ in particular organized ways. [...] To understand the concept of hierarchy or a theory of exploitation means that we act on or regulate or structure our thoughts so that the meaning of a hierarchy or a theory of exploitation is not a ready-made piece of knowledge that is stored in our memories but a set of actions or a prescription to act (or think) in one way rather than another. (Miller, 2011, p.173)

Something like schemata therefore seems to be a necessary component of a modern interpretation of Vygotsky’s concept development theory.

According to Komatsu (1992), explanation-based theories (of which the theory-theories that Slaney & Racine, 2011, describe appear to be a subset) arose partly in response to Putnam’s and Kripke’s philosophical critiques of earlier theories of reference, and the problems these critiques raised for both definitionist and family-resemblance theories. Komatsu considers explanation-based theories to be consistent with, or even elaborations of, schema-theories. What distinguishes an explanation-based theory is that it sees concepts not only in terms of the attributes of items in its extension, but also as consisting of the concept’s relation to other concepts (Komatsu, 1992). In other words, explanation-based theories see concepts as embedded in networks of knowledge (or theories) about concepts and their particular instances, including explanatory, functional, and causal relations (Komatsu, 1992; Slaney & Racine, 2011). In this sense, explanation-based theories can be seen as a synthesis between schema-theories and definitionist theories. Definitionist theories also emphasized relationships between concepts (that is what a definition does), although the utility of these relationships was limited to specifying the overlapping sets constituting the concept’s extension.

In general, the psychological theories of concepts reviewed above have been developed mainly through studies of categorization of concrete objects. This explains why the notions of similarity and attributes have been so common, and possibly why they (especially family-resemblance theories) have had difficulties with abstract concepts and combinatoriality. They have also been more concerned with how concepts are represented or instantiated in the mind, than

with how concepts are learned. If a theory offers an explanation of learning it appears to be treated as an added bonus rather than as an end in itself.

Interestingly, different aspects of Vygotsky's (2012) concept development theory, which I will discuss below, are recognizable in the different theoretical positions, although integrated into a developmental sequence: His stages of concept development from syncretism, to complexes and pseudo-concepts, especially chain-complexes, are similar to family-resemblance views on concepts, perhaps unsurprisingly given that both are mainly based in categorization experiments. Vygotsky's stage theory and family-resemblance theories also encounter similar explanatory problems. The action-component, present throughout Vygotsky's theories, is recognizable in the schema-theories. The schema-theories also appear to have the strongest developmental focus of the ones reviewed above, possibly owing to the influence of Bartlett and Piaget. Finally, Vygotsky's scientific concepts, and the idea that concepts are embedded in a conceptual structure, have elements of both definitionist and explanation-based theories. One reason why I have elected to utilize Vygotsky's theory in this thesis, instead of, for example, a more modern explanation-based theory, is that Vygotsky's theoretical framework appear to offer many of the same basic ideas, but combined with a vocabulary that allows me to consider the role of learning, instruction, and development, an issue I will return to in Section 4.8.

A question I have not considered here is whether concepts by definition are considered to have a sign-component. It is my impression that several of the theories of concepts discussed above are agnostic on this topic. In particular, family-resemblance theories appear to work with an understanding of categorization that does not require the category to be named, and schemata, at least in a Piagetian sense, do not seem to require a sign component. In music psychology and music education, there are several examples of understandings of musical concepts that do not require, or explicitly exclude, a sign-component (e.g. Bamberger, 2013b; DeBellis, 1995; Falthin, 2011b; Gruhn, 2006). I will discuss the issue of non-verbal concepts in Section 4.5.

4.4 SCIENTIFIC AND EVERYDAY CONCEPTS —  
MEDIATED AND SITUATED CONCEPTUALIZATION

For the purposes of this thesis, one of the most useful distinctions I have picked up from Vygotsky's (2012) theorizing about concept development is the one between *everyday concepts*<sup>12</sup> and *scientific concepts*. To use an example from the field of music, a concept like MINOR can be both an everyday and a scientific concept—the distinction is based in their origin, or how they are learned. An everyday concept is learned in a concrete encounter with its object (its referent), say by someone commenting that a song playing in the background is in minor. A scientific concept is learned through a definition in terms of other concepts, say “a minor chord is a triad whose third is three semitone-steps above its root”.

Based on his own research and in agreement with Piaget among others, Vygotsky (2012) views the child's spontaneous or everyday concepts as unconscious. As I will discuss below, consciousness in this sense should be understood as self-reflective awareness of the activity of the mind, and in terms of the direction of consciousness. Hence, saying that spontaneous or everyday concepts are unconscious means that they direct awareness to their objects rather than to the concepts in themselves or to the mental actions they mediate. They orient consciousness toward the *what*, rather than the *how* of the action. In other words, they cannot be *used* consciously.

This lack of consciousness is, according to Vygotsky, due to that everyday concepts are not integrated into hierarchical conceptual systems: A concept mediates conscious awareness of its object, and lacking integration into a hierarchical system means that the concept and the mental acts it mediates remain unconceptualized themselves—that is, they are not generalized by means of a superordinate concept, as a particular *kind* of concept or mental act. As they are not themselves the objects of some superordinate concept, they remain undifferentiated from the totality of mental activity

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12 Vygotsky also uses the term *spontaneous concept* in a way that makes it almost synonymous with *everyday concept*. Here I will use the latter term. I will discuss the difference between the two in Section 4.5.

(Vygotsky, 2012, pp. 180–182). To return to the concept MINOR as an example: It is not necessarily integrated into a conceptual system when one has just encountered instances of it (like someone saying “this is minor” and playing a minor chord, or a minor scale, or a piece of music in a minor key), but if minor is defined, as a *kind* of chord for example, then it has a superordinate concept, such as CHORD, TRIAD or perhaps CHORD QUALITIES.

If conscious awareness and mastery of mental functioning are dependent on hierarchically organized conceptual systems, then an explanation of how that systematicity develops becomes of vital importance. Explaining how systematicity gets started is problematic for Vygotsky: He has already argued that systematicity cannot be transferred wholesale from the outside, the adult world, and also claimed that it cannot arise spontaneously in response to a need for systematicity (Vygotsky, 2012). It is here that scientific concepts play a crucial part in Vygotsky’s work on concepts.

While everyday concepts have their origin in concrete situated experiences with their objects, scientific concepts have their origin in definitions in terms of other concepts; they are conceptually mediated, and stand in a mediated relation with their objects. This means that a scientific concept, already at the beginning of its developmental trajectory, is part of a rudimentary conceptual system—it stands in relations of generality with other concepts. This in turn means that the concepts by means of which a scientific concept is introduced are drawn into that same conceptual system. However, this does not mean that hierarchical conceptual systems are transferred wholesale from one person to another. Scientific and everyday concepts must be understood as starting points of development, not as fully formed, mature concepts. Rather, mature concepts are formed in a dialectical developmental process springing from the tension between the strengths and weaknesses of the different kinds of concepts.

Everyday concepts are introduced in situated experiences, often have concrete reference, and are constrained in their development by implicit patterns in how words are used in the linguistic community, while scientific concepts have their origin in definitions in terms of other concepts. This can make everyday concepts difficult to

transfer between situations, and can make scientific concepts prone to empty verbalism. Everyday concepts overcome their situatedness by being drawn into relations of generality with scientific concepts, and scientific concepts overcome their mediated relation to their objects by being grounded in everyday concepts. This is what Vygotsky means when he describes everyday and scientific concepts as developing in different directions, each clearing a path for the other. Scientific and everyday concepts are not static end points of development, but part of a developmental analysis of the genesis of mature concepts.

Vygotsky (2012) developed a sort of stage theory for concept development, where word-meaning develops from syncretism, via complexes and pseudo-concepts, to concepts proper, which start to appear in adolescence (see especially *ibid.*, Chapter 5 for these stages). To Vygotsky, every concept is a generalization, and concepts stand in relations of generality with other concepts, constrained by a generalizational structure. The stages of concept development, then, represent different generalizational structures, and make possible different relations of generality between concepts (or their pre-stages). Since Vygotsky understands conceptually mediated thought as proceeding along these relations of generality, the level of concept development (i.e. the kind of generalizational structure available) determines what kinds of mental operations a word can mediate (Vygotsky, 2012, pp. 209–213). By virtue of being mediated by other concepts, scientific concepts can mediate mental acts that operate according to a hierarchically organized generalizational structure, while the same might not be true for everyday concepts. This is the key to how to use scientific concepts to study the development of concepts and higher mental functions. By studying scientific and everyday concepts in use, and mapping the relations of generality along which the thought processes move, one may say something about the underlying generalizational structure.

Few commentators have declined to point out that the word “scientific” in scientific concepts is misleading, and several alternate proposals have been put forth, with varying degrees of corresponding theoretical readjustment. At one end, *academic concepts* (e.g.



Gredler, 2007, 2012) and *scholarly concepts* (e.g. Wardekker, 1998) are suggestions that can be regarded as mostly alternative translations. Hedegaard's (1998) use of *subject-matter concepts* strikes me as more innovative, and offers a tempting didactic application of the term. However, this change in terminology is associated with an understanding that subject-matter concepts transform into everyday concepts, which is dubious. Also, as I will argue below, the centrality of a concept to a particular subject is not what distinguishes it from an everyday concept. At the other end, suggestions that focus on the social practice or institution where these concepts are thought to originate, e.g. *institutional concepts* (e.g. Säljö, 2013; Säljö, Mäkitalo, & Jakobsson, 2011; for an application in music education, see Wallerstedt, Pramling, et al., 2014), seem to imply that scientific concepts are distinguished by the institutions we have created for passing them on, rather than (perhaps) the other way around.

In my view, however, these suggestions do not capture the key distinction between scientific and everyday concepts, nor do they address that *everyday* and *concepts* may be equally misleading. Instead of talking about different types of concepts, we might be better served by talking about different types of *conceptualization processes*, and that the key distinction is whether a conceptualization process is *situated* or *mediated*. Everyday conceptualization processes are *situated*, in the sense that they have their origins in concrete, situated encounters, and stand in a situated relationship to their objects. Scientific conceptualization processes are *mediated*, in the sense that they are facilitated by means of other concepts and stand in a mediated relation to their objects.

Hence, when I distinguish between scientific and everyday concepts (I will retain this terminology for simplicity's sake) in this thesis, I am distinguishing between *mediated conceptualization processes* and *situated conceptualization processes*. Note that the outcome of both mediated conceptualization processes and situated conceptualization processes can serve *mediating* functions. The difference is not that the first mediates and latter does not, but that the first is in turn conceptually *mediated*. In fact, mediated conceptualization could not get off the ground without everyday concepts

to mediate the conceptualization process. Similarly, any particular event in which a person learns a mediated conceptualization is of course still situated in a particular physical, cultural, historical and social context. Mediated conceptualization processes do not unfold in a vacuum, rather, the mediated relationship between word and object serves to re-situate the object in a (culturally and historically developed) conceptual framework that is not (as) reliant on the logic of the particular situation. Situated conceptualization processes, on the other hand, *are* reliant on the logic of particular situations. In fact, it is their strength.

Again, this can be illustrated by an example from music education. Wallerstedt and associates point to the special status of language, and especially concepts, as mediators of the higher mental function of listening. However, their sociocultural perspective, stressing situatedness of knowing and obscuring the differences between physical and psychological tools, seemingly makes it difficult to theorize this distinction. In several texts, the authors point to how some cultural or communicative tools work only locally, while others “communicate[...] across settings” (Pramling & Wallerstedt, 2009, p. 149), have “extension beyond the present situation and problem” (Wallerstedt & Pramling, 2016, p. 394), and “detaches, as it were, one’s knowledge from the specific local setting” (Wallerstedt, Pramling, et al., 2014, p. 392). These situation-transcending tools are contrasted with *ad hoc* terms, which work in the setting and the moment, but cannot escape their situatedness (Wallerstedt, Pramling, et al., 2014). While the authors discuss this in terms of everyday and scientific concepts, their understanding of scientific concepts as *institutional* concepts leaves unexplained why this should be so. Instead, I suggest that what matters to whether a communicative tool can transcend the specific setting in which it is introduced and used is whether it is integrated into a conceptual system, that is, if and how the symbol-meaning originates in mediated conceptualization.

Continuing with examples from music-learning, the notion of situated and mediated conceptualization is related to Bamberger’s (2006) distinction between situational and abstract organizing

constraints (see Section 2.1), although applied to another domain of meaning-making. Bamberger's situational organizing constraints are similar to *situated conceptualization processes* in that they both rely on, to use Bamberger's words, "meaning-making that focuses on the present and unique function of events within the context in which they occur" (Bamberger, 2006, p. 71). The difference is that in Bamberger's case, the meaning-making is essentially perceptual, and an "event" is a musical event, while I am focusing on a conceptual level of meaning making, where an "event" is rather a situated instance of word-use.<sup>13</sup> Bamberger's abstract organizing constraints are similar to mediated conceptualization processes in that they both rely on meaning-making "in relation to a generalizable outside, fixed reference structure" (Bamberger, 2006, p. 72). In Bamberger's case, this structure can be a musical structure, for example a steady pulse (what Kaladjev, 2009, would call a musical generalization, see the next section), or a conceptual structure, e.g. a system of pitch-naming conventions. To Vygotsky (2012), every concept is a generalization, and scientific concepts are generalizations of generalizations. Thus, a conceptually mediated conceptualization process involves making sense of one concept in relation to a "reference structure" made up of previous generalizations.

To sum up then, I am using Vygotsky's distinction between scientific and everyday concepts to understand the conceptualization processes in this study. In particular I am using an understanding of everyday concepts as based in situated conceptualization processes where the word-meaning-making is implicit in the use and application of the terms, and scientific concepts as based in *conceptually mediated conceptualization processes* where the word-meaning-making is made explicit through discourse directed toward the meaning of the concepts. This means that I can investigate the external (visible) use of concepts as modeling mediated and situated conceptualization processes.

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<sup>13</sup> Which of course presupposes meaning-making at the perceptual level as well.

4.5 SPONTANEOUS, POTENTIAL, AND  
MUSICAL CONCEPTS

As Vygotsky points out himself (2012, pp. 220–221), the model of concept development he presents suffers from a relative lack of attention to everyday concepts. One may argue that the stages of concept development Vygotsky presents (briefly mentioned above) should be understood as pertaining to the development of everyday concepts, but the term remains less fleshed out than scientific concepts, and risks becoming a catch-all term for everything that is not a scientific concept.

This problem is compounded by Vygotsky's use of Piaget's term *spontaneous* concepts, which Vygotsky treats as equivalent with everyday concepts. As Miller (2011) has argued at length, the conflation of everyday and spontaneous concepts creates problems for Vygotsky's theory. This is because Piagetian spontaneous concepts *are* removed from everyday experience, in the sense that they concern things that are not given to the senses. They are more akin to Kantian categories in that experience happens *through* them:

Rather than assuming a blanket 'non-scientific' mantle, Piaget's spontaneous concepts occupy the space between everyday and scientific concepts. On the one hand, they share the characteristic [with everyday concepts, N.R.] of being self-generated as a product of the child's own construction while, on the other hand, they share with Vygotsky's scientific concepts the quality of going beyond the limits of empirical experience and providing systemic or theoretical knowledge based on the relationships between concepts. (Miller, 2011, p. 139)

A crucial point of Miller's is that Vygotsky's understanding of everyday and scientific concepts depends on something like Piaget's spontaneous concepts for its theoretical consistency (Miller, 2011, p. 147), which is obscured by the shifts in meaning of the term *spontaneous concept*.

Vygotsky sometimes seems aware of this need for something like Piagetian spontaneous concepts, as when he writes that:

The development of a spontaneous concept must have reached a certain level for the child to be able to absorb a related scientific concept. For example, historical concepts can begin to develop only when the child's everyday concept of the past is sufficiently differentiated—when his own life and the life of those around him can be fitted into the elementary generalization 'in the past and now'; his geographic and sociological concepts must grow out of the simple schema 'here and elsewhere.' (Vygotsky, 2012, p. 205)

In this quote, everyday and spontaneous concepts are treated as equivalent and understood as something similar to Piagetian spontaneous concepts, more akin to categories of experience transcending specific situations than specific word-meanings plausibly grounded in a situated encounter, e.g. BROTHER or FLOWER. Yet both these ways of understanding everyday concepts are lumped together by Vygotsky, and that tension is never truly resolved.

This problem of insufficient theorization of one side of the developmental dialectic is echoed in other aspects of Vygotsky's work: Practical intelligence, the "natural line" of development, and lower or elementary mental functions all receive less attention than their abstract, cultural, and higher counterparts. Still, since Vygotsky's understanding of development is fundamentally dialectical, a fuller understanding of the workings of these sides of the developmental dialectic is necessary. Re-distinguishing everyday concepts, that is *situated conceptualization*, and Piagetian spontaneous concepts is one step in that direction. Another is acknowledging, rehabilitating, and developing the parts of Vygotsky's theory that address this side of the developmental dialectic, and which are commonly talked about in terms of tacit or practical knowing, or knowing-in-action today.

In the context of Vygotsky's theorizing about of concept development, one such part is *potential concepts*. This term (which Vygotsky ascribes to Karl Groos,<sup>14</sup> while also drawing on Bühler and Köhler) shows up somewhat unexpectedly in Chapter 5 of *Thought*

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14 I have not read Groos's work, but given the topic and field of this thesis, it is interesting to note that much of his work was in the field of esthetics.

*and Language* (Vygotsky, 2012), forming a vital part of his stage theory of concept development. In fact, Vygotsky considers potential concepts one of the two main lines of concept development, providing the sort of abstraction needed to proceed from complexive to conceptual thought (2012, pp. 144–149, 154). Although prefigured by previous chapters' discussions of the natural and cultural roots of thinking and speech, as well as of practical intelligence and tool use in children and apes, the introduction of potential concepts breaks up the narrative of Chapter 5, with its stages and substages otherwise proceeding in an orderly, chronological fashion. Additionally, although it is clear that there is an explanatory need for something like potential concepts, the *mechanism* by which they contribute to the transition from complexes to concepts proper remains somewhat obscure.

To Vygotsky (2012), every concept is a generalization. What characterizes the complex-phase of concept development is that the generalized features are unstable. The object at first enters the complex in toto, the child being unable to reliably differentiate and isolate abstracted features. This results in phenomena such as chain-complexes, where each new addition to the set of referents of the (pre-) concept shares a feature with the previous one, but not necessarily the same one. Effective generalization presupposes a synthesis of well differentiated and stable elements. The explanatory role of potential concepts is to explain how the isolating abstraction necessary for the formation of true concepts enters the developmental process.

Potential concepts, to Vygotsky, designates a second, independent root of concept development, present already in prelinguistic children and animals. They arise in the spheres of perceptual and action-bound thought, differentiating and isolating features of objects “on the basis of similar impressions in the first case, and on the basis of similar functional roles in the second” (Vygotsky, 2012, p. 147, compare the role of similarity in family-resemblance theories and of action in schema-theories, as discussed above).

As an example of the first, consider why a banana is more like a telephone than an apple, despite the fact that a large number of phones nowadays have apple-icons on them. Might it be because

they both share the feature *ELONGATED* (and for those of us old enough, *CURVED*)? As an example of the second, take again the feature *ELONGATED*, but this time as the unifying property of a number of different objects—e.g. a stick, a pen, or a banana—we could use interchangeably to reach an out-of-reach (but not very far away) object.

As Miller (2017) points out, this is a sort of generalization in action, where some relevant property of an object is isolated from its other features. This abstraction is then applied to other objects, whose other features, when inconsequential for the task at hand (e.g. edibility), are similarly ignored. Because the abstractions and generalizations provided by potential concepts are constrained by instrumental action, they are more stable than the ones Vygotsky demonstrates in complexes. Potential concepts then, have some of the hallmarks of concepts proper—abstraction, generalization—but they cannot fully realize their conceptual potential because they lack the sign element, which can, in a sense, detach the abstracted property from the situation in which it is relevant.

Despite the central part potential concepts play in Vygotsky's view of concept development, they have received relatively scant attention. Even though one might expect otherwise in a field that has a vested interest in attending to non-verbal forms of learning and knowing, this is true also in music education research drawing on Vygotsky. For example, despite using other central concepts of Vygotsky's stage-theory of concept development, such as syncretism, complexes, and pseudo-concepts, Peter Falthin's (2011b, 2011a, 2014) work does not mention potential concepts. This could be because it is difficult to conceive of the theoretical function of a non-verbal root of concept development when one is simultaneously attempting to transfer a theoretical apparatus developed for concept development in a verbal mode to a non-verbal one. But it is worth asking whether Falthin would have reached different results if he had opted to leave syncretism, complexes, and pseudo-concepts in the verbal domain, and instead chosen to develop the notion of potential concepts to conceptualize the participants' musical meaning-making.

Similarly, Kaladjev (2009) draws heavily on Vygotsky and the centrality of generalization to his theory in formulating the concept of musical generalizations (*musikaliska generaliseringar*), but does not address potential concepts. Kaladjev considers both conceptual and auditory generalizations under the umbrella-term musical generalizations, but here I will focus on auditory generalizations of tonality. Auditory generalization is the area where I suspect Vygotsky's potential concepts could have done valuable theoretical work, and tonality is the area most relevant to the topic of this thesis. Kaladjev uses the ability to perceive an implied tonal center as an example of auditory musical generalizations of tonality, writing:

What we see in these examples is the formation of auditory generalizations through acquiring musical structures or *signs*. The children acquire skills that make it possible to respond in the same way to similar (but not identical) musical structures. Through bodily—here primarily auditive—experiences, the child has generalized musical stimuli. (Kaladjev, 2009, p. 98, emphasis in the original, my translation from Swedish)<sup>15</sup>

The key phrase here is “the child has generalized musical stimuli”. It is only through the mechanism of generalization that the skill of responding in the same way to similar musical structures is explained.

But musical structures are holistic, multi-dimensional and open to different interpretations. What is lacking in Kaladjevs model is an explicit mechanism for abstraction of relevant features. This is where potential concepts can play a role: Auditory musical generalizations can be understood as generalization in action, dependent on the abstraction of relevant structural properties of musical objects on the grounds of them playing similar functional roles in some goal-directed musical activity.

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15 Original quote: “Det vi ser i dessa exempel är bildandet av auditiva generaliseringar genom tillägnande av musikaliska strukturer eller *tecken*. Barnen skaffar sig färdigheter som ger dem möjlighet att svara på samma sätt på liknande (men inte identiska) musikstrukturer. Genom kroppsliga – här främst auditiva – erfarenheter har barnet allmängjort musikaliska stimuli.”



Such aspects of musical understanding could also be the organizing constraints and instant perceptual problem solving strategies documented by Bamberger and Brody (1984), or the implicit musical capacities investigated by Bigand, Poulin-Charronnat, Schellenberg and associates (Bigand & Poulin-Charronnat, 2006; Schellenberg et al., 2005). In Bamberger's (2006) view, musical development happens in moments of tension between conflicting musical organizing constraints, and in constructively resolving those contradictions. One way of doing that is by the application of signs. For example, using the pitch-class name *g* and the concepts of *ROOT* and *FIFTH*, one may resolve the tension in hearing the *g* in a *G*-major chord and a *C*-major chord as both the same and different.

In this study, this theoretical understanding becomes important since it allows me to identify forms of knowing and learning that are potentially equally important as the verbal side of concept development. By hypothesizing mechanisms through which potential concepts can be drawn into conceptualization processes, I can design a study that tries to make this side of conceptualization visible.

#### 4.6 TOOLS, SIGNS, AND MEDIATION

When Wallerstedt and associates (e.g. Wallerstedt, 2010; Wallerstedt, Pramling, et al., 2014) conceptualize musical listening as a higher mental function, they do so with reference to Vygotsky's work. In his own time, Vygotsky was by no means alone in distinguishing higher and lower (or elementary) mental (or psychological) functions, nor in seeing the former as based in culture or society (Toomela, 2016; Valsiner & van der Veer, 2000). However, Vygotsky's work was especially focused on the development of higher mental functions—as he saw them as specifically human forms of mental functioning—and his conceptualization of higher mental functions and their origins remains a fruitful one.

Higher mental functions, to Vygotsky (2012), are characterized by being volitional and conscious. Consciousness to Vygotsky here is self-reflective, “awareness of the activity of the mind” (Vygotsky, 2012, p. 180; cf. Miller, 2011). This conscious control is achieved by

lower mental functions being *mediated* (and hence transformed) by psychological tools—signs—in analogy with how physical tools mediate our engagement with the environment, and in doing so change the nature of work. Psychological tools, signs, have their historical origin in society, where they are developed to mediate communication between people, but they can be turned inward (to use Vygotsky’s evocative phrase) and used in mastering our own psychological processes. Hence, the distinction between higher and lower mental functions cannot be reduced to a simple nature-culture dichotomy. Rather, higher mental functions are the synthesis resulting from a dialectic process wherein lower mental functions and psychological tools originating in culture meet and transform into something qualitatively different.

Conscious awareness and mastery of mental functioning are dependent on concepts being integrated into a *hierarchical structure*. This goes back to Vygotsky’s understanding of higher mental functions as self-reflectively conscious. There is a subtle distinction in Vygotsky’s work between for example, mediated act of perception, and mastery of the mental function perception. Vygotsky puts it in terms of the direction of the activity of consciousness, and if it is towards the *what* or the *how* of an action.

I have just tied a knot—I have done so consciously, yet I cannot explain how I did it, because my awareness was centered on the knot rather than on my own motions, the *how* of my action. When the latter becomes the object of my awareness, I shall have been fully conscious. (Vygotsky, 2012, p.180, emphasis in the original)

By being integrated into a hierarchical structure, a mental act can be conceptualized as a *particular kind* of mental act, and thus separated from the undifferentiated whole of mental activity (Vygotsky, 2012, pp. 180–182). There is thus a potentially important, qualitative difference between conscious awareness being focused on the object of the symbol that is mediating awareness, say hearing a chord *as* a certain chord, and conscious (self-reflective) awareness of the act of listening in itself. It is arguably in the latter case that the mental function, *listening*, can be said to be mastered: When the

focus of attention is not only mediated by symbols, but attention itself is mastered by means of symbols. It is, in short, the difference between hearing something *as* something, and *deciding* to listen *for* something. A similar argument can be applied to other higher mental functions, for example *remembering* (Pramling & Säljö, 2011).

In later theorizing (e.g. Wertsch, 1993, 1994), the tool-analogy Vygotsky uses has been expanded to encompass (cultural) tools or artifacts in general. This has the advantage of capturing distributed cognition well—e.g. using a calendar (Säljö, 2013, p. 34ff.) or sheet music (Hultberg, 2002) to think with. However, this expansion of the tool-analogy risks privileging a focus on visible, fully formed, tool mediated activity, over the development of specifically mental forms of functioning (Miller, 2011; Toomela, 2000, 2008).

James V. Wertsch (1993, 1994, 1998) in particular, has argued that *mediated action* should be the primary unit of analysis in socio-cultural research. Wertsch traces his notion of mediated action to Vygotsky, ascribing to him the idea that “mediational means such as language and technical tools do not simply facilitate forms of action that would occur otherwise” (Wertsch, 1994, p. 204), but that they also transform the activity itself. This in itself is not a problematic idea. For example, the act of joining two pieces of wood together is made possible by tools, and using a hammer and nail is a different activity from using a screwdriver and a screw. To use an example of more relevance to this thesis, the concept *TONIC*—a psychological tool—in a sense makes the activity of listening for tonics possible.

What is misleading about Wertsch’s statement is how he combines “technical tools” and language into one category while backing it up by quoting a list of examples given by Vygotsky: “language; various systems for counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes; diagrams, maps and mechanical drawings; all sorts of conventional signs; and so on” (Vygotsky’s “The Instrumental Method in Psychology” quoted in Wertsch, 1994, p. 204). But note what all of Vygotsky’s examples have in common: They function as tools in their semiotic or symbolic capacity, not in their physical or mechanical capacity. Vygotsky sometimes used the example of tying a knot in one’s handkerchief as

a mnemonic device, and it is illustrative here: In such a case; it is not the function of the knot as a joining device that does the work, but letting the knot *signify* something to be remembered (the example is borrowed from Miller, 2011).

While it may be reasonable to do so given Wertsch's knowledge interest in mediated action, not upholding the distinction between technical and psychological tools mischaracterizes Vygotsky's argument in a way that renders the latter's theory incoherent. As opposed to Wertsch, Vygotsky (Vygotsky, 1997a, p. 60ff.) was at pains to point out that the analogy he makes between actual tools such as hammers and sickles, and psychological tools—that is, signs such as the emblem of the USSR—may lead wrong if taken too literally.

[...] there is no shortage of attempts to ascribe literal sense to similar signs, equating the sign and the tool, to erase the profound difference between the one and the other, to dissolve in general psychological determinations the specific distinctive characteristics of each type of activity. (Vygotsky, 1997a, pp. 60–61)

The development of mediated activity using psychological tools requires a different analysis, because it requires an explanation of how learners (re-)construct the tool itself—it cannot be picked up, ready-made from a tool-box—not just how they learn to use it.

Listening as a higher mental function can serve as an example of this. In a study by Wallerstedt (2013), a group of children are using a music technology where musical sounds are accompanied by corresponding waveforms on a screen. They dub one of these (representing a cluster) “the sausage” and use that term to guide their listening and organize their collaboration. As in the example with the handkerchief, it is the act of letting the word “sausage” *signify* the image on the screen and letting the image on the screen *signify* the corresponding sound that lets them use it in communication and turn it upon themselves to aid themselves in listening. Thus, I believe that upholding the distinction between tools and signs is crucial to a consistent analysis of the role of inscriptions in reasoning, as well as of the role of concepts in making inscriptions meaningful.

Subsuming tools and signs into the category *cultural tools* also tends to be connected to a proliferation of things categorized as tools. I am less certain about what drives this tendency, but it may have to do with the lack of a straightforward way of conceptualizing non-mediated perception and thought in these theories. In music education research using a basic mediational triangle (subject, mediational means, object), phenomena seem to gravitate to the top of the triangle and it is often unclear what it is that is being mediated, or the whole activity schematized in the triangle ends up being the entity that is appropriated. For example, Mars (2015, 2016b, 2016a) classifies sounding music, listening, the ability to play by ear, critical thinking, and encouragement as tools in her analyses. Bygdéus (2015) classifies attitude, and respect as tools in her analysis of choir conductors' cultural tool use. Backman Bister (2014), like Hultberg (2009), classifies musical conventions, musical performances, and musical structure as tools.

Arguably, this proliferation of tools mystifies the relation between subject, means, and object at the heart of these theories. Sounding music and musical performances as models for learners to imitate do not in themselves explain how the learner makes sense of the models so that they can be imitated—either they are understood by means of something, in which case that something is the mediational means, or they are apprehended intuitively, in which case it is not a mediated activity in the sense of these theories. A person's tool mediated activity can be characterized by *attitude* or *respect*, but they are not tools in themselves. A musical performance or sounding music can be *listened* to, or imitated *by ear*, or *thought critically* about, and so on, but these are not tools. Rather, they are activities that can be analyzed as being mediated by, for example, concepts of musical structure or musical conventions (which are not the same kinds of things as musical structures or conventions), or by a musical instrument (which is not the same kind of tool as a concept).

4.7 LEARNING, APPROPRIATION,  
AND INTERNALIZATION

Conceptualizing *learning* is fraught with difficulties. No matter how one defines the term, paradoxes seem to abound, starting with Meno's paradox (Marton & Booth, 1997; Miller, 2011; Sfard, 1998). One of the most rhetorically effective innovations of the sociocultural or situative (Greeno, 2015) theory-tradition was redefining learning from acquisition or construction to a movement from peripheral to central participation (Sfard, 1998; e.g. Rogoff, 2003). Activity theory accomplishes something similar by defining the activity system as the learning unit (Engeström, 1987). By redefining learning as a phenomenon that cannot be observed with the individual as unit of analysis, it became possible to avoid several of the conceptual problems associated with theories that uphold a dualism between the learner and the surrounding world.

In some sociocultural traditions, this reconceptualization of learning is expressed through a preference for the term *appropriation* (making one's own) as a term for learning, and a distancing from the term *internalization*, for its dualist connotations (e.g. Jakobsson, 2012; Säljö, 2000; Säljö et al., 2011; Wertsch, 1993). Valsiner (1997) argues that appropriation-terminology is connected to an ontological position that denies a separation between person and (social/material) world (see also Section 4.9). Without such a distinction, there is no meaningful distinction between internal and external mediated action. The utility of the term appropriation in the context of sociocultural theory is thus connected to subsuming tools and signs in one category. Given the knowledge interests of this thesis, I believe that an analysis of learning needs to take seriously the problem that direct transmission of knowledge is impossible (Vygotsky, 2012, excluding the option of telepathy), which is difficult to do if one sidesteps the problem through a participation model of learning (Miller, 2011; Toomela, 1996a, 2015).

While Wertsch (1994) is correct that both tools and signs can function as mediators in mediated activity (that is the content of the analogy), they differ in how they orient that activity and in how the ability to engage in the activity develops.

The tool serves for conveying man's activity to the object of his activity, it is directed outward, it must result in one change or another in the object, it is the means of man's [*sic*] external activity directed toward subjugating nature. The sign changes nothing in the object of the psychological operation, it is a means of psychological action on behavior, one's own or another's, a means of internal activity directed toward mastering man himself[*sic*]; the sign is directed inward. These activities are so different that even the nature of the devices used cannot be one and the same in both cases. (Vygotsky, 1997a, p. 62)

Why cannot the nature of the devices be the same in both cases? The reason comes down to one of the central ideas of Vygotsky's psychology. The original function of signs—the reason for which they are historically developed and culturally transmitted—is to change the minds of social others in communication (note that this does not mean that the minds of social others are the objects of the signs, by “object” Vygotsky means that to which the sign refers). But as mentioned above, signs can be “turned inward” (Vygotsky, 2012, p. 92) and be used to change our own minds as well. This process, by which a social, inter-mental operation becomes a personal, intra-mental operation is essentially what Vygotsky called *internalization* (Vygotsky, 2012; Vygotsky & Luria, 1994).

This is the reason why the developmental trajectory of a sign mediated activity differs from that of a tool mediated activity. Put bluntly, an important difference between a sign, say the word “hammer”, and a tool, say an actual hammer, is this: While one can fruitfully turn the former upon oneself—for example by telling oneself “I shouldn't hit myself with the hammer,” thereby regulating one's actions in such a way as to avoid committing this mistake—one can only turn the latter upon oneself (or worse, internalize it) at the risk of significant injury.

Subsuming physical and psychological tools under the same category and an analytical focus on mediated action is a good strategy given a certain knowledge-interest. But when it is applied to signs, it risks privileging observable patterns of action and surface features of the tools. This problem, as exemplified by Wertsch's work, is at the heart of some of the issues I have pointed to (see Section 2.3 and 4.6) with socioculturally inspired research by Mars (2015,

2016b, 2016a), and with the Bruner-inspired research of Backman Bister (2014) and Hultberg (2009).

These researchers share with Wertsch a conception of cultural tools that encompasses both tools and signs. Since what material and psychological tools share is not the way they are learned—material tools cannot be internalized—but their function in mediated activity, a methodological and analytical focus on changes in external use patterns is privileged before a focus on what learning makes those changes possible. This is, for example, visible when Mars (2015, 2016a) or Backman Bister (2014) write about participants *lending* or *borrowing* tools, even when those tools are words rather than guitars, while at the same time conceding that the students do not understand how and why to use the tools to the same degree that the teacher does. In other words, the analysis privileges surface features (e.g. using the same phonetic form) before the underlying structures that makes the tool use meaningful.

As already Vygotsky pointed out, this is not a satisfactory analysis, since “[t]hough the child and adult may use one and the same word in referring to one and the same object, their mental operations are quite different” (2012, p. 153). Without the distinction between tools and signs it becomes difficult to conceptualize that while I can borrow a fully formed hammer out of my friend’s toolbox, when I borrow a word, the underlying word-meaning needs to be re-constructed. The word is an important part of that process, but in itself it is just a sound.

This means that I do not find the use of the term *internalization* to be inherently problematic, and I will use it to talk about the use of signs to regulate one’s own actions. As Bruner (1996) points out, *externalization* makes it possible to think together, and makes it easier to think about our own thoughts, since it creates a record of mental activity. Externalization and internalization are bound up together, since such records of mental activity, whether produced by oneself or a social other, can be turned inward and used to regulate thought. At the microgenetic level, this may manifest as feed-forward loops, or cycles, of externalization–internalization (Valsiner, 1997).



## 4.8 LEARNING, INSTRUCTION, AND DEVELOPMENT

Today, the language of *learning* tends to be used in framing educational research questions and be the language in which we frame educational goals (Biesta, 2005). During the first half of the 20th century, psychology—especially European psychology—had a strong focus on development rather than learning (which was the language of behaviorism and reflexology).<sup>16</sup> Valsiner and van der Veer (2000) have documented how that focus on development as a dynamic process was attenuated and sometimes lost when psychological theories were adapted to American contexts after WWII. Two prominent examples of this is Piaget’s genetic epistemology, which was turned into a stage theory, and Vygotsky’s cultural-historical psychology. In the latter case, the focus on development of word-meaning was superseded by the study of overt tool-use, often blackboxing intramental processes or denying them outright (on Vygotsky’s reception in America, see also Glick, 2004; Miller, 2011).

While there is no reason to blindly accept Vygotsky’s work as it was left by its progenitor, I believe that overlooking the role of development in it means abandoning much of its explanatory power. Vygotsky’s theory is not only *about* development; it takes an explicitly *developmental perspective* on investigating the mind. Thus, Vygotsky’s work on higher mental functions and concepts is framed in terms of the *development* of higher mental functions, not the *learning* of higher mental functions, or the *development* of concepts, not the *learning* of concepts (Vygotsky, 1997a, 2012). This developmental perspective is both theoretical and methodological.

What, then, is the difference between learning and development in this theoretical framework? Firstly, I should make clear that Vygotsky’s work is not a single, unified theory, so inconsistencies are

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<sup>16</sup> This was probably, in turn, based in the strong presence of Hegelian and Marxist philosophy in this cultural milieu. As Popper (2013) points out, Hegel (and following Hegel, Marx) took over from Aristotle a teleological understanding of essence, meaning that the nature of a phenomenon is revealed in its development towards that nature.

to be expected. Secondly, Vygotsky's notion of development is not one of endogenous processes of maturation. Hence, the difference between learning and development cannot be that learning is a result of interaction with the social and material world, while development is not. While I have failed to find a stringent distinction between the two terms in Vygotsky's work, it is my impression that *development* tends to refer to qualitative change in some psychological system or element (a higher mental function such as memory, a conceptual system, or a concept/word-meaning), while *learning* is more often (but by no means exclusively) used to talk about quantitative change (learning more of something), conditioning, memorization, and imitation. The notion of development, at least in the context of concepts, appears to have more domain-general connotations for Vygotsky, connected to ideas around formal discipline and, reading between the lines of the English translation, *Bildung* (Vygotsky, 2012, p. 188f.; cf. discussion of material and formative *Bildung* theories in Nielsen, 2007).

Such a division between development and learning may be a bit oversimplified, and should be understood as my own attempt to understand Vygotsky's work, but it does help make sense of Vygotsky's claim that the relationship between scientific concepts and concept development is like the relation between the level of actual development and the *zone of proximal development* (ZPD, Vygotsky, 2012). The concept of the ZPD is related to Vygotsky's argument that useful *instruction* runs ahead of development. While the ZPD is often used as a device to argue for a view of knowledge or learning as distributed (e.g. Wertsch & Tulviste, 1992), and to develop a counter-narrative against the view that learning is constrained by developmental stages, Miller (2011, 2017) presents a different interpretation.

Taking up Vygotsky's ideas around formal discipline, Miller argues that the ZPD should not be viewed simply as a zone where learning of skills and facts happens, but that the influence of instruction on development, as conceptualized in the ZPD, pertains to formal aspects of schooling:

[...] there are two components of school learning: content learning of discipline-specific material such as arithmetic, history, literature, physics, and so on; and conscious awareness that cuts across all disciplines and represents meta-knowledge or knowing that one knows. The role of instruction, then, is not simply to impart information but to bring about a state of reflective understanding that enables a learner to regulate and master the learning process. (Miller, 2017, pp. 37–38)

The ZPD can thus be understood as constituted by instruction and learning, but constitutive of development. In other words, the ZPD is not primarily a model of how people take over content from instruction, but of how instruction and learning leads to the development of qualitatively new ways of relating to that content.

To Miller (2011), this distinction crucial to understanding how what is known by the teacher can become known by the learner. Instruction depends on communication, which depends on shared meaning. But the reason that instruction is necessary in the first place is that the learner does not understand something in the same way as the teacher, i.e. there is not shared meaning in the relevant domain: “The teacher cannot teach the very understanding that is the object of learning because the learner cannot use the old or existing understanding that needs to be replaced as a means to grasp new understanding” (Miller, 2011, p. 173). Therefore, Miller argues that a theory seeking to explain how instruction, learning, and development work needs to specify “an *interface* between the known of the teacher and the not-known of the learner” (Miller, 2011, p. 172, emphasis added).

Tying back to the ZPD, Miller’s solution to the interface-problem is other-regulated action and performance without competence. Teachers can use their understanding of a domain to regulate students’ (overt or covert) actions in such a way that they can solve a problem without having the competence to do so. While students might learn verbal scripts, definitions, or techniques (i.e. content) from their teachers in such a situation, the source of development is not the teacher *per se*, but students directing conscious awareness toward actions they could not have performed successfully without

instruction<sup>17</sup> (Miller, 2011, 2017). In this context, the concept of *scaffolding* should be mentioned. Wood, Bruner, and Ross (1976) used this metaphor to describe the way in which a more experienced tutor controls aspects of a task which are beyond the ability of a learner, allowing for the successful ordering and execution of subtasks, and eventually the whole task—similar to how a scaffold permits the construction of an arch.

The scaffolding concept, as developed by Wood et al., is concerned with the development of skills, and with the process of problem-solving. To Miller (see Miller, 2011, p. 294ff., 373, 2017, p. 40, footnote 46) the scaffolding-concept has little or nothing to do with the kind of performance without competence he ascribes such importance to. This partly has to do with scaffolding being about skills, and specifically how the skill is organized by other people, while Miller is concerned with understanding, which he equates with the ability to organize action, a recipe for action. On the other hand, Wood et al. (1976) stress that in learning through scaffolding “comprehension of the solution must precede production” (p. 90, emphasis omitted), which appears to me to be quite similar to Miller’s point that “[i]n performing actions that satisfy the demands of a new task[...] the meaning of the task resides in the actions that constitute its solution” (Miller, 2011, p. 173). The difference, if there is one, appears to be that Miller stresses to a higher degree that conscious awareness directed at one’s own actions is the source of learning and development, and that there is necessarily a certain amount of intersubjective understanding required for scaffolding to get off the ground, which Miller appears to think analyses in terms of scaffolding leave unaccounted.

With that said, Miller (2011, 2017) and Wood et al. (1976) appear to be in agreement in regards to the importance of other-regulated action in the relation between instruction, learning, and development. Note that this holds even in a context where the

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17 Or rather, would have been less likely to perform without instruction. Otherwise, new knowledge could never be created.

teacher has left the scene, since modes of learning such as memorization, imitation, etc., can facilitate other-regulated action also in the absence of a teacher. It also holds where interaction with social others is mediated through some kind of inscription or other socially and historically developed artifact. Following Valsiner (1996), I understand this process as one of *co-construction*, to which I will turn in the next section.

#### 4.9 CO-CONSTRUCTION AND INCLUSIVE SEPARATION

As developed by Valsiner, the co-constructionist perspective seeks to balance between constructivist and sociogenetic theories, and especially the risk of the former sliding into solipsism and the latter sliding into social determinism. It is also an attempt to balance the focus on the individual learner as constructor, and the redefinition of the learning or developing entity as a group, a practice, or an activity system (e.g. Engeström, 1987). The co-constructionist perspective recognizes both the centrality of the developing person and the historical primacy of the social world by using a bidirectional model of cultural transmission. For the purposes of this thesis, this means that the social situations in which learning happens are neither imposed by some nebulous culture nor the products of an individual's idiosyncratic construction, but rather jointly constructed by the participants using the cultural and cognitive means and constraints at their disposal. The individual is constructing the social reality that feeds into the developmental process, both by interaction and interpretation, but so do the other individuals s/he is interacting with and whose actions s/he is interpreting.

Note that on this view, notions such as shared meaning or intersubjectivity cannot be taken as explanatory devices. As Toomela (2016) points out, an organism relates to the world through its senses, and the sensory organs can be understood as a meaning-bottleneck. Every phenomenon in the world, no matter how exquisitely socially organized and pregnant with meaning, needs to pass through the senses before it can be apprehended. The notion of individuals constructing and directly apprehending meaning in

some kind of shared social space therefore becomes an oversimplification (although perhaps a useful one, similar to how a biologist might talk about “a gene for attribute X” although that is not how heritability works).

In order to avoid the solipsism that could result from such a view on meaning, the learner-world dualism of individual constructivism, Valsiner (2003, 2014) argues for taking a stance of *inclusive separation*. The concept of inclusive separation rests on the idea that any separation between two units A and B of a holistic system AB (as this stance recognizes the world to be) implies a metaphorical boundary between them. But such a boundary becomes not only what separates, but also what unites and constitutes these two units. Methodologically, this implies directing attention to what happens on the border, rather than on how something from A moves to B or the other way around. Indeed, this is one of the strengths of the ZPD as a theoretical concept, where Miller’s (2011) notion of an interface (see Section 4.8) can be understood as an attempt to focus on what happens on the border.

If the notion of co-construction is not to become a black box, one must be mindful that co-construction does not depend on shared meaning, but is intended to *explain* how shared meaning originates through interactive and interpretative co-constructive processes. Shared meaning is a result of sign-meaning developing in ways that are socially constrained in co-constructive (direct and indirect) interaction. As discussed above, this co-constructive activity can serve to *conceptually mediate* the conceptualization process by means of signs and their previously developed meanings, or to *situate* the conceptualization process by drawing implicit and situationally relevant connections between concept and object. As an example, a teacher defining a concept, demonstrating how to use it in problem solving, or using it to refer to an experienced phenomenon that is its object, can be said to be modeling different kinds of conceptualization processes.

As Branco and Valsiner (1997) put it: “the focus of interest is on the ways in which the causal system operates, rather than on its parts per se” (p. 43). The study of word-meaning in development

provides a microcosm of the development of higher mental function (Vygotsky, 2012), and an understanding of the development of mature concepts is, at the same time, essential to understanding the development of the higher mental functions they mediate. By focusing on concept development, the development of word- or sign-meaning in and around a central visual representation of a conceptual system, I can narrow the study to a manageable aspect of this process, that still retain the properties of the whole.





## 5. Methodology and Ethics

The design of a study is not only a question of practical considerations, but must also be informed by ethical considerations, and a theoretical understanding of one's field of study and knowledge interest—as can be seen in how the preceding chapter already veered into the territory of how to study these phenomena.

This study is about how students make sense of the circle of fifths and the music-theoretical concepts associated with it, and how those sense-making processes relate to educational practices. In the first section (5.1) of this chapter, I will discuss how the theoretical understanding of these matters, which I have developed in the previous chapter, informs my decisions regarding how I go about investigating them empirically. In other words, it is about methodology (Branco & Valsiner, 1997, p. 37ff.; Valsiner, 2017). After this (Section 5.2), I will discuss ethical constraints on how I can go about studying these matters, and outline how I have handled ethical challenges encountered during the course of the study.

### 5.1 METHODOLOGY

Above, I have developed an understanding of the circle of fifths, in its materialized, external form, as an inscription, which implies that it is not inherently meaningful. This means that in studying

how students appropriate the circle of fifths I need to consider how it is made meaningful, into a representation. While some of the individual signs and symbols making up the diagram can be construed as referring to concrete musical phenomena, the utility of the diagram is arguably rooted in its ability to model more abstract conceptual relationships. Therefore, a study of how students make sense of the circle of fifths also needs to take into account how students make sense of the more abstract concepts of tonality that the diagram can be read as representing.

Drawing on Vygotsky's work on concept development, I conceive of concepts as generalizations, and the development of mature concepts as a dialectic synthesis of mediated and situated conceptualization processes, resulting in qualitatively new generalizational structures. Mediated conceptualizations are ultimately dependent on situated conceptualization, since they are introduced by means of other concepts. Situated conceptualization, in turn, is dependent on concrete, situated experiences—in the case of music, they are the link between potential concepts, grounded in musical experience and practice, and sign-based ways of approaching music.

I have also stressed that terms like *scientific concepts* should not be understood as static end-points of development, but rather as dynamic aspects of a developmental process. I will argue that taking such a developmental, or *genetic*, perspective is a theoretical position with methodological consequences. It is in development that we may get at the different elements that are synthesized into a new structural whole—what they are, how they interact, and how they are changed in the process of synthesis. This is because of how the development of higher mental functions is dependent on mediation by means of symbols, which are originally co-constructed in an overt manner, which is observable.

Taking a developmental perspective, this means that I need to situate my study in a setting where the phenomena I am interested in are in the process of development, and where there are reasons to believe that such development is required, supported, and encouraged—an educational context. To the extent that non-verbal aspects of musical understanding are important for the development

of music-theoretical concepts, it would be of interest to select a site where potential participants are able to communicate not only verbal, but also non-verbal musical knowing. This also applies to the selection of participants within the site. I should select cases who are relatively proficient musicians, and thus able to *show* situated musical understanding in practice, but who are only beginning to learn the circle of fifths and associated music-theoretical concepts.

An educational context offers the possibility to study the practices through which circle of fifths-inscriptions are introduced, reproduced, and used. But restricting myself to (supposedly) naturalistic situations would limit the degree to which I would be able to extend a description of educational practice into a wider theoretical account of the relationship between instruction, learning, and development. A certain amount of intervention is motivated in order to construct a data material that allows for analyses of how participants interrelate and change concepts in interaction. I will return to the concept of case study and the selection of cases in Sections 5.1.2, 6.4.1, and 6.7.1.

### 5.1.1 Units of Analysis

Matusov (2007) points out that the question of the “appropriate unit of analysis” (p. 307) is a contested one in research traditions drawing on Vygotsky’s work. Focusing on units of analysis has long been a popular way of framing theoretical and methodological critiques of competing research traditions, and in this sense, Vygotsky’s latter-day adherents are following in his footsteps. An argument for a specific unit of analysis easily takes on a totalizing aspect, however, becoming framed as *the* appropriate unit of analysis, rather than *an* appropriate unit of analysis given a certain research interest and certain theoretical assumptions. Similarly, Säljö (2009) points out that the concept of learning offers many possible units of analysis, corresponding to different levels of inquiry.

A certain kind of holism (which Toomela, 2015, calls structural-systemic) is an important part of Vygotsky’s approach. Discussing his unit of analysis, Vygotsky (2012) argues for a holistic understanding of consciousness, of verbal thought, and of word-meaning,

respectively. Note that already by making these three distinct arguments, Vygotsky shows that his holism does not postulate the identity of these three phenomena (compare the concept of inclusive separation, Section 4.9). Rather, Vygotsky argues that understanding consciousness requires an understanding of the interrelated dynamics of its parts, one of which is verbal thought, which in turn must be understood based on the dynamic interrelations of its parts as well as its place in the whole system of consciousness, and so on. In other words, Vygotsky is not averse to partitioning psychological processes into parts for the sake of analysis, but insisted that, in order to avoid misleading reductionism, these parts should retain the properties of the whole (Vygotsky, 2012; cf. Matusov, 2007).

Vygotsky uses the example of water to illustrate how the whole is more, or different than, the sum of its parts, and that analysis should not be into elements but *units* that retain the properties of the whole. If we seek to understand why water extinguishes fire, and in the analysis reduce water into its elements hydrogen and oxygen, we will to our surprise find that “hydrogen burns and oxygen sustains fire” (Vygotsky, 2012, p. 4; Matusov, 2007, points out that this example was borrowed from the Gestalt psychologists).

Vygotsky’s water-example is a pretty bad argument, and one that is at odds with his methodological principles in some respects. For example, one might argue that one of the reasons that water does not burn is that it is the product of burning hydrogen and oxygen, something we can only understand by reducing water to its elements and then putting them back together. The example is misleading because it is lacking the other aspect of Vygotsky’s theoretical-methodological approach—genetic (developmental) analysis. To continue with the water-example, we understand the non-burning properties of water not only by reducing it to its elements but by also *putting it back together again*, that is, by studying its genesis, how it comes to be. If the whole is something more or different than the sum of its parts, and if the parts change or lose their properties when they become part of the whole (e.g. hydrogen is, in some sense, no longer flammable when it is part of a water molecule), understanding a complex whole requires

studying its development. In development, the parts making up the whole can be distinguished, by studying how they are synthesized into a new whole it can be understood how they change in that process, and how their interrelations produce something that is qualitatively different.

In other words, to understand something is to determine the units making up that something and how those units combine structurally in development to make something that is more or different than their mere summation. This structural-systemic holism may be most apparent in Vygotsky's analysis of word-meaning (Vygotsky, 2012, p. 209ff.). Word-meaning is a dynamic phenomenon to Vygotsky, a set of relations in a conceptual system. This conceptual system is not static: word-meaning develops. Vygotsky's choice of word-meaning as his unit of analysis boils down to it being the smallest possible unit where thought and word, the inner and outer, private and social aspects of verbal thought unite—social speech without meaning is just nonsense, thought without words only carries the potential of conceptualization. It is by means of this dual function of the word (or the sign) that the mind becomes socialized.

It should be noted that there are two different senses of “unit” at play in Vygotsky's discussion (Matusov, 2007), a descriptive one, simply meaning the smallest object being analyzed, and a prescriptive one, which is the one I have highlighted above. In order to avoid this confusion, Matusov calls the former *the descriptive unit of analysis*, and the latter *the unit of the phenomenon*. The relation between these two is a theoretical-methodological problem. Vygotsky's critique of other psychological schools' units of analysis can thus be reframed as an argument that their descriptive unit of analysis is reduced to one side of the dialectic making up the unit of the phenomenon (e.g. a singular focus on either reflexes or social practices).

In later theoretical developments based on Vygotsky's work (e.g. sociocultural theory, activity theory, CHAT), it appears that mainly Vygotsky's argument against reducing the unit of analysis into smaller elements than the unit of the phenomenon has been heeded. Attempts to find appropriately holistic units has resulted in

staking out progressively larger ones: Word-meaning, activity, activity systems, mediated action, dialogue, communities of practice, and so on (Matusov, 2007). Matusov argues that this results from implicit assumptions about there being *one* appropriate unit of analysis, and that since it is always possible to argue that a given unit of analysis misses some aspect of the unit of the phenomenon, the result is an ever-increasing holism which eventually becomes unmanageable.

How then, to find a balance between too reductionist and too holistic units of analysis? Matusov (2007) suggests that the search for *the* appropriate unit of analysis is misleading, and that we need to be comfortable with partial, incomplete, and open units of analysis. On this view, a particular unit of analysis is always part of a larger system, and could always be subdivided into smaller units. The choice of a unit of analysis depends on what aspects of the problem-field one wishes to foreground, and which ones one can be content to leave in the background. This also means that any particular issue can never be fully explored in a single study, nor using only one approach. Deciding on the unit of the phenomenon may be a question of theoretical and conceptual analysis, but how to operationalize that unit in a descriptive unit of analysis requires prioritizing which aspects of a problem to foreground based on knowledge interests, practical conditions, stakeholders, and so on.

I argued above that theories of learning need an *interface* between known and unknown (Miller, 2011). This interface needs to be able to work at the border of the (inclusively separated) personal and social, because if it is not, the teaching-learning paradoxes come into play. In considering what theories to use to constitute one's unit of analysis, then, an important question becomes whether the mechanisms by which this interface comes into being and does its job are in turn understandable, and not tantamount to claiming that it just works. Vygotsky's genetic and structural-systemic conception of what it means to explain his unit of analysis leads him to a method of study that is not contrary to (inclusively) separating its elements (e.g. the natural and cultural roots of thinking and speech; scientific, everyday, and potential concepts; etc.). The analysis, however, proceeds to synthesis rather than stopping at reduction.

Vygotsky (2012) argued for word-meaning as a productive unit of analysis (as in unit of the phenomenon) because it retains the properties of the whole (verbal thought). But it should be stressed that it, by doing so, also is precisely the kind phenomenon on the border discussed above. Here, I am aiming to delimit a similar unit of the phenomenon, although I will talk about *sign*-meaning rather than word-meaning. This is because my research-focus, the circle of fifths, is a representation constituted by visuo-spatial signs as well as conventional symbols. But how can sign-meaning be studied? I cannot look inside the heads of the participants in my study and see what they mean when using a certain word (and even if I could, it would not tell me much). This means that the analysis of sign-meaning in turn depends on operationalizing it through a more observable, descriptive units of analysis: The observable aspects of practices through which sign-meaning can develop, and the individual cases *for* whom sign-meaning develops. I will expand on the first of these in Section 5.1.3 on the study of interaction, on the latter in Section 5.1.4 on microgenesis, and both in the Section 5.1.5 on analysis.

#### 5.1.2 Qualitative Case Studies

As I state in the formulation of my research problem and research questions (Chapter 3), this study is organized by a selection of cases. The particular educational context where my study is conducted is a case of aural skills and music theory education in upper secondary school. Aural skills and music theory education in upper secondary school is a case of music education focused on the representation and conceptualization of music involving adolescents. The students whom I interview are cases of adolescents involved in music education focused on the representation and conceptualization of music. Music-theoretical concepts and models are cases of representation and conceptualization of music. The circle of fifths is a case of a music-theoretical model embedded in a conceptual system.

This structure of cases within cases rests on three pillars that ground it in empirical observation: The students, the educational

practice in which they are situated, and the circle of fifths with its associated concepts, which are introduced through the educational practice.

My understanding of learning and development directs what kind of data I want to construct. If concept development is change in generalizational structure, and this change in generalizational structure is the result of a dialectic *process*—a question of synthesis rather than a direct cause-effect relationship—then that change is qualitative (or at least the interesting aspects of it are). It is not a question of adding or subtracting more of some fixed variable, but a structural change, resulting in something qualitatively different. This means my methods of data construction need to be sensitive to qualitative differences, and the data thus constructed needs to make those qualitative differences available for analysis. This also means that I cannot limit myself to describing process as a series of states, where one causes the next. Instead I must investigate how one functional whole transforms into another, by analyzing the structural relations between the units making up the whole as determining both the nature of the whole and the nature of the units themselves (Valsiner, 2017; Wagoner, 2009).

This view of what development is also entails that the individual case is where such processes can be studied. Systemic change happens at the level of the individual psychological system (Toomela, 2015; Wagoner, 2009), and although other people, contexts and so on can be involved in the co-constructive process, their role cannot be inferred from averages. My methods need to reflect that, focusing on the different units and how they are synthesized into a new whole in each individual case. However, focusing on individual cases should not be confused with assuming that development is a wholly endogenic process, or that the wider context and the instruction happening in that context is irrelevant to how development happens (and what develops). Rather, I should combine detailed studies of developmental processes as they occur, with more contextualizing studies of how the relevant concepts are introduced and used in the educational setting. Each of these can then potentially inform the other.



### 5.1.3 Studying the Co-Construction of Sign-Meaning through Interaction

This study asks about educational practices, which can be understood as particular institutionalized forms of interaction, and frames the relationship between teaching and learning in terms of co-construction, which happens through direct or indirect interaction. Arguably, interaction of some sort or other is the basic method of any social science (Valsiner, 2017). Thus, I need a way to analytically make sense of interaction. The field of *Interaction Analysis* grew out of the fields of ethnography, sociolinguistics, ethnomethodology, and Conversation Analysis, supported by the growing feasibility of using video to document human activity in the field. Interaction analysis can, at least in part, be understood as a way of extending conversation analysis beyond the bounds of verbal communication, but also includes attempts at analyzing how people interact with artifacts and technologies (Jordan & Henderson, 1995).

As such, interaction analysis is not simply a method of analysis but a theoretical-methodological package that carries assumptions about what interaction is, as well as what about it is important and possible to study. In particular, interaction analysis tends to view knowledge as situated in the interactions of members of a community (of practice), and to view analysis of “naturally occurring, everyday interactions” (Jordan & Henderson, 1995, p. 41) as the way to study such knowledge. There is often a focus on uncovering regularities in how interaction is organized and upheld, for example through turn-taking and repair-strategies (Gardner, 2019; Jordan & Henderson, 1995).

Therefore, it is important to be clear that this study is not primarily an interaction-analytic study. Although interaction analysis can be used to study learning, it should be clear from the previous chapter that the ambitions of this study go beyond describing knowledge and learning as it appears in situated interaction. Studies of *naturally occurring*, everyday interactions (a problematic concept in its own right) are not sufficient for capturing all the aspects of learning and development I am interested in, and I will argue that a degree of intervention is justified in order to provoke

and document learning and development (see e.g. Section 5.1.4). Regardless of one's theoretical ambitions, however, human action and interaction, and the traces these leave as artifacts, inscriptions, works, etc. are the only observable aspects of knowledge, learning, and development. When action and interaction are not tightly regulated (as in a controlled experimental situation, or filling out a survey) it is a messy, tangled business. In this thesis, I use some of the tools and analytical strategies of interaction analysis in order to disentangle that mess.

As pointed out by Rostvall and West (2005), a study may need to be set up with different levels of analysis, based in a multidisciplinary theoretical framework, where different levels correspond to different research questions. I am attempting something similar here, where the interaction analysis is primarily aimed at Research Question 1, while theories of learning and development are deployed in response to Research Question 2. One of the strengths of interaction analysis is that it makes clear what is actually *there* in the documented interaction, and conversely, what must be inferred by the researcher. I have tried to make this distinction clear in the way my analyses are presented in Chapter 7. My use of interaction-analytical tools and strategies should thus be viewed as a first layer of analysis, onto which I intend to build further layers using theoretical and methodological assumptions that are not typically part of the interaction-analysis package. I do not think that these assumptions are incompatible with the assumptions underlying interaction analysis, but simply that they represent different levels of analysis (Matusov, 2007; Rostvall & West, 2005).

The ambition of inferring not directly observable phenomena, processes, or regularities from observation is arguably an important part of any empirical discipline. For example, an inheritance from ethnomethodology into interaction analysis is the ambition to describe what people need to know (implicitly) to be able to engage in social practices (Jordan & Henderson, 1995). What tends to distinguish interaction analysis from more mentalistic analyses is instead something like Latour's (1987) rule (quoted on p. 68 above), that is, to not ascribe to people's minds what can

be explained by more readily observable factors. I will not strictly uphold this rule in this thesis, although I hope it will be clear when my interpretations deviate from it.

#### 5.1.4 Microgenesis

Detailed studies of development as it occurs are sometimes referred to as studies of *microgenesis*—approximately micro-development—and such studies are sometimes said to use microgenetic method or methodology. The concepts of microgenesis and microgenetic method have developed in several different directions since Heinz Werner introduced the term in the 1950's (Werner, 1956). In what follows, I will be building off of a microgenetic methodological tradition that is more focused on qualitative aspects of development and which has close ties to the holistic psychology of the interwar period (cf. Diriwächter, 2009; Diriwächter & Valsiner, 2006; Valsiner & van der Veer, 2000; Wagoner, 2009).

In particular, Wagoner (2009) approaches the study of microgenetic processes in a manner that strikes me as consonant with the theoretical and methodological assumptions I am working with. Starting from Valsiner's definition of microgenetic method as "any empirical strategy that triggers, records and analyses the immediate process of emergence of new phenomena" (quoted in Wagoner, 2009, p. 100), Wagoner develops a methodology that is explicitly experimental, but with an inclusive view of experiments that makes room for qualitative experiments. An experiment, to Wagoner, is "a *purposeful distortion of ordinary reality* carried out to systematically provoke, access, and analyze some generic aspect(s) of reality" (Wagoner, 2009, p. 99, emphasis in the original). Hence, an experiment need not be hypothesis testing in the conventional sense, nor rely on quantifiable variables specified ahead of time.

In a qualitative microgenetic experiment then, constructive developmental processes are provoked and supported in such a way that they become observable and available for analysis. In such an experiment, the experimenter is not a neutral observer, but an active participant in those processes. In my view, even some forms

of qualitative interviews can be seen as microgenetic experiments in this sense, since they are events that would not have transpired if not for my intervention in the normal flow of events, and can be planned with a certain purpose in mind—to systematically provoke certain communicative processes in a way that makes them accessible for analysis. Indeed, Valsiner (2017) turns this argument on its head, and argues that even conventional, highly controlled psychological experiments should be considered a peculiar form of interview.

Concerning accessing the relevant phenomena and making them accessible to analysis, this relies on a theoretical assumption that mediation is central to the processes being studied, because mediation by means of external (that is, observable, no dualism necessarily implied here) signs is what gives access to otherwise unobservable thought processes (Wagoner, 2009). A research participant putting something into words, in this view, is not primarily providing *intro-* or *retrospective evidence* of thought, conception, understanding, etc. Instead, the process of verbalizing is viewed as a developmental process in itself (this puts a different spin on the utility of so called “think-aloud” methods, see e.g. Ericsson & Simon, 1980). This can be understood as co-constructed cycles of externalization–internalization, where the constructive, generative aspect of the process happen at the boundary zone between inclusively separated insides/outsidings/pasts/futures (Valsiner, 1997). As Wagoner points out, whether observable mediation takes place is dependent not only on what mediational means are available, but also on the difficulty of the task, a point made already by Vygotsky (Vygotsky, 2012, e.g. in regards to egocentric speech).

Microgenetic experiments in this sense depend on variation in the clarity or nature of a stimulus, making it clearer, less clear, or introducing new, auxiliary stimuli, which can be used as mediators. These three ways of inducing and supporting microgenetic processes have clear parallels in pedagogical interaction, where a teacher may gradually increase or decrease the amount of support, or introduce new supporting structures. As Wallerstedt, Pramling, and Säljö (2014) point out, interviews can be approached as learning situations (for all parties involved, cf. Kvale & Brinkmann, 2009),

and the interviewer can be viewed as supporting the interviewee in a developmental process. Hence, again, it seems like the qualitative interview can be understood as a microgenetic experiment (Wagoner, 2009, brings up Piagetian clinical interviews as another example). In a sense, this means using deliberate changes in scaffolding (Wood et al., 1976) as a research method.

Being congruent with a developmental perspective also requires that these experiments are analyzed developmentally. This means, as Wagoner (2009) puts it, reading *between* observed instances—not just describing a developmental sequence (cf. Valsiner & van der Veer, 2000, for a similar argument). This is equally true for data documenting more long-term change, where one may not be able to follow the whole process in detail, as well as for understanding how microgenetic and more contextualizing analyses fit together. It is in this approach that the difference between the first, interaction-analytical layer of analysis, and the developmental analysis comes into play.

### 5.1.5 Abductive and Inductive Reasoning in Qualitative Research

As part of the movement for increased acceptance of qualitative research from the mid 20th century onward, qualitative research methods were formalized through the publication of articulated criteria for quality, best practices, and ontological and epistemological positions deemed congruent with a qualitative approach (Tavory & Timmermans, 2014). Much of the inspiration for this work came from the traditions of ethnography, phenomenology, and grounded theory, while other qualitative traditions—notably the qualitative psychology of the interwar period—left few traces. These influences, presumably together with a wish to create a contrast with hypothetico-deductive methodology, led to a conceptualization of the logic of qualitative research as *inductive*. This conceptualization has been increasingly questioned in recent years (e.g. Alvesson & Sköldberg, 2017; Tavory & Timmermans, 2014; Valsiner, 2017). *Induction* is a mode of reasoning where one proceeds from instances

to generalities. For example, I might note that all guitars I have encountered have had six strings, and conclude (erroneously) that all guitars have six strings. In qualitative research, grounded theory in particular laid claim to following an inductivist logic, connected to its repudiation of predefined theory. On this view, generalities, patterns, or categories are supposed to emerge from a thorough and theoretically unbiased engagement with the data (Alvesson & Sköldbberg, 2017; Tavory & Timmermans, 2014).

As Tavory and Timmermans (2014) point out, however, this idealized model can hardly hold in practice. To return to the guitar-example above, that piece of inductive reasoning relied on concepts like GUITAR and STRING being present beforehand. The notion that induction generates but does not require theory is based on a conflation of theory and generalization. It is true that induction can lead to generalized statements such as “all guitars have six strings,” which can be viewed as little micro-theories or hypotheses. But these hypotheses are not created by induction alone. The inductive contribution is the generalization from instances to general statement, not the categories that facilitate the induction. In the context of qualitative data analysis, induction is mainly a way of amplifying or substantiating generalizations by broadening their observational base.

Especially in combination with assumptions about the importance of naturalistic data, attempting to restrict oneself to inductive reasoning can easily lead to research that is mainly descriptive. These two positions when taken together also limit our ability to consider the ways in which qualitative research can contribute to theoretically driven generalization, and thus tends to lead to careful researchers pointing out that their results are only valid for the particular time, place, and people who were studied.

C. S. Peirce’s (1955) concept of *abductive reasoning* has therefore gained increasing support as more realistic, and theoretically productive, way of conceptualizing qualitative research and analysis (for different cases adapted to different disciplines, see e.g. Alvesson & Sköldbberg, 2017; Tavory & Timmermans, 2014; Valsiner, 2017). Peirce (1955) coined the term *abduction* to denote inference from

one or more (often surprising) instances to an explanation or a hypothesis—that is, among other things guessing. One of his examples involves meeting a man who speaks Latin, and from that surmising that he must be a Catholic priest. Note that this example relies on having some kind of (loosely defined) theory beforehand. In this case one must first assume that speaking Latin is uncommon and requires an explanation, and know that Catholic priests are supposed to know Latin. In other words, abductive reasoning involves asking *what would predict this already observed outcome?* “[A]bduction starts with consequences and then constructs reasons” (Tavory & Timmermans, 2014, p. 37). If other characteristics are part of one’s theory of Catholic priests, for example that they are to be unmarried, dress in a certain manner, etc., one is able to test one’s hypothesis in the standard hypothetico-deductive manner.

Because of its focus on explaining or theorizing about, rather than generalizing from, observed instances, abductive reasoning is often employed in case-study based research. Alvesson and Skoldberg offer a succinct explanation in terms of the research process: “Abduction entails that a (often surprising) single case is interpreted based on a hypothetical general pattern that, if true, explains the case in question” (2017, p. 13). In practice, a single act of abduction is often little better than a guess. Therefore, abduction-based models of research tend involve an iterative aspect, where the explanation for one observation is tested and adjusted on subsequent ones. Thus, the direction of generalization is not from single case to population, but from single case to theory, back to (new) single case (cf. Wagoner, 2009, on this point).

Both inductive and abductive strategies are useful in approaching the analysis of a complex data material. In order to make sense of and organize the data, both inductive pattern-finding and theoretical classifications will be necessary. When it comes to the analysis of single cases, and the relationship between observation and theory, however, abductive reasoning provides a better model. In the context of this thesis, this means that I will select cases based on theoretical considerations and my knowledge of the field. In the process of analysis, it may be motivated to focus on thoroughly analyzing an

especially rich case or two, and use other cases mainly as ways to test if the theoretical explanations are extendable or case-specific. Trying to use the logic of abduction also means that I should try to state strong theoretical explanations in general terms, in the hope that further research might refine or refute them.

#### 5.1.6 Interviews *in* Music<sup>18</sup>

If, as I have argued above (see Section 4.5), potential concepts are important for understanding concept development, and if musical potential concepts exist in musical action, a study of musical conceptualization processes needs to address the question of how they can be explored empirically. I have also argued that qualitative interviews can be seen as qualitative microgenetic experiments. Interviews in this sense are co-constructive learning situations. Given the multitude of music education research stressing the multimodal nature of communication in musical learning (recent examples include Falthin, 2015; Pramling & Wallerstedt, 2009; Sandberg Jurström, 2009) there is really no reason—other than living in a culture that prioritizes verbal language—to assume *a priori* that such interviews cannot be performed *in* music.

Indeed, it is difficult to think of any form of communication that is truly mono-modal. Qualitative interviewers relying on talk still pay attention to gaze, gesture, tone of voice, etc. The same holds true for the musical interviews considered here, but in this section, I am treating the musical aspect of the interview-communication as primary, to better see the implications of re-conceptualizing interviews in this way.

It is also common in interviews to use means other than those above—just three examples out of many are Piaget's different tasks,

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18 This section is based on an unpublished paper presented at the PhD-student day of NNMPF's conference in Gothenburg, February 2017. It has benefitted from comments from the auditorium and especially from my appointed discussant, Olle Zandén. Any and all remaining problems are, of course, my own.



stimulated recall, and photo-elicitation. In music education, a conventional example might be listening to music and playing on hand-held drums as part of interviews (e.g. Wallerstedt, 2010; Wallerstedt, Pramling, et al., 2014). To my knowledge however, co-construction of musical meaning *by musical means*—i.e. playing music together—has not been conceptualized as an interview *in itself*.

One researcher who comes close to a conceptualization of interviews by means of music is Sæther (2003, further discussed in a 2015 chapter). During fieldwork in Gambia, Sæther's gatekeeper, interpreter, and co-researcher *Alagi* Mbye asked her to be quiet during an interview and instead “played the questions on his instrument” (Sæther, 2015, p. 91). According to Sæther, Mbye could use “the musical discourse in Mandinka tradition to guide or manipulate the conversation along the lines needed” (2015, p. 91). In this interview, both Mbye and the interviewees are highly skilled musicians in that tradition. “Playing the questions” is dependent on the deep familiarity with conventional connections between certain ostinatos and certain narratives, which is what allows Mbye to steer the conversation in the desired direction.

Sæther (2015) discusses methodological implications of this event, and also of adopting similar research strategies closer to home. However, in both cases it is the interviewer rather than the interviewee who engages in musical activity, and the aim of that musical activity is conceptualized in terms of eliciting or facilitating verbal answers in the interview, to steer the communication in a certain direction, or to establish good relationships with research participants. Sæther's discussions of shared meaning making through playing music together are mostly framed, instead, in terms of participant observation. I believe the reason Sæther does not go further than that in her conception of the interview—to playing the answers as well as the questions—may be the nature of her research interests. The *musical* knowing in itself, while important, is not the focal point of the studies she discusses, but the social and cultural structures and practices that support (and are supported by) such knowing. Engaging in music, then, becomes just one of many ways to understand those structures and practices.

Interviews are conversations that are often structured as sequences of questions and answers. But what does asking and answering questions mean in joint music-making? Is it even possible to view musical communication in these terms? To Sæther, one can pose musical questions, but I would suggest that other metaphors—say conducting the interview in a context that is conducive to certain topics and less so to others—may be equally apt. The comparison of music and language is common enough that it is easy to take it for granted. There is a risk that verbal language becomes the implicit paradigm for understanding other modes of communication. Music may be a mode of communication, but that does not mean that musical communication affords all the same communicative opportunities as linguistic communication (Johnson, 2007, p. 235ff.; McDonald, 2011, 2012b, 2012a). That being said, some musical practices and conventions could be usefully understood *metaphorically* as questions and answers. One case of how the metaphor of asking and answering questions can map to the domain of music is the resolution of ambiguity in “fill-in” melodies (e.g. the first two phrases of *Twinkle, Twinkle Little Star*, where the second phrase fills in the scale steps contained in the pure fifth jump in the first phrase). As the answer to a question may resolve the ambiguity that prompted the question, the second phrase of *Twinkle* (partially) resolves the ambiguity of what kind of tonality we are in.<sup>19</sup>

As in Sæther’s case, understanding the “question” and “answer” as such depends on our familiarity with certain musical conventions. Hence, if I play a phrase that affords such a fill-in continuation, but leave it to you to invent the next phrase, the way you respond—and the amount of support you require from me in responding—tells me something about your familiarity with such conventions. Some of your musical knowing may become audible in your musical interaction. Kaladjev’s (2009) paper on musical generalizations refers

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19 Had we not known the melody beforehand, we might have assumed after the first phrase it was in the doric mode, or pentatonic, etc. Of course, just as an answer to a question can defy our expectations, the “fill-in” could as well.

to a study by the same author utilizing a similar method. In this study, children were asked to complete a short melody descending from the fifth of a major scale in three three-note sequences (e.g. g-f-e, f-e-d, e-d... implying an ending on c). In Kaladjev's study, however, this is understood as a *measure* of the children's sense of tonality rather than as question and answer in an interview (but see Valsiner, 2017, on viewing experiments as a highly constrained kind of interview).

Incidentally, this idea of completing *melodies* resembles a method Vygotsky (2012) used to study concept development. In order to study the development of scientific and everyday concepts, Vygotsky (and Shif) asked children of different ages to complete *sentences* ending in "because..." or "although..." (Vygotsky, 2012, pp. 156, 202). The relevant parallel here is that the unfinished melody and the unfinished sentence *imply* a completion, and that precisely what completion (if any) is implied to a respondent varies according to what implicit or explicit knowledge of conventions the phrase is understood and made meaningful. What conventional or unconventional turns of phrase it evokes for the person doing the completing says something about the understanding and reference frames of that person.

But if questions and answers in a musical interview can be thought of in terms of implication, does that not mean that the questions are *leading* questions? Yes, that is exactly what it means. As Branco and Valsiner point out, "all questions in interviews[...] are inevitably leading; if the researcher does not make them so, the subject will!" (Branco & Valsiner, 1997, p. 47). From this perspective, it is neither possible nor interesting to tap an interview subject of knowledge, unbiased by the interviewer. What is possible and interesting is instead understanding *how* the questions are (co-) constructed as leading in the interview situation. The same holds true for a musical interview.

Thinking of a musical interview in terms of implication allows us to go beyond the temporal sequence of questions and answers in the verbal interview. Musical interaction need not rely on turn-taking in the same way. Instead we can view the musically meaningful whole

emerging from the joint music-making as being both question and answer at the same time. Questions about what metrical structure is implied by a certain rhythm, or what harmonies are implied by a certain melody, can be asked and answered in the process of playing together. This can be done by creating musical activities that leave these options open, and where it is possible to vary the clarity of the stimulus, the strength of the implication and the support given. That is—as in Sæther’s (2015) case—musically guiding the respondents and the activity towards exploring those options, while attending to how a respondent taps their foot, strums a guitar, picks out chords, etc., and how that contributes to the musical meaning being co-constructed.

## 5.2 ETHICS

This research follows the ethical guidelines of the Swedish Research Council (Vetenskapsrådets expertgrupp för etik, 2011, 2017). All participants have been informed about the study and their rights in both spoken and written form (see Appendix A, Appendix B, and Appendix C), and have consented to participating. Since all participants were over 15 years old, parents were not asked for consent. The video recordings are stored on encrypted hard drives.

Since this study was initiated in 2014, the Swedish Research Council has published an updated edition of its ethical guidelines (Vetenskapsrådets expertgrupp för etik, 2017). In this edition, it is stressed more thoroughly that working with and storing video and images of participants is legally equivalent to processing personal data, and therefore regulated by The EU General Data Protection Regulation of 2016. I was not aware of this while drawing up consent forms for this study, and hence these forms do not explicitly identify the video recordings as personal data (Swedish: *personuppgifter*). Nor do they make explicit reference to the *specific legal framework* that protects participants whose personal data are collected, processed, and stored for the purposes of research. That being said, the personal data collected for the purposes of this study are still protected to the extent required by the law.

No participants appear with their real names. Since there was only one teacher participating in the study, he is simply called “Teacher” in the excerpts and in the body of the text. I have given the students pseudonyms. Since facial and bodily expressions have been important for some of my analyses, I have had to find a way to show these to my readers without making the participants identifiable. Masking does not work since it obscures the face. I have chosen to use line drawings based on stills from the video recordings, where I have sought to alter the participants’ faces to make them more difficult to identify, while at the same time faithfully representing changes in facial expression (this is mostly achieved by conserving the angle of the eyebrows, eyes, and mouth, and indicating whether muscles in the cheeks are contracted or not). These precautions do not necessarily make the participants unidentifiable to each other, but should make them unidentifiable by outsiders.

As in any complex activity, it is difficult to predict all ethical challenges that may arise, and they may not be adequately addressed by predefined rules. In such cases, a researcher needs to be able to make ethical judgments in practice, based on a thought through ethical position and the cultivation of an ethical disposition (Pring, 2000, 2001). For example, an ethical principle of any research involving humans is “do no harm.” While this particular research is unlikely to result in serious physical injuries or psychological trauma, my presence, and the presence of a recording device, might disturb lessons or make participants uncomfortable, potentially affecting the participants and their education negatively—doing a kind of harm. In practice then, the principle cannot be blindly applied, but a practical ethical judgment regarding what kind of harm is acceptable and how it can be minimized, is required. This decision is not fully mine to make; the participants must be given the information required to make an informed choice on whether they are willing to participate.

These ethical judgments do not end with the signing of a consent form, but must be continually negotiated throughout the research process (Miller & Bell, 2012). The participants must be made aware that they can withdraw consent at any stage in the process, but I must

also strive to make ethical decisions in the moment during the whole project, and continually be on the lookout for new ethical challenges. Here I will exemplify this by reporting on some ethical decisions I had to make during the preparation for the empirical study, while in the field, and in the stage of analyzing and writing up the results.

### 5.2.1 Some Examples of Practical Ethical Challenges Encountered during the Study

The first example concerns access and consent. It is often necessary to gain access to a research-context through a gatekeeper. However, the choice of gatekeeper has ethical ramifications. If a gatekeeper is in a position of authority, other potential participants may feel obligated to participate. For example, in opening up their lessons to a researcher, teachers invite critical scrutiny of their professional practice and competence. This makes going through their superiors ethically fraught, since teachers then might feel obligated to participate, despite not being comfortable with the situation. However, a similar argument can be made concerning the power relations between teachers and students.

In preparing for this study, I had the choice to approach school management, teachers, or students first. Despite both school management and teachers being in a position of authority relative to the students, I chose to approach teachers first. This is because of the practical difficulties involved in going through the students. To resolve this, I needed to make the voluntary nature of participation extra clear to the students. Besides informing about it at the outset of the study, I also had the opportunity to make it clear during the course of the study. Firstly, by always asking the students who had signed up for interviews if they still wanted to take part before bringing them to the interview, and assuring them that it was okay to say no if they were hesitant. The fact that two participants declined to take part in the second round of interviews indicates that this strategy was successful in those cases, at least. Secondly, by reminding the participants at the start of each lesson that I was going to start a camera, and engaging with anyone who seemed

uncomfortable. Third, by asking again if I could join and film them, when walking around between different student groups.

The second example concerns the potential negative impact of the interviews. I have tried to make a point of asking the participants at the end of the interview if anything felt uncomfortable or hard on them. In one case (which does not mean this was the only case, but it is the only one I am aware of), a participant expressed discomfort, telling me that s/he<sup>20</sup> felt bad at music theory or like s/he did not know enough. This meant I had to make an on-the-spot intervention to try to minimize the damage.

The objective of this intervention was to make sure that the participant in question did not leave the interview situation feeling worse about their own abilities than when they came. In my field notes (these questions were asked after turning the camera off), I recorded two different things I told the participant. (1) I attempted to point to how the participant's actions and talk in the interview shows that the participant is actually skilled in, and knowledgeable about these matters, despite not having mastered the terminology fully. And, (2) I pointed out that they have not covered these topics in depth yet in their lessons, and that I am asking about them *because* of that. I cannot be certain that this undid the damage, but it hopefully did something to counteract it (and I have tried to check up on this participant periodically during the rest of my empirical work, to gain a better sense of this). In retrospect, I wish that I would have been even clearer that the interviews are not knowledge tests, in the sense that one might expect in the school setting, and that I had explained more about *why* I am asking the participants about things they may not know yet. I believe that the participants are able to understand those reasons, if explained in an appropriate way.

These issues were addressed in later interviews by attempting to be somewhat clearer on the above points. In practice, this meant that when introducing the terminology, I was clearer that the participants

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20 I am being deliberately ambiguous about the gender of the participant to make it more difficult to identify this person.

were not expected to know it, using phrases like “this may have come up in your lessons” or “I know that you haven’t talked about this much but....”. It also meant being attentive to when a participant was reaching the limits of what we would accomplish during the interview, and telling them that I was asking these questions because I knew that they were difficult to answer, and because I knew they had not covered it much yet. In doing that, I also reminded them that the interviews were partly an attempt to follow their learning of these terms, which was why I asked them about things that were difficult for them. This was also connected with reaffirming things I already included in my original interview guide, such as my interest in *how* they reason about these matters or solve the problems we encounter, and that there is no way to be wrong in the interviews.

A third ethical issue encountered in the field emerged during observation of a lesson. The teacher gave the students the option to either stay in the classroom for a teacher-led session on chords and transposing chords using the circle of fifths, or work individually and in groups with ear training and sight-reading exercises. All students chose the latter options and left the classroom, but the teacher asked one student to stay behind, explaining that the student needed help with chords, the circle of fifths, and transposing. Since these topics had by this point emerged as central to my study, I too stayed behind. However, the conversation between the teacher and the student soon turned to the student’s performance in the subject more generally, the need to do homework and practice regularly, etc. In this situation, I was faced with the choice of either staying and potentially get very good material for my study, or respecting the privacy of the student, who was visibly bothered by this conversation, and leaving the room. I chose the latter, because the focus of this study is not the study-habits of the students. The potential added embarrassment of the student, from me being present and documenting this situation, did not seem to be justifiable, and having this specific situation studied was not what the student signed up for.

A fourth ethical issue is how the teacher comes through in the thesis. As the analysis progressed and I selected the lessons and then excerpts most relevant to my topic, it also became evident that



these lessons and excerpts had some features that may not make the teacher look his best. By limiting myself to lessons on the circle of fifths, tonality, and harmony, I also appear to have limited myself to a very specific form of teaching. Hence, in Chapter 7, the teacher will appear to favor lectures and avoid musical examples. It is also the case that the episodes within the lessons that tend to give the richest material are ones where there is some kind of misunderstanding or miscommunication. When interaction flows smoothly, too much remains hidden beneath correctly applied terminology.

I want to stress here that the examples of teaching practices in this thesis are not reflective of the full range of lessons I observed, and that they are even less likely to be true of the teacher's teaching style as a whole. Nevertheless, since I have limited space, I have had to weigh a fair representation of the teacher against my other duties as a researcher, such as the selection of informative and appropriate examples for my research questions. The intrusion into the educational practice is hardly justified if I avoid answering my own questions. Nor is it my intention to evaluate the teacher's methods. To compensate for this issue, I have tried to be clear throughout that the lessons selected for analysis are not representative of the full range of observed lessons, and to explain how the specific conditions in context could affect the choice to organize these particular lessons in this particular way.



## 6. Method

The empirical work for this study was performed at a music program in an upper secondary school in a Swedish small town. One teacher's lessons in *Gehör- och musiklära 1* with one class in the second semester of their first year were followed over a period of six weeks. A subset of students were interviewed at the beginning and end of this period. Ten students were interviewed in the first round of interviews and seven of these students were interviewed again in the second round of interviews. The structure of the empirical study can be summarized as in Figure 4.

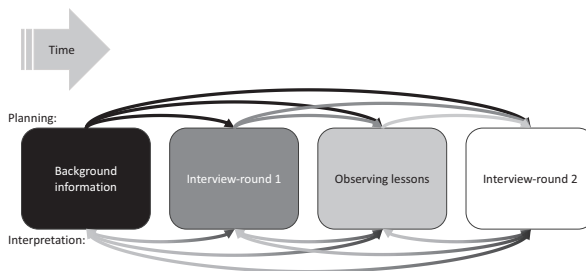


Figure 4: Structure of the empirical study. The arrows above the boxes indicate how each stage influences the planning of the others. The arrows below the boxes show how the different stages are interpreted in the light of each other.

Since this is not a hypothesis-testing design, each stage of the study influences the design of the following stages. This means that even though the general structure of the study with a period of lesson observations bracketed by interviews was set beforehand, the precise focus of the first round of interviews was decided by the background information I had acquired in the previous stage (previous research, theory, conversations with the teacher, etc.). Likewise, what I paid attention to when observing lessons was a result of what I had done in the two previous stages, and what became the focus of the second round of interviews was a result of what I had done in the previous three stages.

This exploratory aspect of the design is not only a matter of method-choices, narrowly defined. The study was originally conceived as a study of concept-learning, focused on three music-theoretical concepts. Based on previous research, theory, and the background information collected in the first empirical stage, I decided to focus on three concepts: *KEY*, *TONIC*, and *KEYNOTE*. This focus decided the design choices for the first round of interviews. As I concluded the first round of interviews and started observing lessons, it became more and more obvious that in order to understand what was going on with the three concepts, I had to understand how they were related to the circle of fifths in the educational practice. This realization influenced the design of the second round of interviews, but it was not until I had concluded my field work and had been working with my analyses for quite some time that I fully realized that the study had morphed into one about the circle of fifths, and rewrote my research questions accordingly.

While the planning of each stage of the study is constrained by the irreversibility of time, the interpretation of the data generated is not. Hence, the interpretation of the first round of interviews is informed not only by the background information assembled beforehand, but also by the results of the following stages of the study, and the resultant shift in focus from *KEY*, *TONIC* and *KEYNOTE*, to the circle of fifths. The same holds for the lesson observations and the second round of interviews.

## 6.1 SETTING, ACCESS, PARTICIPANTS, AND SAMPLING

This study was performed at a Swedish upper secondary school. In the Swedish school system, years 1–9 are compulsory, while upper secondary school (*gymnasium*, years 10–12) are elective. Upper secondary students can choose between a number of different programs, one of which is the arts program (*Estetiska programmet*), which has specializations in visual arts, theater, dance, and music. This study was performed at such an arts program with a music specialization, which I will call a music program, for the sake of brevity.

The sampling strategy for this study can be described as purposive sampling (Bryman, 2008), in that I have tried to select site and participants who are relevant to my research questions based on theoretically and methodologically motivated criteria. I have introduced some such criteria above in Section 5.1. There are of course also criteria based in the previous research which inform my research problem and questions. As Bryman points out, purposive sampling restricts the generalizability of a study. However, this view is based in a quantitative understanding of generalizability, where generalization is dependent on representative random samples. In a study such as this one, generalization should be viewed differently. The direction of generalization in this study goes from single cases to theory, not to a population—the reasoning is abductive. The theory can then be used to understand other cases, and to generate variables according to which cases can be compared (Alvesson & Skoldberg, 2017; Tavory & Timmermans, 2014; Toomela, 2009; Wagoner, 2009).

In selecting the site for the study, I first considered what kind of site would be conducive to my goals. The criteria I developed were based on (1) the study being situated in the fields of teacher driven educational research, arts education, and music education, (2) (the current iteration of) my research problem and questions, (3) theoretical assumptions about what kind of phenomena I am studying, and (4) methodological assumptions about in what kinds of contexts the phenomena of interest would be most visible. This led me to try to situate the study in a context fulfilling the following criteria:

- Based in or close to an actual educational context (1, 2, 4)
- Where participants with relatively little or no previous experience with music-theoretical concepts meet these concepts for the first time, or at least treat them in depth for the first time (2, 3, 4)
- Where there is an expectation that such concepts are learned and used (1, 2, 4)
- Where there are potential participants who can express themselves musically at a relatively advanced level (2, 3, 4)

Several kinds of sites fulfilling these criteria were considered: Compulsory schools with a music profile, upper secondary music programs, *folkhögskolor*<sup>21</sup> offering music courses aimed at musicians without much previous formal music education, and finally music teacher education, specifically one-semester music teacher education not requiring entrance exams. At all these levels, one may expect that music-theoretical concepts are taught, either in specialized subjects such as *Gehörs- och musiklära* at the upper secondary level, or more integrated into other music-activities.

More practical considerations became relevant at this stage. A study in a compulsory school would be most difficult to arrange, both because of the need to involve parents to a higher degree, and because it would be more difficult to arrange interviews with students during the school day due to tightly packed schedules. The latter issue, although to a lesser degree, was also considered an argument against situating the study at an upper secondary school. However, upper secondary music programs are the most common of the aforementioned types of music education institutions, which meant it would be easier to find a suitable school with willing participants. The upper secondary level is also the one

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21 The Swedish word *folkhögskola* is difficult to translate, because there are (to my knowledge) no equivalent institutions in English-speaking countries. *Folkhögskolor* are institutions of adult education. They originated in the *folkbildning*-movement and do generally not award academic degrees or credits, but are in some other ways similar to community colleges. See Damianek (2016) for a brief overview in English.

I have most experience with—having been both a teacher and a student at such music programs—and it was partly in the context of teaching at that level that this study was conceived. Therefore, upon learning about an upper secondary school with a music program, where several teachers had declared an interest in participating in research, I contacted those teachers, starting with the ones I knew to be teaching *Gehörs- och musiklära*. One of those teachers was interested in participating in this project (in this sense, there are elements of convenience sampling (Bryman, 2008) in my sampling strategy as well).

I started by contacting teachers, rather than e.g. school management, because teachers are well placed as gatekeepers for a study like this. Through a teacher, I can get introduced to students, school management, and parents (see also Section 5.2.1, for discussion of the ethical sides of this choice).

The selection of students for interviews started by asking for volunteers amongst the students. A larger than expected number of students volunteered, and I ended up having to prioritize whom I wanted to interview. I did this with help from the teacher, who could give me information about the students that helped me pick out those who fitted my profile. While I was mainly looking for students with relatively little or no previous experience with music-theoretical concepts, I also picked a few students who were not in line with this profile, partly to challenge my own background assumptions. For the follow-up interviews my pool of interviewees shrank from ten to seven due to two students not wanting to participate in follow up interviews and one student switching schools. For further selection of lessons and cases to be presented in this thesis, see Sections 6.4.1 and 6.7.1.

## 6.2 PREPARATIONS

Before commencing with interviews and observations, I visited the school to look at the facilities, inform the teacher and students about the project, and to gain background information from the teacher. From talking to the teacher, I learned what the makeup of the class

was in terms of previous music education, proficiency in playing instruments, etc., how the lessons were normally structured, what they had covered so far in their lessons, what he was planning to do for the rest of the semester, and what aspects of that they had more or less difficulties with.

This information led me to focus the study on the related concepts KEY, TONIC, and KEYNOTE, in Swedish: *tonart*, *tonika*, and *grundton*. These were concepts they had touched upon but not covered extensively, and which would likely come up again throughout the semester. They also had the benefit of being central concepts in music theory, and referring to central musical phenomena in tonal music, with close correspondences in some modal musics as well. Note that there is not a perfect overlap between the meanings of the English term “keynote,” and the Swedish term “*grundton*.” In Swedish, “*grundton*” can refer to the root note of a chord *or* the tonic note of a key. In this thesis, I will mostly concern myself with the latter sense of the word. As I mentioned in the introduction of this chapter, each stage of the study influenced the design of the following stages, and hence the study as a whole (see also Figure 4). As the study progressed, and especially during the course of lesson observations, it became apparent that the circle of fifths was intimately connected to how the KEY-, TONIC-, and KEYNOTE-concepts were handled in the studied practice. I therefore expanded the scope of the study to include this diagram in addition to the above-mentioned concepts, and eventually made it the main focus of the thesis.

### 6.3 INTERVIEWS

Bracketing the period of lesson-observation, two rounds of qualitative interviews were performed—one at the outset of the study, and one at the end of the study. Ten students participated in the first round of interviews, and seven of these participated in the second round of interviews (see Table 1). The interviews were performed on site, in a small room usually used for one-to-one lessons, and ranged between 30–50 minutes in length. The interviews were video-recorded using one stationary recording device.



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Table 1: Interviewed students (pseudonyms) with their lesson-group and number of interviews.

PSEUDONYM	LESSON-GROUP	INTERVIEWS
Cecilia	1	2
Fredrik	1	2
Ingrid	2	1
Joakim	1	2
Joel	1	2
John	1	1
Lena	1	2
Monica	2	2
Sofia	1	1
Tobias	2	2

As discussed in Section 5.1.6, a guiding idea in the planning of these interviews has been conceiving of them as qualitative microgenetic experiments (Wagoner, 2009). I view the interviews as learning situations for both the participants and myself (Kvale & Brinkmann, 2009; Wallerstedt, Pramling, et al., 2014), more specifically as planned interventions designed to provoke and support observable co-constructive processes of development.

Microgenetic methodology depends on varying some aspect of a stimulus, access to mediational means, or other support structures (Wagoner, 2009). On a very general level, the activity in the first round of interviews proceeded from a practice-based engagement with music to a semiotically mediated engagement. In contrast, the activity in the second round of interviews generally proceeded from the kinds of symbol manipulation I had observed in the lessons to activities where the participants were supported (to differing degrees) in relying less on inscriptions and other external mediational means. Especially in the second round of interviews, there are aspects of think-aloud methods (Ericsson & Simon, 1980). A meta-analysis of think-aloud studies shows that the method does not tend to alter the accuracy of performance on a task, but effects the time it takes to complete it. An exception to the method's non-influence on accuracy

is explanatory verbalization, which tends to increase accuracy (Fox, Ericsson, & Best, 2011). Unlike in the studies reviewed by Fox et al., however, this study does not use a standardized think-aloud protocol, and has different aims with employing think-aloud. I am using the assumption that thought is semiotically mediated, whether or not it is externalized. Think-aloud should thus be understood not as a window into the mind, but as semiotically mediated thought in development. As an aspect of co-constructive processes, rather than as a measurement device, it is thus consistent with my theoretical and methodological position (Valsiner, 2017).

### 6.3.1 Interview-Round 1

The first round of interviews started with some opening questions about the participants' background in music and experiences with music education (see Appendix E for interview guide (in Swedish)). The main part of these interviews, however, was planned around the three concepts that the study originally focused on (KEY, TONIC, and KEYNOTE), which had been identified through talks with the teacher. This part of the interviews was designed to approach the focused concepts by different routes. These different approaches were ordered in time as below, but depending on the developments in each specific interview they could blend into each other to different degrees. The three concepts were approached by:

- Exploring if and how the participants performed and handled keys, tonics, and keynotes in musical practice by means of a joint music-making activity;
- talking about aspects of the musical activity that related to keys, tonics, and keynotes, challenging the participants to account for such musical choices in verbal form;
- and supporting the participants in applying the relevant terms, introducing them if necessary and asking the participants to explain them, but also by relating them back to the musical activity.

At the start of the musical activity, I offered the participants the use of piano, electric bass, or guitar in addition to using their voice, and with me playing one of the instruments they did not choose (either

piano or guitar). The musical activity was presented as making up a simple melody together, and setting chords to it. In introducing this part of the interviews, I stressed that the melody did not have to be long, advanced, or even good, and that there were no right or wrong ways of approaching the task, but that it need only work as a melody. As an appropriate level of complexity, I exemplified with common children's songs. This had the added benefit of helping me situate the activity in a simple tonal melodic and harmonic context, which is both more in line with the origin of the focused concepts, making them easier to apply, and more in line with the "example-music" the students often encounter in their lessons.

I gave the participants the choice of either starting from scratch, or starting from a pre-prepared first few bars of a melody that I brought with me. Most, but not all participants chose to start from one of the pre-prepared melodies. I brought three such melodies (see Appendix F), all prepared to imply a key and a tonic, without actually playing that note. This setup is similar to the method used by Kaladjev (2009), who let children finish short tonal musical fragments, but set up more like an interview than a test. The decision to exclude the tonic note was an attempt to make the tonic (one of the focused concepts) the object of musical inquiry, and on indications in the literature that melodies not starting on the tonic could be a possible source of difficulty (mainly Davidson et al., 1988). Some kind of ambiguity is also an important aspect of microgenetic method. During the musical activity, I would encourage participants to make musical decisions that were especially relevant to the concepts focused at this stage in the study (e.g. what note the melody should end on), and support them by picking up and refining melodic and harmonic fragments that were produced in the compositional and improvisational process.

In the conversation following the musical activity, the participants were encouraged to use their instruments and other means of non-verbal communication (blank paper, staff paper, and pens were provided for drawing or writing) if they found that helpful. At the outset, they were once again reminded that there was no right and wrong in this conversation. Starting from questions of

a more evaluative nature—what they thought worked well or not in the piece of music we created—I gradually steered the conversation to questions relevant to the participants' treatment of roots, keys and tonics: why the melody ended the way it did, or why the harmonization ended on a certain chord, why some notes were preferred over others, e.g. tested and discarded in the process of working out the melody, and so on (see Appendix E).

While these questions were often couched as intro- and retrospective (e.g. “why did you decide to do X and not Y?”), it should be noted that their purpose was not primarily to gain retrospective evidence of the participants' thought or decision-making processes. Instead, this line of questioning should be understood as an attempt to co-construct shared attention on, and an explanation or justification of, certain musical phenomena, as they were realized in the musical activity. In other words, the questions were intended to provoke and support the microgenesis of a verbal account of the kinds of musical phenomena that *KEY*, *TONIC*, and *KEYNOTE* refer to. The conceptualization of music happens, and becomes visible, in that process. By supporting the participants with follow-up questions and musical illustrations, and challenging them with counter-examples, it becomes possible to explore the use of situated and mediated forms of conceptualization. This can be understood as exploring zones of proximal development (e.g. Vygotsky, 2012), with the goal of exploring how they differ depending on the situated relations between concepts and their objects, and the mediated relations of generality between concepts.

If the participant had not already introduced the focused terms, I would do so when I judged that I could not further support the development of a verbal account without them. Regardless of whom of us that introduced the terms, I asked the participant to explain them. This can be viewed as an attempt to investigate the mediated aspects of the conceptualization process, the concept's relations of generality with other concepts and symbol systems, which can be viewed as delimiting one end of the concept's zone of proximal development. However, by relating the concepts back to our previous discussion, and the musical activity, I was also attempting to provoke

and support two related processes: Firstly, the co-construction of a conceptually mediated account of the relevant musical phenomena, and secondly, the integration of situated and mediated forms of conceptualization in the development of such an account.

### 6.3.2 Interview-Round 2

Participants from the first round of interviews were asked for follow-up interviews at the end of the semester. Since the number of willing interview participants was higher than expected, some follow up interviews had to be postponed to the beginning of the following semester. The design of the second round of interviews was influenced by what I had already uncovered in the first round of interviews and the observed lessons (see Figure 4). During the first round of interviews, and during the observed lessons, it became increasingly clear that the concepts *KEY*, *TONIC*, and to some degree *KEYNOTE*, were introduced and used mostly in the context of working with the circle of fifths to illustrate key-general relationships between chords and engage in transposing using the diagram. Therefore, the follow-up interviews were planned around the circle of fifths and a transposing activity (the interview guide for the second round of interviews can be found in Appendix G).

Since these interviews drew on material from the observed lessons, it became especially important to strike a balance between identifying areas that were difficult enough to trigger observable processes, and attempting to make sure they did not turn into pure testing-situations rather than learning-situations. I started the interviews by telling the participants that while some of the questions might appear as though I was checking their homework, I was not interested in how much they knew, but rather in how they handled things that were difficult. I also told them that they might learn things during the course of the interview that they had not yet covered in their lessons.

The ability to reproduce the circle of fifths was highly valued in the lessons. Therefore, I first gave the participants pen and paper and asked them to reproduce the diagram to the best of their ability, encouraging them to tell me how they went about the task

and providing support where needed. With their finished circle of fifths (or one provided by me if they could or would not reproduce the diagram with my help), we then proceeded to transposing tasks similar to the ones I had observed in the lessons. I gave the participants short chord sequences in major keys which they wrote down, and told them to transpose some interval up or down. That is, I did not provide the key of the original chord sequence or the target key unless the participant could not solve the problem without me doing so. Starting with sequences consisting of tonic, subdominant, and dominant, we progressed to more complex sequences including submediants and the dominant's dominant if a more challenging problem was needed to provoke external sign use. The participants were also encouraged to talk me through how they went about solving the problem.

As the participants went about transposing, I took note of what strategies they did and did not use. I then asked them about different parts of the transposing strategy as modeled in the lessons, such as deciding the key of the chord sequence or "box" in the circle of fifths, using functional analysis terminology, and using the circle of fifths, and supported them in applying these if they had not already. I paid special attention to the use of functional analysis, which led over to the next phase of the interview.

At this point, I asked the participants to put away their circle of fifths-diagrams and presented them with a new task: To make a functional analysis of a chord sequence, and then transpose that chord sequence to a different key by "decoding" the functional analysis in the target key. This was the point at which the interviews started going beyond things that had been observed in the lessons. This task should not be understood as me asking them to perform the task without mediational means, but rather as depriving them of one set of tools (the inscription of the diagram) in order to push them into using another set (function-concepts). This is important since the circle of fifths can be used to transpose without knowing the key of the original chord sequence, the key of the target sequence, or using functions, by simply moving the spatial organization of chord-symbols around. Note that this does not exclude the option

of using the circle of fifths, but rather changes the conditions under which one may do so.

A mistake in the planning of this part of the interviews was that I did not think to be consistent in how I varied the intervals between starting key and target key. If I had done this, it might have been easier to distinguish to what degree participants relied on moving patterns around in an imagined circle of fifths, based on the hypothesis that this would be more difficult to do when the distance between keys in the circle grows larger. Again, this should not be understood as a test of acquired knowledge. By varying the difficulty of the task and the amount of support given, this activity seeks to find the point at which external sign use becomes necessary, which makes it possible to study the process.

The last phase of the interview consisted of a listening exercise where the participants were asked to listen for functions in chord sequences I played on the piano. While introduced as a continuation of the transposing tasks in the sense that once we had identified the functions we could “translate” them into chord symbols in any key we liked, the activity revolved around listening, with the “translation” taking a back seat. Because of the changed focus of the thesis, from a primary focus on the concepts KEY, TONIC, and KEYNOTE, to a primary focus on the circle of fifths, the listening part of Interview-round 2 has decreased in importance, and is not presented in any of the analyses in the next chapter. I will therefore not go into a more detailed description of the task.

#### 6.4 OBSERVING AND DOCUMENTING LESSONS

Between the first and second round of interviews, lessons in *Gehörsoch musicklära 1* were observed and video-recorded for six weeks. For these lessons, the class was divided into two groups (Group 1 and Group 2, see Table 2). The groups were not divided according to proficiency levels. Each group had two 40-minute lessons in a normal week. However, several weeks over the course of the study had one or more cancelled lessons due to breaks, holidays, or projects. In total, the six-week period did not add up to 24 observed lessons, but

to a total of 14 lessons, seven per group, which means that ca. 560 minutes of lesson time was observed. All lessons were taught by the same teacher. A student teacher was present during a few lessons at the start of the period, but did not plan or conduct any lessons herself.

Table 2: Overview of lesson groups, with group size, and number of observed lessons per group.

GROUP	STUDENTS	OBSERVED LESSONS
1	12	7
2	6	7

The choice of observing lessons was mainly motivated by the assumption that the way in which a concept or model is introduced and used in an educational practice is relevant to understanding how students make sense of it, and by the fact that (especially upper secondary) aural skills and music theory classrooms are relatively unexplored. Thus, the period of lesson observations primarily concerns Research Question 1, which in turn is vital to answering Research Question 2. I originally had the intention to follow my interviewed students through the lessons in order to document developmental processes over longer periods of time. This intention had to be largely abandoned because of how the lessons were structured, an issue that will be discussed further below. Note though, that what happens in lessons still informs my interpretation of interviews, and vice versa, as in Research Question 2 and Figure 4.

Both groups had lessons based in two different classrooms on different days of the week (henceforth referred to as Classroom 1 and 2), and sometimes corridors, smaller group rooms, the cafeteria, etc. were utilized as well. The two main classrooms (1 & 2) had whiteboards, projectors, and at least one piano, but only Classroom 2 had a piano in the same end of the room as the whiteboard. Both rooms were quite spacious: Classroom 1 had a table in the middle of the room which the students usually sat around. Classroom 2 had a big open floor surface where the students placed chairs in a line or semicircle for the lessons. The



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majority of the relevant lessons, and all the ones that will be analyzed in detail, were conducted in Classroom 1, a plan of which can be found in Figure 5.

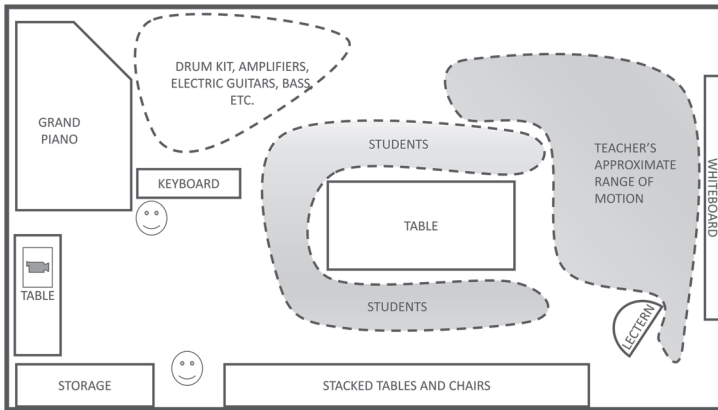


Figure 5: Layout of Classroom 1. Camera symbol indicates stationary camera placement. ☺ indicates the two most common researcher vantage points in the classroom during lecture-type lessons. Gray areas indicate most common student placement and the teacher's approximate range of positions during lecture-type lessons

Originally, I had planned to be a relatively passive observer, but this approach had to be revised during the course of the study. Since lessons were frequently organized around the students practicing on their own or in smaller groups, often using their laptops to do ear-training and sight-reading exercises (on websites like <http://www.musikteori.se> and <http://www.musictheory.net>), I had to actively move around between different spaces where students gathered to work. This manner of working also made recording a less effective strategy for documentation for three reasons. Firstly, because the screens of the students' laptops proved difficult to capture using the camera, secondly, because students' work was frequently done with headphones on, and thirdly, because the students often worked in spaces where other students, who had not consented to being recorded, were present.

This meant that I had to rely more on actively engaging with the participants, asking if I could sit in with them for a while, what they were doing, if I could look more closely at something, and so on, and also that I had to rely more on notes taken during and after lessons for documentation. When taking notes during lessons, I developed a system where I used a regular notebook for most notes, but staff paper for music, whether sounding or notated on the whiteboard. As the lesson observations progressed, I used the parts of the lessons where students were working individually or in smaller groups to increasingly focus on students who were potentially extra interesting cases, based on the first round of interviews and what happened during the lessons. As mentioned above and explained below, the idea of tracing single student cases' development through the lessons had to be abandoned at a later stage of the research process. This means that my strategy for selecting which students to follow during individual and small-group work is largely irrelevant to the results.

The distinction between passive and participant observation is a fluid one, and arguably no observer can remain fully passive (Bryman, 2008). Given the theoretical perspective employed in this thesis, I do not find it desirable nor possible to observe an activity without affecting it in some way. This would be a problem if I was aiming to achieve perfect ecological validity, but that is not the case here. Rather, since the researcher's influence is inevitable, it should be acknowledged and used as a resource. By being more active, I can potentially gain *more* opportunities to study the phenomena I am interested in. The key point is that the influence of the researcher cannot be treated as a potential source of error that needs to be controlled for, and excluded, in the analysis. Instead it must be brought into the analysis, accounted for, and given the same weight as other social and contextual factors influencing the situation.

### 6.4.1 Selection of Relevant Lessons and Limitations of the Lesson-Material

Six of the observed lessons (three with Group 1 and three with Group 2) revolved around topics that directly or indirectly required engagement with the circle of fifths, or with concepts otherwise treated in close relation to the diagram. Table 3 lists these six lessons with a brief description of their main topics and methods. For some of these lessons, students could choose whether to participate in the teacher-led lesson, or self-directed practice, which is shown by split cells.

Table 3: Overview of the six most relevant lessons, with main topics and teaching methods, divided by lesson-group.

GROUP	LESSON	MAIN TOPICS	MAIN METHOD(S)
1	2	Triads; the circle of fifths; chord functions; transposing chord progressions	Lecture
		Ear-training, sight reading, dictation, etc.	Individual or small-group practice, mostly using online resources
	3	Chords <sup>22</sup>	One-to-one teaching
		Ear-training, sight reading, dictation, etc.	Individual or small-group practice, mostly using online resources
	4	The circle of fifths; keys and key signatures; chord functions; transposing chord progressions	Self-assessment test; lecture
22	2	Triads; the circle of fifths; chord functions; transposing chord progressions	Lecture
		Ear-training, sight reading, dictation, etc.	Individual or small-group practice, mostly using online resources
	3	Triads; tetrads; major and minor sevenths; diminished chords; chord functions	Lecture
		Ear-training, sight reading, dictation, etc.	Individual or small-group practice, mostly using online resources
	4	The circle of fifths; keys and key signatures; chord functions; transposing chord progressions	Self-assessment test; lecture

<sup>22</sup> For ethical reasons, I stopped attending and documenting this part of the lesson after only a few minutes and I have excluded it from the analysis (see section 5.2.1).

This is not a very large material, and it is limited in other ways as well. These factors must be kept in mind in the analysis as well as in assigning weight to the findings in relation to the other parts of the study. To clarify in what way the nature of the data affects the analysis and interpretation, I will briefly discuss the limitations of the material.

Not all students I had interviewed were present for every lesson, and even when they were, they sometimes elected to leave the classroom and work individually when they were given that choice, as in lessons 2 and 3 for both groups. This means that some students (e.g. Lena) only had one observed and documented relevant lesson between Interview 1 and 2. This problem is further compounded by an equipment failure affecting the documentation of Lesson 3 with Group 2. During this lesson, the video camera did not record properly, and I did not think to write in my field notes which students were present (something I did for several other lessons). Since this particular lesson (as many others) involved letting the students choose between staying for a lecture or working individually or in small groups, I could not rely on the teacher's attendance lists to solve this problem.

Hence, I cannot confidently say which students out of those I interviewed were present (consulting the teacher's attendance list did not help since the students could choose between staying for the lecture or working individually, and attendance was taken before they left). This means that I, for example, can only say with certainty that Monica attended one observed and documented relevant lesson between Interview 1 and 2. A lesser problem is that the viewing angle and lighting conditions prevent me from noting all present students in lesson 3, group 1, since only one student stayed to work on chords with the teacher, and that student was not one of those I interviewed. The number of observed and documented relevant lessons per interviewed student is shown in Table 4. Note that because of the problems with documentation mentioned above, the number of lessons for students in group 2 is a minimum (it may be one more lesson for each student in group 2).

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Table 4: Number of relevant lessons per interviewed student.

GROUP	NAME	INTERVIEWS	RELEVANT OBSERVED LESSONS
1	Cecilia	2	2
	Fredrik	1	1
	Joakim	2	2
	John	1	2
	Joel	2	2
	Lena	2	1
	Sofia	1	2
2	Ingrid	1	2 (minimum)
	Monica	2	1 (minimum)
	Tobias	2	2 (minimum)

Another factor that limits the utility of this data material is that the relevant lessons are confined to one type of lesson—basically a lecture. Although students ask and receive questions, they do not typically engage in much overt problem solving. Rather, the teacher demonstrates the application of different techniques on the whiteboard. While some students are quite active (asking questions, offering answers, talking out loud, etc.) during the lessons, other students only have to visibly engage with the concepts when called on by the teacher to do so.

These restrictions on the amount and quality of relevant lesson-data per individual student case limit the utility of the lesson observations in tracing the developmental processes of my cases. The limited number of lessons also means that I have to be careful about assuming that the lessons I observed are representative for all lessons on the same topics. Consequently, the relevance of any particular lesson episode will depend on the extent to which I am able to use triangulation between (a) interviews (ideally several interviews) and lessons, and/or between (b) different lesson episodes, to show that the lessons or the interviews make more sense when understood in the context of each other than in isolation.

An example of (a) could be how students in interviews often seem to define the tonic as the first chord of a piece. This makes

more sense in light of the short chord sequences that the teacher analyses with functional analysis during the lessons, since these all start on the tonic, but never end on it. This argument can gain additional support through strategy (b). Although there is only a small number of relevant lessons, the teacher uses five different chord sequences during these lessons, which all start on, but do not end on, the tonic. The question of which chord in these chord sequences is the tonic is problematized (by a student) only in one of these cases. In the other four, the tonic is treated as given beforehand, and the focus is on analyzing the other chords based on that premise.

Keeping these limitations in mind, it must still be stressed that these lessons *did* occur and are relevant to answering my research questions. While their utility in generalizing to unobserved lessons is limited (which would be the case with more observed lessons as well), any patterns of similarity or difference across these six lessons are still valid observations *about these six lessons*, which in turn means they are valid observations about the bulk of lessons on relevant topics between interview-rounds 1 and 2. Similarly, while the format of these lessons makes it difficult to gauge the involvement of the students in several cases, it is still of interest to describe what kinds of conceptualization processes the students are invited to take part in during these lessons. This gives me the ability to claim that at least these learning opportunities were made available to the students who were present.

### 6.5 USING VIDEO

Both interviews and lessons were documented using video-recordings. The recordings were made with a Zoom Q3HD and transferred to an encrypted hard-drive. The decision to use recordings, rather than relying on only notes, was motivated by the possibility that very specific details in communication could be of interest to the study. The choice to use video as well as audio recording was motivated by indications in previous research that multimodal forms of communication (gesture, images, etc.) could be important in how people learn to talk about music.

In using video, it is important to remember that while video does capture a lot of what is happening, it does not necessarily help in understanding contextually dependent meaning in what has been recorded (Heath, 2016). Therefore, I have avoided filming lessons (or parts of lessons) where I have not been present myself, and I have attempted to make notes about relevant issues that are not captured by the recording (e.g. the teacher telling me something about his plan for the lesson on our way to the classroom). Since the lessons were often distributed across several different localities, the use of a fixed position camera was often impossible. Heath (2016) advises against the use of roving cameras where possible, pointing to how it is common that the onset of an action is missed by the camera operator, how fixed camera positions makes it possible to optimize light and audio conditions, and to how people tend to orient themselves toward the camera, involving the researcher in their activity. While the first two issues are problematic, and had to be dealt with on a case-to-case basis, the third one is less so. Heath writes from an ethnomethodological and conversation-analysis point of view, and thus finds it important to capture everyday activities as they unfold in naturally occurring settings. As I have already pointed out, I am working instead from the assumption that my presence will always affect what happens, and that this is not a problem as long as I do not try to hide it in the analysis.

As mentioned above when discussing observing and documenting lessons (Section 6.4), the students' individual work using laptops proved to be mostly impossible to capture using video. For that, different technological solutions would have been required (such as some kind of screen-recording software). This should perhaps have been addressed in the planning stage, but would have presented a number of new ethical challenges and made the study into a very different one.

#### 6.6 TRANSCRIPTION AND EXCERPTS

The video-recorded interviews were transcribed using the software ELAN. This transcription software allows for transcribing on several different "tiers" per participant. Each such tier can be assigned to a

specific modality. This makes it possible to visualize how several modalities work in tandem in the communicative activity (Wittenburg, Brugman, Russel, Klassmann, & Sloetjes, 2006). I used five tiers per participant: voice, instrument (sounding), gesture, gaze, and tactile use of an instrument (e.g. a guitarist testing chord grips on the guitar without playing them). The gaze-tier was rarely used since I discovered this to be difficult to make out with any certainty in the majority of the recordings. The ELAN interface is illustrated in Figure 6.

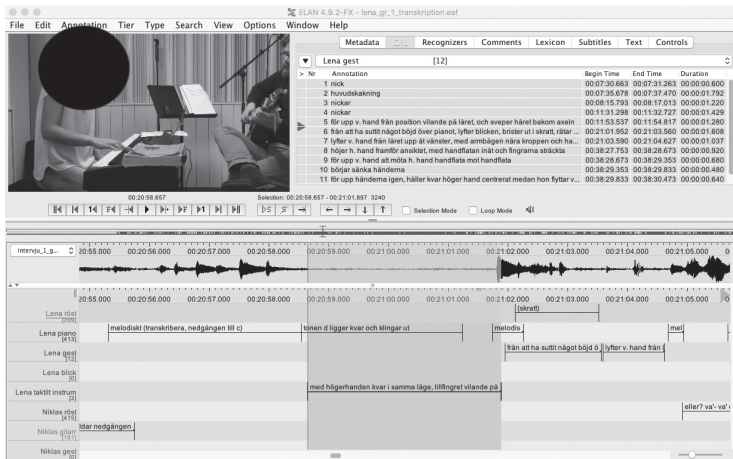


Figure 6: The ELAN interface. The names of tiers are listed bottom left. Transcriptions of events in each tier are contained in the delimited blocks, which scroll by as the media is played.

Since ELAN does not offer the functionality to transcribe music using music notation, music that was more complex than what can be captured with chord symbols was transcribed separately where necessary, and incorporated into the transcript for the analysis. This method of transcription is inspired by Annika Falthin's (2015) transcriptions of musical interaction, and use an adapted form of music notation. The music notation is adapted to show speech, chords, and arrhythmic playing/singing. In this notation, x-shaped note heads represent speech and other non-pitched vocalisations (and is not intended to show rhythm). Dash-shaped note heads represent



chords and are accompanied by a chord symbol. Stemless note heads represent musical sounds where no steady pulse can be detected, and in that case relatively shorter and longer sounds are represented by filled and unfilled note heads respectively. In sections where pulse and meter can be detected this is illustrated by dotted bar lines, but no time signatures are indicated. Melody that fits approximately into a pulse and meter are notated with standard music notation. A key for these transcription conventions can be found in Figure 7.



Figure 7: Transcription key for transcriptions of musical interaction.

I had originally planned to use ELAN for the transcription of the lessons as well. But as I went through the material, I concluded that a smaller number of lessons would be selected for closer analysis, that these lessons shared a similar format (the lecture) which was largely monologic, and that there was very little musical communication in the relevant lessons. Therefore, it seemed to me that the fine-grained segmentation of interaction and possibility to visualize coordinated action (between participants and between modalities) made possible by the ELAN-transcriptions would play a smaller role in the analysis of these lessons, and that the extra time that such a thorough transcription would take could be put to better use in other aspects of the project.

Therefore, the selected lessons were transcribed using word-processing software. These transcriptions use narrative to sum up parts of the lessons not directly related to the topic of this thesis (e.g. taking attendance, giving general information, off-topic discussions), and detailed, word-for-word transcripts, including gesture and drawing on the whiteboard, for the bulk of the lessons.

Unlike the mainly musical interaction, verbal or mostly verbal interaction will not be displayed in the form of a score, but in a more conventional “script” format with speech and action (e.g. playing something on an instrument, gesture, or drawing on a whiteboard) separated in different columns.

## 6. METHOD

Table 5: Transcription key for excerpts of mostly spoken interaction.

IN EXCERPT	MEANING
(.)	Short pause
(3.532)	pause in seconds and milliseconds
[inaudible]	Part of utterance is inaudible
[pa]rt of or whole [word]	Best guess to partly inaudible words or parts of words
[Name] [Teacher] [Student]	Inserted pseudonyms or titles when speakers use names
[word/other word]	To indicate that a word could be heard as two or more homophones in Swedish
CAPITALIZED	Indicates stress, or that the speaker speaks at a significantly higher volume
[descriptions in square brackets]	Used to add descriptions of how something is said or done, e.g. [quietly:]
Co:::lons	Indicates protracted sounds, e.g. cooolons
(cough) (laughter) (mumbling)	Non-speech sounds, or indistinguishable speech

The empirical work for this thesis was done in a Swedish school-context, and since I have elected to write this thesis in English, the verbal interaction in selected excerpts from the data material needs to be translated. Regmi, Naidoo, and Pilkington (2010) brings up the problem that in translating interview and observational data, researchers sometimes have to choose between establishing a close correspondence word for word, and establishing a close correspondence with the holistic and contextual meanings of utterances. This is less problematic when the analyses are done on the untranslated transcripts, as is the case in this thesis, but issues of translation will still make the evaluation of the analyses by readers more difficult. I therefore want to briefly describe the choices I have made in the process of translation.

Especially in the interviews, the original transcriptions are quite close to the sound of spoken language. I have not added dropped syllables or separated contracted words. Similarly, since the Swedish words *och* (and) and *att* (to/that) are commonly pronounced the same way [ɔ] in this language context, I have not distinguished them in the transcript. However, I have chosen to not attempt to translate

such spoken-language idiosyncrasies when translating excerpts into English, since this is often impossible and would be mostly superficial (similarly, as Regmi et al., 2010, recommends, I have been careful about translating idioms by replacing them with similar English ones). The English translations are therefore generally closer to written language conventions than the Swedish originals. When spoken language conventions particular to Swedish are relevant to the analysis, I point that out in the analysis accompanying the excerpt. Some more specific considerations about the translation of certain music-theoretical terms can be found in Section 1.3.

### 6.7 ANALYSIS

Arguably, analysis starts already in the field as one makes sense of what is going on and makes conscious as well as unconscious decisions on what to attend to, what to follow up, what to document and what to remember. The act of transcribing, and in some cases, selecting what to transcribe, also involves aspects of analysis. In this section, however, I will discuss analysis in the narrower sense of how one transforms the data, generated in the field and refined in transcription, into results.

In the analysis, transcripts, recordings, field notes, and inscriptions generated and documented during field work were analyzed together. After a first stage of familiarizing myself with the data and importing the lesson-transcripts into NVivo, the first stage of analysis used tools and techniques from interaction analysis to make sense of complex interaction (as discussed in Section 5.1.3).

Using the ELAN interface, one can view the video with the transcript scrolling underneath, which makes it easier to re-integrate small details isolated during transcription into the flow of the activity and understand how they act in tandem with other modalities. In analyzing the sections of mainly musical interaction in Interview-round 1, the analytical focus was on how the participants co-constructed the tonality of the composition (musically and verbally) in interaction with me (as clarified by interaction analysis). In regards to the musical interaction, this entailed both an analysis of the finished pieces, con-

sidering how melodic, rhythmic, metrical, and harmonic means were used to create a sense of tonal/modal center(s), and an analysis of the process through which the finished piece was co-constructed. In the analysis of the sections of mainly verbal interaction in the interviews, the initial analytical focus was on how the theoretically identified elements of the conceptualization process were co-constructed in interaction. This included attempting to trace references to the musical activity and to subject matter originating in the lesson context through cycles of internalization and externalization, focusing on if and how they became interconnected and changed.

At the planning stage, a similar analysis of the lessons was planned. However, the lessons that were most relevant to the selected focus of the thesis were also the least interactive lessons, largely consisting of the teacher lecturing. Since many of these lessons also divided up the students into different activities (see Table 3), it proved difficult to trace the student cases I had interviewed through the lessons. Therefore, I elected to change the primary analytical focus of the lessons to one of how conceptualization processes were modeled by the participants, i.e. a focus on the external use-aspect of the co-constructive process rather than on issues of individuals' learning and development. In practice, this means that the analysis of the lessons as presented in this thesis are closer to the base layer of interaction analysis than many of the interview-analyses are. In addition to this, I have used NVivo to code and classify different use-categories in relation to different concepts and inscriptions in the educational practice. The question of how the ways of handling the circle of fifths and associated concepts in the lessons can facilitate learning-processes at the individual case level (Research Question 2) had to be answered mainly by attempting to trace them in the interviews.

### 6.7.1 Analysis and the Presentation of Cases

Wagoner (2009) argues for the importance of presenting full, single case analyses as a first step in the research process, and holds that it is on the basis of such analyses one may start to perform aggregate and comparative analysis. As mentioned above, I had more volunteers

for interviews than expected, and ended up with seven students who were interviewed twice, and three students who were interviewed once. For the purposes of this thesis, I consider it equally important to present an analysis of the educational practice within which these single cases develop. Since presenting a full analysis of all seventeen interviews plus a number of relevant lessons would far exceed the bounds of this thesis, I have been forced to make choices about what to include and exclude.

My solution to this problem has been to try to reflect the abductive logic of the analytical process in my selection of what student cases to foreground. In particular, the interviews with the student I have called Lena generated an especially rich material, both because she was at a point in her development which appeared to necessitate externalization, and because we happened to play and talk ourselves into interesting positions. This means that in the process of analysis, abductively generated hypotheses based on Lena's case would often inform the analysis of more obscure episodes from other cases, as well as the analysis of lessons. In other words, Lena's case is often the original source, and the clearest example, of my conclusions. It is, to refer back to Wagoner's position, often (but not exclusively) on the basis of Lena's case that I have generated the concepts and categories that allow me to start comparing and aggregating. I have let that be reflected in my choice of examples and excerpts. Lena's case is the student case that is presented most fully, while I have mainly used the other student cases to contextualize, strengthen, nuance, or contradict my interpretations.



## 7. Analysis and Results

This chapter presents the results of the empirical study through selected excerpts and analyses. It is divided into two main sections: The first (Section 7.1) considers how the circle of fifths is introduced and reproduced, and the second (Section 7.2) how it is used. Throughout the chapter, I attempt to demonstrate how the way in which the diagram and the concepts related to it are introduced, reproduced, and used facilitate certain ways of engaging with the meaning of the diagram. This will often, but not always, mean that I start in the lesson context and then move on to how these educational practices show up in the interviews. The chapter ends with two sections (7.3 and 7.4) considering more general aspects of the relevant lessons: The role of definitions, explanations, and algorithms, and the absence of music. Before diving into the circle of fifths, however, I will provide a short overview of the lessons.

The general purpose of the lessons during the period of lesson observations was to repeat and reinforce different modules they have worked with during the previous semester, mainly: intervals, melodic dictation, notating and reading rhythm, harmony (triads, tetrads, the circle of fifths, using the circle of fifths and chord-functions to transpose chords between different keys). The main activities during the observed lessons can be roughly divided into three categories:

- 1 Self-directed practice, mostly interval-identification, sight reading, and melodic dictation, using books like *Modus Vetus* (Edlund, 1976) or websites like musikteori.se and musictheory.net.
  - 2 Group-work, mostly in the form of composing three-part rhythmic compositions, training in notating and reading rhythm.
  - 3 Teacher-led lectures, mostly on harmony, triads and tetrads, the circle of fifths, functional harmony, keys, and transposing.
- Sometimes, students could choose between (1) and (3) depending on what they thought they needed the most (see Table 3). For the purposes of this project, I will draw on data from lessons in category (3). This means that all the lessons discussed below were lecture-type lessons.

#### 7.1 INTRODUCING AND REPRODUCING THE CIRCLE OF FIFTHS

The circle of fifths is central to almost all talk about concepts of tonality (e.g. KEY, TONIC) in the observed lessons. Use of such concepts is almost always integrated in using the circle of fifths to solve specific tasks. Below, I will show several cases of how information about what the concepts involved actually mean remains hidden inside spatial designations in to the circle of fifths. Hence, the conceptualization processes modelled by the teacher are largely dependent on the students' understanding of what the diagram represents.

In this section, I will look at semiotically mediated strategies for orienting oneself in and reproducing the circle of fifths, and how those strategies relate to mediated remembering. I will demonstrate that one might distinguish at least three different ways of remembering the circle of fifths. One is direct, unmediated remembering (rote memorization where one can recall the image). Two are mediated strategies relying on creating a meaningful structure to aid remembering: Using unrelated mnemonic techniques, or using an understanding of what the diagram represents. This means that I am looking both at statements like *the circle of fifths shows all the keys there are* and at mnemonic strategies that can be used to reconstruct



the diagram or parts of it, because both can be understood as part of semiotically mediated conceptualization processes.

### 7.1.1 Explicating the Circle of Fifths in Lessons

A considerable amount of lesson time was spent on demonstrating not only how to use the circle of fifths, but also on how to generate the diagram. During all of the relevant lessons but one, there is a circle of fifths on the whiteboard. In almost all cases the teacher has gone through ways of generating the diagram while drawing it up. There are also a few brief episodes where the meaning of the diagram is touched upon, as exemplified in Excerpt 1. The episode takes place just as the students have finished reproducing the circle of fifths from memory (individually), a task given by the teacher at the start of the lesson. The intention of the task is to give the students a chance to self-assess how well they have learned methods for reproducing the diagram, so they will know what they need to practice.

Excerpt 1: What does the circle of fifths want to say to us? From Lesson 4 with Group 1.

Participant	Turn	Says	Turn	Does
Teacher:	5	What is it that this circle tells us? What this circle tells us... what is it?		
Lena:	6	[inaudible] eyeliner		
Student 1:	7	Yees...		
Teacher:	8	What does it tell us? What is it that it wants to say to us [inaudible]		
Student 2:	9	Seven, eight, nine, ten...		
Joel:	10	A lot of things		
Students:	11	(mumbling)		
Student 3:	12	[inaudible] well, what chords you can use		
Teacher:	13	For example		
Student 4:	14	Yeah, [inaudible] [kind of how you change]		
Student 5:	15	[inaudible]		

## 7. ANALYSIS AND RESULTS

Participant	Turn	Says	Turn	Does
Student 4:	16	[inaudible]		
Teacher:	17	Mm		
Student 6:	18	[inaudible] tells [inaudible] (laughter)		
Teacher:	19	Yeah, it does tell- or it shows, like, the keys		
Students:	20	(laughter)		
Joel:	22	but this is two [inaudible]	21	points at his paper
Teacher:	23	It shows all the keys there are.		

Some students, who have been quick in finishing the task have started taking amongst themselves about other matters while waiting for the rest of the group (as can be seen in Lena talking about eye-liner in turn 6). The teacher's questions in turns 5 and 8 serves the added purpose of reestablishing a common focus in the classroom and setting up for his upcoming demonstration of different ways of generating the diagram, which will also give the students the opportunity to correct or complete incorrect or incomplete attempts.

The question about the meaning of the diagram is framed by the teacher as a question of what it is trying to say or tell. Although many of the students' replies are inaudible, this framing seems to produce answers in line with the instrumental approach taken in the lessons (as will be demonstrated throughout this chapter), focusing on the use of the circle of fifths: It tells which chords you can use (turn 12), how you change something (turn 14, most likely about changing keys). The teacher sums up (in turn 19) saying that it shows the keys. This could be interpreted as an attempt to say something about how the diagram represents the structure of keys—internally, as related chords grouped together, or the relationship between keys—but the teacher follows up by saying “It shows all the keys there are” (turn 23), a task that might just as well be performed by a list (or by mnemonics such as the ones used to generate the circle later in this section).

However, I have noted in my field notes that one student says something about fifths in this exchange above. This is not audible in the recording, but it is confirmed by the teacher briefly mentioning

it later, ascribing it to Cecilia (see turn 35 of Excerpt 2). This happens when the teacher is transitioning to demonstrating how to generate the diagram. He has stated that C—the key without accidentals—is at the top, and as he is setting up the letters along the outside of the circle as representing names for keys with sharp-signs on one side and flat-signs on the other. This is the only time in the observed lessons that the fifth as the organizing principle of the circle of fifths is made explicit (except in the name of the diagram, and as can be seen from Lena’s case, see Excerpt 7, that is not necessarily sufficient). At the start of Excerpt 2, the teacher has an almost empty circle on the whiteboard, with just the key C-major indicated at the top, a flat-sign to the left and a sharp-sign to the right.

Excerpt 2: Fifths in the circle of fifths. From Lesson 4 with Group 1.

Participant	Turn	Says	Turn	Does
Teacher:	31	[...] And then there’s, based on how many accidentals, eh, on each, flat-side	32	brings his hand downwards along the left side of the circle
	33	or sharp-side,	34	brings his hand downwards along the right side of the circle
	35	then the next key is called that which has an- one sharp-sign, or the fifth then, as [Cecilia] said before, to the previous note.		
Joel:			36	sings the first phrase of “Twinkle, twinkle little star”
Teacher:	37	Exactly. And the- if you don’t know the fifth you can remember these little mnemonics we’ve learned. And then they’re called	38	starts filling in the major keys/chords on the right outside of the circle

The teacher’s talk in turn 31 is a bit difficult to follow, which is exacerbated by the format. (It makes more sense in context and when visual and verbal means of communication are not artificially separated as in the transcript.) Nevertheless, it is possible to discern how the teacher makes some distinctions that may work to scaffold the students’ ability to organize their attempts to decode

and recollect the diagram. The main distinction is that between the “sharp-side” and the “flat-side”. These are indicated by pointing and the flat-and sharp-signs to the left and right of the “C” at the top of the circle (turn 32–34). This distinction will also become important at a later stage in the generation of the diagram, when a rule against crossing over from the sharp-side to the flat-side is introduced, a rule that is also used in some of the transposing exercises (in both cases it is used to make sure the chords/keys are spelled correctly, e.g. that C#, not Db, is the dominant in F-sharp major).

Using this distinction, the teacher can formulate a principle for the order of keys in the circle of fifths (turn 35). Each key progressing clockwise or counter-clockwise (compare the pointing in turn 32 and 34) from C-major at the top to the nethermost position on the circle has one more accidental than the previous key, a sharp-sign on the sharp-side, and a flat-sign on the flat-side. The reason for why the keys are in this particular order is not touched upon. The way the teacher is putting it implies the order of the keys in the circle of fifths is deduced from the number of accidentals in a key, but given several of the students’ unfamiliarity with music notation the opposite is likely to be the case—the number of accidentals is deduced from the order in the circle of fifths, or from one of the mnemonics used to generate the diagram (see Section 7.1.2).

It is in this context that the teacher offers another principle for generating the order of keys in the diagram, that the next key is (based on) the fifth to the tonic note of the previous key. This principle is only valid if one generates the circle clockwise of course, and therefore has to be inverted to generate the left side of the circle if one starts from C (as they will do). But since the teacher is transitioning to writing down the right side of the circle in turn 37–38, it works well in context.

In turn 36, the student Joel offers a musical representation of the fifth-concept by humming the first phrase of “Twinkle, twinkle little star.” The teacher acknowledges this as a correct response (“exactly”, turn 37) before moving on. The teacher then goes on to say that “if you don’t know the fifths” you can instead rely on the mnemonic techniques they have been learning. That is, the teacher is anticipat-

ing (based on some of the interviews, correctly) that some students might not be able to ascertain the fifth of any given pitch. This leads over to a demonstration of how to generate the circle of fifths using mnemonic techniques and algorithms utilizing the results of such techniques, i.e. generating the relative minor keys on the inside of the circle from the corresponding major keys on the outside.

The episodes in Excerpt 1 and Excerpt 2 are the closest thing to a formal definition of the circle of fifths in the observed lessons. In these episodes, the teacher offers an interpretation of what the circle of fifths represents, as well as two different principles for how it is organized—that the order of the keys is decided by the number of accidentals, and that it is decided by the fifth-interval. The division between one half of the diagram for sharp-keys and another for flat-keys, that is introduced as part of the explication of the order of keys based on number of accidentals, will continue to play a part throughout the lessons and in the interviews. It mediates a powerful way of reading the diagram by chunking it into two parts, and is the reason for many of the more complex ways of handling the generation of the diagram. It is important to stress here that talk about the meaning of the circle of fifths or its organizing principles as illustrated in Excerpt 1 and Excerpt 2 is rare, and that the vast majority of lesson-time concerning the circle of fifths is devoted to using it to transpose or to generating the diagram based on mnemonics and algorithms. The use of the circle of fifths as a transposing device will be explored in Section 7.2, the next section will be devoted to techniques for generating the diagram.

### 7.1.2 Modeling Mediated Remembering in Lessons

In this section, I have relied on and will mostly rely on Lesson 4 with Group 1 for examples, since this lesson contains some of the most explicit discussions of both the meaning of the diagram and of mnemonic techniques. I also believe it is useful to be able to see how the different excerpts build on each other. The mnemonic techniques illustrated in this section are, however, present to some degree in all observed lessons where the circle of fifths is being used. When

they are present to a lesser degree, they do not tend to be supplanted by other techniques but rather tend to be taken for granted.

The central devices for generating the circle of fifths are mnemonics designed to help remember the order of the keys clockwise and counter-clockwise from C. The other techniques to be explored here all start from a circle with all major keys filled in. Excerpt 3 shows how one mnemonic device is suggested by the teacher while another is supplied by a student. The excerpt is a direct continuation of Excerpt 2, so that the mnemonic recited by Joel in turn 39 is spoken as the teacher is writing down the key-names of the right side of the circle (in turn 38, Excerpt 2).

Excerpt 3: Mnemonics. From Lesson 4 with Group 1. The mnemonics are rendered in Swedish, since they are reliant on syntax and phonology rather than meaning. Quotation marks are used to distinguish “untranslated text” from translated text.

Participant	Turn	Says
Joel:	39	[timed with the teacher’s writing:] “Gå, du, Axel, efter, Bertils, fiskar”
Student 1:	40	What weird mnemonic did you have, [Joel]?
Joel:	41	“gå du Axel efter Bertils fiskar”
Teacher:	42	“Gå du Axel el- efter Bertils fiskar”, or “giv dem alla en bamsig fisk”, if you think that’s better.
Student 2:	43	“Bamsig”?
Teacher:	44	“En bamsig fisk”, a large fish.

These mnemonics<sup>23</sup> are short sentences where the first letter or syllable in each word correspond to the name of the key. In turns 39 and 41, Joel suggests the mnemonic *Gå Du Axel Efter Bertils FISkar* (Go, you Axel, for Bertil’s fish) for the sharp-side of the circle (clockwise from G-major to F-sharp major, see Figure 8). The mnemonic supplied by the teacher in turn 42 is *Ge/Giv Dem Alla*

23 In the lessons, these mnemonics are referred to by the much less intimidating Swedish word *ramsa*, which is also used for things such as nursery rhymes. I have not managed to find a suitable English translation that works in context.

*En Bamsig FISK* (give them all a big fish). The capitalized letters of each word correspond to the pitch-class name of each key. (In the last word of both mnemonics, “FIS-” in the Swedish word *fisk(ar)* corresponds to the Swedish word for F-sharp, *Fiss*.) For the other half of the circle (counter-clockwise from F-major to G-flat major) the mnemonic used by the teacher is: *Frosten BEStal ESters ASter DESS GEStalt* (the frost robbed Esther’s aster of its form), where the capitalized letters correspond to the Swedish pitch-class names *F, Bess, Ess, Ass, Dess, Gess* (F, B-flat, E-flat, A-flat, D-flat, G-flat).

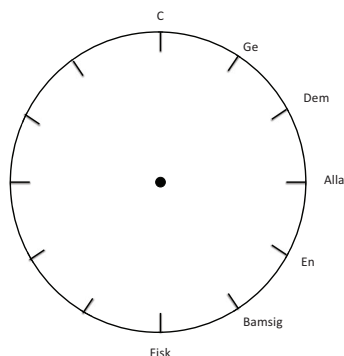


Figure 8: The mnemonic device *Ge Dem Alla En Bamsig Fisk* (give them all a big fish) mapped onto an empty circle of fifths.

As the activity progresses beyond Excerpt 3, and also in other lessons, it becomes clear that the students at some point have had the task of coming up with their own mnemonics. When these are used, the other students often attempt to make sure they understand the meaning of the sentences. This can be seen in turn 43–44 in Excerpt 3, where a student asks what “*bamsig*” means and gets this clarified by the teacher. Other cases include a long discussion about whether *Estrella-askar desarmerar gästerna* (Estrella-boxes disarm the guests, *Estrella* is a Swedish manufacturer of snacks) in one of the mnemonics means that the guests are to be understood being hot-tempered and mollified by snacks or as being armed but putting their weapons aside to munch on chips. The question of whether chips were actually ever sold in boxes was also raised. This is because understanding what

the sentences mean aids the recollection of their exact form. These mnemonic devices are paradigmatic examples of psychological tools mediating memory functions (Vygotsky, 1997a; Vygotsky & Luria, 1994). As can be seen in Lena's second interview (see Excerpt 9–11), such psychological tools can be used by students to reconstruct the circle of fifths externally, on paper, or intramentally, to the mind's eye. In this sense, they are signs that are turned inward, a means of auto-stimulation. The holistic meaning—the imperative to dole out large fishes or the observation about the effect of a sudden night chill on Esther's flowerbed—serves to make the sentences more memorable than a seemingly arbitrary list of words (or pitch labels) and together with the syntax of the language also to restrict possible word order. Thanks to the letter- and syllable-based pitch-naming system used in Sweden, the words can serve as auxiliary stimuli (Vygotsky & Luria, 1994) when deconstructed in terms of their sound or their spelling. The mediated operation relies on the external form of the sentence and its constituent signs (their phonological and syntactic structure) and automatized spelling conventions to convey the target of the mnemonic technique (the list of pitch-labels), and on the semantics of the sentence as a whole to make it memorable (Figure 9).

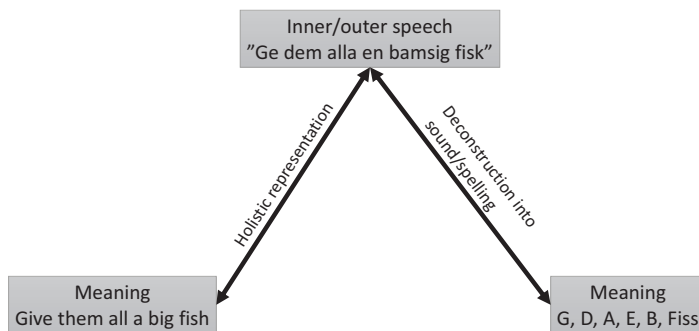


Figure 9: The mnemonic *Ge dem alla en bamsig fisk* (give them all a big fish) as the auxiliary stimulus in a sign-mediated memory operation. Loosely based on Figure 7.2 in Vygotsky and Luria (1994, p.144)



The utility of such a mnemonic device is, of course, relative to how meaningful the target sequence itself is to the agent. As the teacher says in Excerpt 2, turn 37, these mnemonics are useful “if you don’t remember the fifth” of C, G, D, and so on. Since the mnemonics do not mediate any information about why the signs should be in that particular order in the diagram, they can be used to mediate the generation of the outside of the circle of fifths (the major keys or chords) without requiring any understanding of what the resulting symbols and their placement in the diagram represent. The time spent on the mnemonics relative to the time spent on talking about the meaning and organizing principles of the circle of fifths implies that the logic of the mnemonic devices may supersede the logic underlying the diagram. This is best illustrated by Lena’s discovery that the circle of fifths consists of fifths in her second interview (see Excerpt 7).

When the whole outside of the circle (all the major keys) has been generated using mnemonics such as those discussed above, the teacher progresses to demonstrating techniques for generating the minor keys on the inside of the circle based on the major keys already established. These techniques can be understood as semi-otically mediated, self-referential algorithms for generating the remaining parts of the diagram. The beginning of this process, where the different techniques are introduced, can be found in Excerpt 4. On the whiteboard there is, in addition to the unfinished circle of fifths, a piano keyboard drawn up (which is unfortunately blocked from view by a student’s head in the video recording).

Excerpt 4: Techniques for generating minor relatives. From Lesson 4 with Group 1.

Participant	Turn	Says	Turn	Does
Teacher:	87	And then the secret trick, how do you find out which minor key- because it is relatives we’re supposed to find on the inside	88	brings his hands together to form a circle
	89	the relatives of the major keys, minor rela- rellallalla-		
Student 1:	90	Rallallalla		
Students:	91	(talking over each other)		

## 7. ANALYSIS AND RESULTS

Participant	Turn	Says	Turn	Does
Teacher:	92	[raises his voice:] What is then the best way to figure that out? Do you have any secret tricks?		
Martin and Joel:			93	Raise hands
Teacher:	94	[Martin]?		
Martin:	95	You jump three steps		
Student 2:	96	Backwards		
Teacher:	97	You jump three steps		
Martin:	98	So that if you look at C, then you jump three steps to the right, to G, D, and then you end up on A, then C is A-minor.		
Lena:	99	I think le- left		
Teacher:	100	That's how you think		
Lena:	101	Left		
Teacher:	102	[Martin] thinks like this	103	walks over to the circle of fifths
Lena:	104	Left from C [inaudible]		
Teacher:	105	He jumps three steps this way	106	points in the circle of fifths
	107	one two three		
Student 3:	108	[to Lena:] ah, you mean on the piano		
Student 4:	109	Yeah		
Lena:	110	Yeah		
Teacher:	111	EEH, you can do that, it worked at least this time		
Joel:			112	Points at his sheet of paper
	113	[to Lena:] we're thinking in the circle of fifths		
Lena:	114	Ahaa [inaudible]		
Teacher:	115	Do we have any other tricks?		
Joel:	116	Memorize		
Teacher:	117	You can memorize, any other tricks?		
Student 5:	118	As [Lena] said, that you just-		
Teacher:	119	[to Lena:] What did you say?		

## 7. ANALYSIS AND RESULTS

Participant	Turn	Says	Turn	Does
Lena:	120	C, three left		
Student 6:	121	Three		
Teacher:	122	Three steps backwards on a piano, yes		
Lena(?):	123	Yeah		
Teacher:	124	Can do that		
Martin:	125	Th- then I found that it's the same pattern on the in- inside as on the outside actually		
Students:	126	[several talking in the background:] do you think like that? Yeah, I count...		
Martin:	127	Because then, G has E-minor, [then I see an] A and an E beside each other, [then I know that D] must have B-minor, and A then F-sharp minor		
Teacher:	129	There's C, here's C as [Lena] said then, on an on a keyboard you count three steps backwards, one two three, and that's the kind of thing you can [inaudible] do just as well as [Martin]'s way. All ways are good except the bad ones. [...]	128	points at something on the whiteboard [probably the piano keyboard that is blocked from view by a student's head]

There are a lot of things going on at once in Excerpt 4, which means that the analysis below will sometimes be non-chronological. Starting from the top, however, the teacher introduces the task in turn 87, framing it (jokingly, in my interpretation) as revealing *the* “secret trick” to finding out the relative minor keys along the inner rim of the circle. The teacher spends some time in this turn establishing terminology by using the terms *MINOR KEY(S)* and *MAJOR KEY(S)*, and connecting these with *RELATIVE*. The situation is slightly derailed in turns 90–91 by a student poking fun at the teacher’s failed attempt to say “relatives” in turn 89, but the teacher reasserts himself in turn 92, raising his voice to be heard over the talking students. Here, the teacher reframes the situation from revealing the “secret trick” (singular) to crowdsourcing “secret tricks” (plural) from the students. In response, two students sitting next to each other, Joel and Martin, raise their hands (turn 93) and the teacher gives the

word to Martin (turn 94). In order to first clarify Martin’s “trick”, his technique, I will mostly (and temporarily) disregard the interpolations by Student 2, 3, 4, and Lena (turns 99, 101, 104, 108–110). Martin’s technique is summarized in Figure 10, which the reader may want to consult to clarify the descriptions in the excerpt and text body.

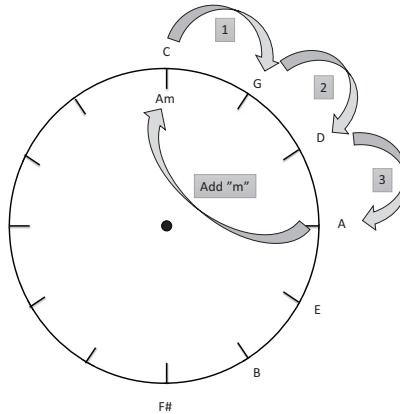


Figure 10: Martin’s technique. Generating the minor relative to C by jumping three steps (1, 2, 3) clockwise from C in the circle of fifths and transferring the resulting symbol (“A”) to the position opposite C while adding “m” for minor.

Martin introduces his technique in turn 95 as simply “You jump three steps.” As the comments by Student 2 and Lena (e.g. turn 96 and 99) show, this is ambiguous. The teacher prompts Martin to elaborate by repeating his statement verbatim in turn 97, which indicates that the teacher is aware of this ambiguity. In turn 98, Martin elaborates on his technique, focusing attention on C in the circle of fifths and clarifying that you jump three steps to the right.<sup>24</sup> Using an if–then construction, giving the impression of a deduction, he enumerates the key/chord symbols he encounters along the way (“G, D, and then you end up on A”), and states as

24 Martin follows the teacher in using “to the right” instead of e.g. “clockwise.”

his conclusion that this means A-minor is the relative of C-major (but in somewhat abbreviated form).

Martin's technique can be restated in general terms as: To generate the relative minor key of a major key, jump three steps to the right (clockwise) in the circle of fifths starting from the major key in question. Transfer the symbol you end up on to the position on the inside of the circle corresponding to the starting major key, adding "m" for minor (compare Figure 10). As will be explored further below, this algorithm will work for all starting major keys except E-major, B-major, and F-sharp major, where it will yield the enharmonic equivalent instead (e.g. D<sup>b</sup>m instead of C<sup>#</sup>m when starting from E, compare Figure 12).

The teacher comments in turn 100 with "that's how you think" ("you" referring to Martin). This anticipates the teacher's focus on there being multiple valid ways to solve the problem, as also indicated e.g. by turn 92. In turn 102, the teacher switches to addressing the group as a whole while moving to the whiteboard, indicating that he will now demonstrate Martin's technique. He proceeds to do this in turn 105–107, completing the deictic reference "this way" by pointing out the clockwise steps in the circle of fifths as he counts them. The teacher does not verbalize the result of the procedure, but instead lets the pointing (ending up on A) speak for itself, only adding in turn 111 that the technique worked—at least in this case.

The teacher then moves on to other "tricks" in turn 115 and onward. Before discussing those, however, I will briefly skip ahead to turn 125 and 127, where Martin offers further elaboration of his understanding of the circle of fifths. In turn 125, Martin relates his discovery that the same pattern repeats on the inside and outside of the circle. This is exemplified in turn 127, where he states that the relative of G is E-minor, and that since they have just demonstrated that the relative of C is A-minor, he can see an A followed (clockwise) by an E, which is also present on the outside of the circle. If the pattern holds, that means the next minor relative (to D-major) should be B-minor, since B follows E on the outside of the circle, then F-sharp minor, etc. This is, of course, perfectly correct, although Martin stops short of the point where he would

have to deal with enharmonic equivalence. In fact, what Martin is offering here (whether he realizes this or not) is an explanation of why his technique works, although one that is wholly contained within the structure of the diagram itself.

The underlying reason why Martin's technique works is that adjacent major keys in the circle of fifths are one perfect fifth apart, and that the corresponding minor keys are all one minor third below/a major sixth above their major relatives, which means that adjacent minor keys are also one perfect fifth apart. Since three stacked perfect fifths are octave equivalent to a minor third down/a major sixth up, the point where the pattern starts repeating is three steps clockwise or counter-clockwise in the diagram. Unlike this explanation of the underlying reasons, Martin's explanation is contingent on patterns as they are presented in the inscription of the diagram (rather than an explanation of why those patterns are there), which is also the case with his technique. Since Martin was not one of the students who volunteered for interviews, I have not had the opportunity to further investigate whether or not he is (or could become) aware of the underlying reasons behind these patterns, and I do not wish to imply the one or the other. The fact remains, though, that the pattern observed by Martin as well as his technique for generating the minor relatives, can be observed, described, and applied without those underlying reasons being known or utilized. (This is also true for the extension of Martin's technique discussed below, see Excerpt 5).

The other prominent "trick" in Excerpt 4 is ascribed to Lena, and I will call it Lena's technique. It consists of counting three semitone-steps down (or to the left) on a piano keyboard. Since this technique is also mediated by a central three-steps phrase, it leads to some confusion early in the excerpt. When Martin first introduces his technique as "You jump three steps" (turn 95) another student immediately says "backwards" (turn 96), which does not match Martin's "to the right" (turn 98) nor the corresponding forward direction implied by the alternative clockwise/counter-clockwise way to semiotically organize directions in the circle of fifths. It does match the way the teacher sometimes talks about (descending)

minor thirds on the piano keyboard, saying “three steps backward” as in Excerpt 14, turn 147, 153, and 155. This interpretation gains further strength when Lena, seemingly in response to Martin’s “to the right” in turn 98 (Excerpt 4), says “I think le- left” (turn 99), then “left” again (turn 101), and “left from C” (turn 104). At this point, another student responds to Lena, “ah, you mean on the piano” (turn 108), to which Lena and possibly another student answer in the affirmative (turn 109–110). That is, Lena’s “left” here definitely refers to left on the piano keyboard, which makes sense given that Lena is a pianist.

Here, Joel seems to grasp the source of the confusion, because he turns to Lena and says “we think in the circle of fifths” (“we” presumably referring to him and Martin) while pointing at his sheet of paper where he has drawn up a circle of fifths earlier (turn 112–113). Lena’s “ahaa” in the following turn indicates that this clears up the confusion for her as well. Meanwhile, the teacher has finished demonstrating Martin’s technique and asks for more suggestions (turn 115). Joel suggests memorization which the teacher acknowledges as a possibility before moving on and asking again for more “tricks” (turn 116–117).

Another student answers with “What Lena said” and starts explaining (turn 118), but the teacher turns to Lena and asks what her suggestion was (turn 119). Lena sums it up as “C, three left” (turn 120), which the teacher remediates for the rest of the group by making explicit that it is three steps on a piano. He also replaces “to the left” with “backwards,” which has the benefit of letting the left-right terminology be specific to directions in the circle of fifths and is consistent with his previous usage (e.g. Excerpt 14, turns 147, 153, and 155, also, in the same excerpt, the teacher’s stress on the transposing being from C-major to A-major is an attempt to preempt conflation with the technique Lena is representing here). Lena probably confirms this interpretation in turn 123, and the teacher confirms that this is a doable technique in turn 124.

As Martin and other students are talking in the background (turns 125–127) the teacher moves to the whiteboard to demonstrate Lena’s technique for the rest of the group. In turn 128–129, he points

at something on the whiteboard and says “There’s C, here’s C”, most likely he is pointing at a c-key on the keyboard drawn up there, but this cannot be confirmed from the video recording because this part of the board is blocked from view. He then reiterates that on a piano keyboard you count three steps backward and illustrates this by counting “one two three”. Most likely he is simultaneously pointing at each successive key (B, B $\flat$ , A) on the piano keyboard on the whiteboard, thereby indicating that “steps” means semitone-steps, but again this cannot be confirmed from the video recording. A summary of Lena’s technique can be found in Figure 11, compare also this technique in action in Excerpt 10 and Excerpt 11).

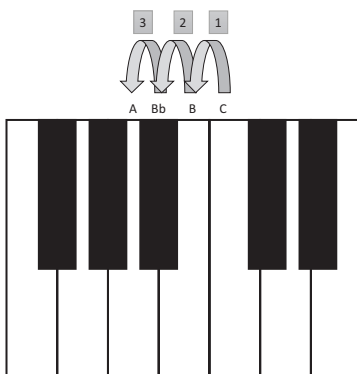


Figure 11: Lena’s technique. Generating the minor relative to C by jumping three (1, 2, 3) semitone-steps down (C–B, B–B $\flat$ , B $\flat$ –A) on the piano keyboard.

Lena’s technique is mediated by the inscriptional aspect of the piano keyboard and by the polysemous names of keys/chords in the circle of fifths and of piano-keys on the keyboard. Hence, in contrast to Martin’s technique, Lena’s technique involves a transition between different representations of pitch-relationships mediated by the specific naming-conventions of this music-theoretical discourse. It therefore opens up the possibility that one representation can potentially mediate some of the underlying logic of the other. For instance, a student who is familiar with the symbolic organization of the piano keyboard and able to connect the teacher’s “tree



steps backwards” in this lesson with other times he has used it in connection to the concept “minor third” (e.g. Excerpt 14), could potentially conclude that the minor relative chord/key is a minor third down from the corresponding major key.

As the activity moves on beyond Excerpt 4, the teacher continues demonstrating how each minor key on the inside of the sharp-side semicircle can be generated from the major keys using both techniques (Martin’s and Lena’s). By doing this, he is reinforcing the adequation of the two inscriptions on the whiteboard (piano-keyboard and circle of fifths), by repeatedly demonstrating how these two operations yield the same result. However, like with many of the algorithms in this chapter, the underlying logic is not made explicit, and it is possible to apply this technique mechanically as long as one knows (or can find a map of) the names of the piano’s keys. As he progresses to A-major and beyond, however, the teacher needs to address the problem of enharmonic equivalents, that is, should the minor relative of A-major be F-sharp minor or G-flat minor (etc.)?

When using Lena’s technique, the solution to the problem is to remember the rule that there are no flat-signs allowed on the “sharp-side” of the circle (and vice versa). This means that after finishing the counting-three-steps operation on the piano keyboard, the resulting key (if it is a black key) must be read as X-sharp rather than X-flat (and vice versa for the flat-side of the circle).

When using Martin’s technique, the solution presented is not the similar option to read D-flat as C-sharp and so on (since they mark the bottommost position in the circle as “G $\flat$ /F $\sharp$ ” this step does not seem to create any trouble), but a more complex solution that further reinforces the reliance on the features of the diagram. This extension of Martin’s technique is presented in Excerpt 5. The reader may wish to consult Figure 12 for added clarity.

## 7. ANALYSIS AND RESULTS

Excerpt 5: Avoiding enharmonic equivalents. From Lesson 4 with Group 1.

Participant	Turn	Says	Turn	Does
Teacher:	173	You're not allowed to cross the border, but [when you] get here, to F-sharp, you start over again. [But] what? Does it become C again then?		
Student 1:	174	Nuh-uh		
Students:	175	[Joking about <i>Skorpan</i> <sup>25</sup> ]		
Sofia:	176	C-sharp! [inaudible] that is, you- because it's an- that is, you add an sharp- a sharp-sign, on those [inaudible] that it becomes		
Student 2:	177	In <i>Skorpan</i>		
Student 3:	178	<i>Skorpan</i> what?!		
Teacher:	179	[inaudible] [what?] (shushing) look here now, this is important stuff. When you've gone all this way down here,	180	points along the right side of the circle of fifths
	181	then it continues here, with a sharp-sign on each	182	points at C in the circle of fifths, moves his hand clockwise
Students:	183	(mumbling, laughing)		
Teacher:	184	So that here it becomes one, two	185	[probably pointing at B and F# in the circle of fifths]
	186	three,	187	points at C
	188	if we're doing [Martin]'s model	189	writes C#m in the circle of fifths
	190	so it becomes C-sharp minor.		

- 25 Referring to one of the main characters in Astrid Lindgren's *Bröderna Lejonhjärta* (*The Brothers Lionheart*) named Skorpan in Swedish (Rusky in the English translation). This is because the teacher has earlier likened the "border" between the sharp- and flat-sides of the circle of fifths with the border between the two warring realms in that book and/or its TV-adaptation: *Körsbärsdalen* where Skorpan lives, and *Törnrosdalen* ruled by the evil Tengil. ("Here you meet Tengil, 'All hail Tengil our liberator!' H- here he rules, in this kingdom [...] You cannot cross the border there.")

In turn 173, the teacher stresses that one is not to cross over from the sharp-side to the flat-side of the circle. This rule has been stated before by the teacher, comparing the two sides of the diagram with two warring realms in a popular children's book, which is what leads to the jokes and comments about "*Skorpan*" in turns 175, 177 and 178 (I will ignore these turns here, for context, see note 25). The teacher continues in turn 173 by describing what to do instead of crossing the border. In his demonstration the teacher is starting from E-major. As can be seen in Figure 12 (left), having jumped two steps clockwise, he ends up on F-sharp. Instead of crossing over to the flat-side in the third step and ending up on D-flat (the dotted arrow in Figure 12), the teacher instructs the students to "start over again", that is, to go back up to C. Anticipating a possible source of confusion, the teacher asks "[But] what? Does it become C again then?", and gets a declining response from a student (turn 174). In turn 176, Sofia provides the correct solution ("C-sharp!"), and explains that "you add[...] a sharp-sign" to the end result of the process.

After attempting to restore order in turn 179, the teacher re-mediates his own and Sofia's explanations (turn 179–182): "When you've gone all this way down here[...] then it continues here, with a sharp-sign on each". By indicating the progression along the right side of the diagram from C to F-sharp, then pointing to C again, he is using the diagram to mediate the same point he expressed verbally in turn 173 ("[when you] get here, to F-sharp, you start over again"), while the continued clockwise movement after pointing back at C helps clarify Sofia's explanation in turn 176 ("you add[...] a sharp-sign, on those [inaudible] that it becomes").

With this, the teacher resumes his demonstration in turn 184. As in turn 105 of Excerpt 4, he counts out the steps, probably accompanied by pointing at B and F# at "one, two" (the lower part of the circle of fifths on the whiteboard is blocked from view at this point in the video recording) and (visibly) pointing at C at "three" (compare Figure 12). After reminding the students that this is Martin's model, he writes down and states the final result, C-sharp minor. Implicit in the teacher's final demonstration is (1) the rule to

add the sharp-sign, which was stated in turns 176 and 181, and (2) that “m” or “minor” needs to be added. The latter is stated more or less explicitly by the teacher just a few turns later: “Then C-sharp is there. Then we know it’s minor- because we’re on the inside [of the circle NR], then it’s always minor.” (Teacher, Lesson 4 with Group 1, turn 194)

This extended version of Martin’s technique can thus be stated as a (somewhat more complicated) general rule (compare Figure 12): To generate the relative minor key of a major key, jump three steps in the circle of fifths starting from the major key in question. Steps are clockwise unless they start on F-sharp, in which case the step is vertical, up to C. If any steps remain after a vertical step, resume clockwise motion from C. If one of your steps was vertical, add a sharp-sign to the last symbol you end up on. Transfer the last key-symbol you end up on to the position on the inside of the circle corresponding to the starting major key, while adding “m” for minor.

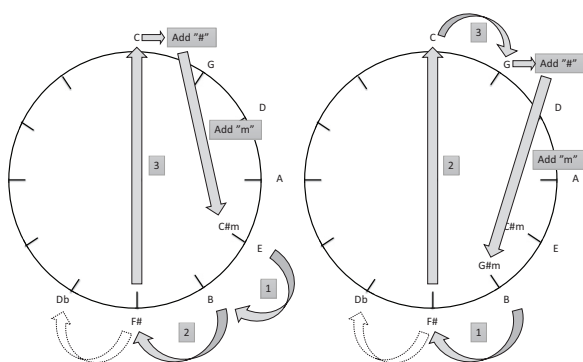


Figure 12: Extension of Martin’s technique. The extension addresses the need to handle enharmonic equivalents arising from E-major to F-sharp major (compare Figure 10). To the left is the technique applied to E-major, to the right applied to B-major. The technique is still based on jumping three steps (marked 1, 2, 3), but in order to avoid crossing over to the “flat-side” of the diagram (which would result in D $\flat$  instead of C $\sharp$  when starting from E (the dotted arrow)), jump up to C instead of clockwise to D $\flat$ , add a sharp-sign and transfer the resulting symbol (“C $\sharp$ ”) to the correct position opposite E while adding “m” for minor.

As with Martin's original technique, the extended version is almost wholly contingent on surface features of the diagram. The exceptions are the need to add the sharp-sign and to remember that the resultant key-symbol represents a minor key, which cannot be read off from the diagram itself. The former of these is, like the exact number of steps, their directions, etc., presented as arbitrary rules, with no attempt made to explain why they are required or why they work. For example, it is not pointed out that applying the original technique with its three steps clockwise would have resulted in D-flat, which is enharmonically equivalent to C-sharp.

The added complexity of Martin's extended technique makes it the most unequivocal example in this material of a more general trend in the relevant observed lessons: The logic of the representations frequently supersedes the logic being represented. We will see other examples of this in this chapter, for example when concepts such as TONIC, SUBDOMINANT, and DOMINANT are defined based on their relative positions in the circle of fifths, or when polysemous meanings of identical signifiers (e.g. the same sound or symbol "A" standing for the pitch-class, the major chord, and the major key) are relied upon to mediate the systematicity underlying the naming conventions.

Another example is how the logic of the mnemonics used to generate the major keys in the circle of fifths supersedes an aspect of the logic of the circle of fifths. The logic underlying the order in which the keys are enumerated by these mnemonics is the increasing number of accidentals,<sup>26</sup> which leads to there being two mnemonics—one for the sharp-keys and one for the flat-keys. These mnemonics generate half the circle each, clockwise and counter-clockwise respectively. As such, they obscure the circularity of the circle of fifths, that is to say, that the same principle (stacked fifths ascending or descending depending on

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26 I am unaware of the origin of these mnemonics, and whether they were first designed to aid memory of number of accidentals or not. Either way, I would argue that they are more well suited to this than to revealing the underlying principle of the circle of fifths.

the direction) holds from C and all the way back to C (allowing enharmonic equivalence at one point in the series). This is then further compounded by techniques such as Martin's extended technique, where a non-crossable border is erected between the two sides of the circle (which in turn is only there because of the logic of how we chose to represent pitch, e.g. that the pitch one perfect fifth above F-sharp is called C-sharp and not D-flat).

It is also possible to see how the logic of the mnemonics is reinforced by how other techniques for generating the minor relatives are organized. Lena's technique, while less dependent on the features of the circle of fifths diagram, is still applied in the same order as the mnemonics, that is, first the relatives for C-major to F-sharp major are generated, and then for F-major to G-flat major. In a sense, this creates a line of fifths, rather than a circle.

Given this, it is interesting to note what the teacher does in Lesson 4 with Group 1, after letting the students reproduce the circle of fifths from memory, having demonstrated how to use mnemonics to generate the major keys, and then Lena's and Martin's techniques to generate the relatives for the sharp-side of the diagram. He walks away from the whiteboard, turns toward the students, and gives the following short and impassioned speech:

Ehm, that's how it's supposed to look. But the most important thing to me is not what it looks like, but that you understand why it ends up this way. It's super important that you understand why. Not just 'Ah! I got it right! I didn't know [how] it was but I just got lucky, just [oh well]'. [...] Eh, it's not that way [inaudible, student coughing] want it, but better that 'Yeah, shit, I do know it's that way, and I got it wrong,' better that way, than that [you] wing i[t] and get everything right. You have to know why (marks each word by pointing down at the floor/table), it's super important. That's why I'm doing this repetition, so it'll really stick. (Teacher, Lesson 4 with Group 1.)

With this, the teacher moves on to generating the minor relatives on the other side of the circle, using Martin's and Lena's techniques. Although there has been some talk about what the circle of fifths represents early in the lesson, and even brief mention of the fact that it consists of fifths, the lesson as a whole gives the

impression that the mnemonics and the techniques for generating the rest of the diagram based on those mnemonics is the *why* that the teacher is talking about.

### 7.1.3 Remembering the Circle of Fifths in the Interviews

The second round of interviews drew on the episodes related above to focus on if and how the participants used these mnemonic techniques when reproducing and using the circle of fifths. Looking cross-sectionally at the seven participants in the second round of interviews, it is possible to recognize a pattern established in early studies of the development of mediated memory functions (Vygotsky, 1997a; Vygotsky & Luria, 1994). Vygotsky argued that higher memory functions develop from a stage where signs are not used, or used in an inconsistent manner, via a stage where external signs are used, to a stage where the operation has been internalized and the sign use is no longer observable (other than in better performance).

In my material, Fredrik, Tobias, and Monica show either a lack of semiotically mediated strategies for reproducing the circle of fifths, or use strategies that only solve part of the problem. Fredrik is the most extreme case. He does not seem to remember anything about in what order the keys are positioned in the circle of fifths. This is probably explained by him being absent from many of the observed lessons, and by him not being comfortable with the Swedish language yet. The mnemonics that are introduced and discussed in the lessons are all in Swedish, and their usefulness is based on them being perceived as more meaningful than the (apparently) random string of letters C, G, D, A... But for someone who is still not used to the language, the mnemonic will most likely be perceived as just another random string of sounds.

Immediately when I ask him to draw up a circle of fifths, Tobias says that it is probably what he is worst at. In Excerpt 6, he explains while he is attempting to reproduce the diagram that he has started “to memorize it” (turn 94).

## 7. ANALYSIS AND RESULTS

Excerpt 6: Tobias tries to remember the circle of fifths. From Interview 2 with Tobias.

Participant	Turn	Says
Tobias:	94	But I've started to (.) like memorize it a little
Niklas:	95	Yeah
Tobias:	96	So I have a little image but I know that I don't remember a lot of it...
Niklas:	97	You know that- you know that it starts with a circle right? (laughter)
Tobias:	98	Yeah, that's what I'm best at, the circle! (laughter)
Niklas:	99	yeah
Tobias:	100	[silently:] just a circle... [normally:] so I know that C is up here anyway
Niklas:	101	mm
Tobias:	102	It's going to go a bit so-so
Niklas:	103	Yeah
Tobias:	104	I know that F-sharp is down here, but I don't know [inaudible] somewhere
Niklas:	105	Yeah, right, yeah it's like opposite C
Tobias:	106	mm
Niklas:	107	mm
Tobias:	108	I don't remember if D comes after here... no
Niklas:	109	Yeah... how (is) it, do you have a mnemonic?
Tobias:	110	No, C isn't up there at all!
Niklas:	111	Yes, C is up there, it's correct that far
Tobias:	112	I don't have a mnemonic or anything, no

Tobias is responding to the task of reproducing the circle of fifths by saying that it is one of the things he is worst at. He continues to manage (his perception of) my expectations throughout the excerpt (see especially turns 94, 96 and 102), indicating an awareness of the high value placed on the ability to reproduce the diagram in this educational context. Tobias says that he has started to memorize the diagram and that he has a “little image” (Swedish “*liten bild*”, turn 94) of it. In Swedish, the expression *ha en bild* (have an image/a picture) can be used metaphorically in the sense of having a general impression of something, but it could also be interpreted more literally as referring to visual remembering (picturing something).



After an attempt by me to use humor to dissipate some of the tension (turn 97–100), Tobias starts relating what he does remember. In turn 100, he says that C is at the top of the circle. His utterance (“up here”) indicates a deictic reference by pointing, and it is obvious at a slightly later point in the conversation (though beyond this excerpt) that he has already drawn up a circle on his sheet of paper. But since I only have audio of this interview (due to a camera malfunction), I cannot confirm this. After some affirming sounds from me (turns 101, 103) and some more managing of my expectations (turn 102), he goes on to say that he knows that F-sharp is “down here” (turn 104, again most likely pointing). While one key word is inaudible in turn 104, it seems like he qualifies this by saying he does not know exactly where in the lower part of the circle F-sharp should be placed. In turn 105, I confirm and follow up by specifying that F-sharp is opposite C, which is followed up by further confirmatory sounds from us both in turn 106–107.

Tobias tries to continue reconstructing the order of keys in turn 108, offering a guess that D comes next (clockwise) after C. He probably picks up on me not immediately confirming, and draws back his suggestion quickly. Instead of confirming in turn 109 (I do say “yeah...” but the prosody indicates it is not intended as confirming Tobias’ suggestion), I ask if he has any mnemonics. This works both as a factual question and as an attempt to scaffold his way of approaching the problem by bringing up mnemonic strategies. Tobias does not answer the question right away. He is still focused on trying to solve the problem correctly and expresses doubt in his previous assertion that C is at the top (turn 110), and I assure him in the next turn that the C is placed correctly. After we have settled this, Tobias answers that he does not have any mnemonics (turn 112).

In relation to this episode, it is interesting to consider what Tobias means by “memorizing.” It seems like memorization to Tobias means rote memorization without memory-aides. His use of the word “*bild*”, image or picture, could indicate that he is trying to use visual rather than semantic remembering strategies to reproduce the diagram. There are indications that this view of memory is part of

the discourse in context, for example Joel's suggestion to simply memorize in Excerpt 4, turn 116, which positions memorization as something different than the use of mnemonics. There are also similar indications in Monica's case, although she has a partial semiotically mediated strategy to remember the order of some of the major keys. Here, Monica is talking while reproducing the diagram on paper:

Then I think... the violin's strings, or I know that it starts on C, then I think the violin's strings, so then it becomes G, eh, I should write G too, G, D, A, eh, E, ehm... Then I have- I only have the image in front of me, if I even remember that. (Monica, Interview 2)

Monica is a violinist, and she can use her knowledge of the violin's strings to organize her remembering of the first four keys clockwise after C, but after that point, her mnemonic device is of no further use to her. Like Tobias, she knows C is at the top, does not rely on mnemonic sentences like those taught in the lessons, and talks about remembering in visual terms ("I only have the image in front of me"). Unlike Tobias, Monica can reproduce a few more keys (F and B-flat) seemingly learned by rote or visually, and uses two semiotically mediated strategies (Martin's technique and Lena's technique, compare Figure 10 and Figure 11) to generate the minor keys once I have helped her fill in the rest of the major keys correctly.

Out of the seven participants who were interviewed in the second round of interviews, five used some kind of (observable) semiotically mediated strategy to reproduce the circle of fifths, either the whole diagram or parts of it. Out of these five, three (Joel, Joakim, Lena) used mnemonic sentences like those demonstrated in the lessons (compare Excerpt 3, Figure 8). Using these mnemonic sentences, these three participants could reproduce all the major keys correctly. In all cases, and like in the lessons, two mnemonics were used: One enumerating the sharp-keys from G (in one case including C) to F-sharp, and one enumerating the flat-keys from B-flat to G-flat.

When reproducing the relative minor keys, Joel, Joakim, Lena, and Monica use Lena's technique, Martin's technique, or some combination of the two. That is, they use techniques that consist of semiotically mediated rules that take the inscription with the already

generated major keys as input, and generate an amended inscription with their relative minor keys as output. As in the lessons, these techniques are applied first clockwise from C/A-minor to F-sharp/D-sharp minor, and then counter-clockwise from F/D-minor to G-flat/E-flat minor. The border between the sharp- and flat-side of the diagram, which is established by the structure of the mnemonic sentences, is reproduced in the application of mnemonic techniques for generating the minor keys. This is unsurprising regarding the participants using Martin's extended technique (Joel and Monica), where observing this border is crucial to the successful application of the technique. But this order of generating the minor relatives is also observed by those using Lena's technique (Joakim, Lena, Monica), where it is strictly unnecessary as long as one remembers to "read" the right pitch-class name from the piano keyboard (e.g. C-sharp rather than D-flat for the minor relative of E-major). Thus, the division of the circle into two halves, introduced in the lessons and built into some of the mnemonic techniques, is upheld.

Cecilia is the only interview-participant who manages to reproduce the whole circle of fifths without any overt use of mnemonic sentences like those discussed above. Instead she uses the FIFTH- and FOURTH-concepts to organize her remembering (which becomes visible also in the lessons, see Excerpt 2 and analysis of Excerpt 1). Talking while she is drawing up the circle of fifths, she says that she is thinking based on the piano, which is her main instrument: "I think from the piano, usually. From C to G it's a fifth (writes), and then from G to D (writes), and D to A (writes) [...]" (Interview 2 with Cecilia, 04:31–04:41).

It is worth noting that Cecilia is not actually sitting at a piano here, but rather seems to (if her self-report that she is "thinking from the piano" can be trusted) be relying on an internalized semiotic map of the piano keyboard, the piano's inscriptional aspect. Like the participants using mnemonic sentences, after filling in the major keys clockwise from C to F-sharp, Cecilia starts filling in the flat-keys counter-clockwise from F. When doing this, she uses (ascending) fourths instead of fifths as her organizing principle. Cecilia, however, shows an awareness of the circularity of the circle

of fifths. After filling in F-major and B-flat major, she says “but you could continue here otherwise (indicates the bottom of the circle)” (Interview 2 with Cecilia, 05:15–05:16), and fills in the rest of the flat-keys clockwise.

Cecilia’s use of the fifth- and fourth-concepts as organizing principles is interesting to compare with Lena’s way of organizing the circle of fifths (which will be explored in more detail below). Both are pianists with a history of playing from music notation, and both are relatively successful students in this educational context. They can both reproduce the circle of fifths flawlessly on paper as well as represent it to themselves. They can use it as an explanatory model in their reasoning about music. They can perform complex operations using both inscriptions and intramental representations of the diagram. But when I ask Lena why the keys are ordered the way they are in the circle of fifths, differences in how their understanding is organized are revealed. In Excerpt 7, it seems like Lena is reasoning her way into the realization that the circle of fifths is organized as stacked fifths in the interview situation. In this excerpt, I have included the duration of silences (ss,ms in parentheses between spoken dialogue) between consecutive turns by the same speaker in order to further stress how Lena is pausing to think and consider the diagram while she is speaking. At the start of the excerpt, we are looking at the inscription of the circle of fifths that Lena has just reproduced.

Excerpt 7: Fifths in the circle of fifths. From Interview 2 with Lena. Silence durations in ss,ms included between consecutive turns by the same speaker.

Participant	Turn	Says
Niklas:	111	E:h (.) have you thought about WHY they’re in the order that they’re in? (0,89)
Lena:	112	[quietly:] n::o (1,88)
	113	[normally:] I haven’t thought about that like tha:t (1,16)
	114	[whispering:] [see/C] (1,57)
	115	[hm] (0,67)
	116	[quietly:] [s::e/ protracted C]

## 7. ANALYSIS AND RESULTS

Participant	Turn	Says
Niklas:	117	We can turn it over (0,46)
	118	Oups!
Lena:	119	[quietly:] G D [normally:] is it (2,62)
	120	a fifth between each [or]?
Niklas:	121	[inaudible]
Lena:	122	Is it?!
Niklas:	123	[on intake of breath:] yup [normally:] ts'why it's called the circle of fifths
Lena:	124	Yeah right yes, (laughter) HA! Maybe you could think like that (laughter)

In turn 111, I am initiating a new topic by asking Lena why the keys come in this particular order in the diagram. Lena answers with a quiet and hesitant no in turn 112, and after a pause states that she has not thought about that. After pausing again to look at the diagram, she seems to be talking to herself more than to me, whispering “see” or “C” (turn 113), “hm” (turn 114), and then slightly louder a protracted see or C (turn 115), pausing between each. In Swedish as in English, the word “see” (Swedish *se*) and the name of the letter C sounds the same. This makes it possible that in turns 114 and 116 Lena is reading the letter C from the circle of fifths diagram she is looking at. It is also possible that she is (like with the “hm” in turn 114) marking to me that she is thinking, saying something like “let’s see”, but only partly audible (in Swedish, something like (*ska vi*) *se*). The first interpretation goes well with Lena quite clearly reading the next two keys clockwise from C in turn 119, but the second interpretation is also plausible.

With “turn it over” in turn 117, I am referring to the circle of fifths inscription we are looking at, since she has been showing it to me and it has been turned my way (I am sitting opposite Lena). As I turn it over so it is right side up for her, I drop something and exclaim “oups!” in turn 118.

As mentioned above, Lena is reading the keys G and D off the circle of fifths diagram in turn 119. If the C-interpretation of turn 114 and 116 holds, this means she has read C, G, and D from the diagram. She is still talking quietly, indicating that she is talking

more for herself than for my benefit, although it could be viewed as simultaneously working to communicate that she is still thinking about the question. This is supported by her switching to a normal conversational volume when she starts asking me a question in turn 119. She stops herself mid question and takes a rather long pause (approximately two and a half seconds) before continuing her question in turn 120.

In turn 120, Lena states, in the form of a question, the conclusion of the thought process, the realization that there is a fifth between each key. Stating it as a question indicates that she is not yet sure that her hypothesis holds. This in turn indicates that she has not gone through the whole circle to check if it does. It seems likely that she has realized the common denominator uniting the distance C–G and G–D, the pitches/chords/keys she has read aloud from the diagram, and is turning to me for confirmation that this holds for the whole diagram.

I say something inaudible in turn 121, which is probably inaudible to Lena as well, because she reiterates her question in turn 122, with more emphasis. This prompts me to offer confirmation in turn 123, adding that this principle is present in the name of the diagram. In turn 124, Lena responds in a way that indicates that she feels that this should have been obvious to her. This is unfounded though. As I have illustrated above, although the fifth as the organizing principle of the circle of fifths is mentioned in a lesson where she is present, this is overshadowed by a focus on mnemonic sentences and methods for generating minor relatives.

While it is tempting to connect Lena not having realized that the circle of fifths consists of fifths to her way of remembering the diagram using mnemonic sentences, other cases show that this is not necessarily the case. For example, Joel has realized that the circle of fifths consists of fifths. He also uses mnemonic sentences, and uses Martin's technique (based on jumping three steps in the diagram) rather than Lena's technique (based on jumping three semitone steps on a piano keyboard) for generating the minor relatives. Martin's technique should on its face be more likely to obscure the connection between the circle of fifths and interval

concepts, while the point that three semitone steps equals a minor third is made several times in the lessons.

What this episode shows is rather that (1) competence in being able to generate the circle of fifths, when based on mnemonic techniques that have no substantial connection to what the diagram represents, should not be assumed to equal understanding of its organizing principles. (2) That given the requisite prior knowledge (e.g. INTERVAL concepts), it is possible for a student like Lena to reason their way to this insight given that someone prompts them to ask the right question. Likely this is what explains the difference between Lena and Joel in this regard. Joel has happened to consider this, while Lena has not until prompted to do so in the interview. This demonstrates the importance of the teacher, as well as the risks of a method of instruction that relies on underlying principles becoming evident through repeated application rather than explicit instruction.

Returning to the model of mediated remembering introduced above, both Joel's and Cecilia's performance (although to different degrees) can be interpreted as indicating the third stage in the model, where the sign operation has become internalized. For both, this is connected to remembering the minor relatives. While they also can be seen to be using overt sign mediated techniques for this, it is to a much lesser degree than the other participants. There is a methodological challenge to identifying this stage, since it is characterized by non-overt use of signs. This means that the only observable difference between the non-sign-using stage and the internal-sign-using stage is (consistently) successful performance (Vygotsky, 1997a; cf. Vygotsky & Luria, 1994). The inference that the latter uses signs is wholly based on theoretical assumptions.

The difference between this kind of understanding and the rote memorization of parts of the diagram that I have discussed in relation to Tobias' and Monica's cases above can be difficult to pinpoint. Rote memorization of part of the diagram seems to be present to some degree in all interview-cases except Fredrik's, even if it might just be remembering that C is at the top of the circle. When the demands on memory exceeds what can be achieved by natural memory, a structure of meaningful connections between the

elements to be remembered, mediated by signs, need to be created. Most of the examples I have shown so far have done this by:

- 1 Creating small meaningful units, mnemonic sentences, whose content have nothing to do with the wider conceptual system of which the circle of fifths is part.
- 2 Creating simple (or not so simple) rules or algorithms (Martin's technique, Lena's technique) that can be applied to an already remembered and reproduced material. These rules also require rote memorization (e.g. to remember that you are supposed to jump *three* steps, not four), but work by being easier to memorize than the pattern that they reproduce when being correctly applied.
- 3 Cecilia's way of remembering the circle of fifths using the fifth- and fourth-concepts, and to some extent Lena's technique for generating minor relatives as well, do the same kind of work as mnemonic sentences and Martin's technique. But by using other music-theoretical concepts and music-relevant semiotic means, they have the potential to mediate the integration of the circle of fifths into a wider conceptual system.

When Joel and Cecilia generate some or all of the minor relatives in a way that just works, with no externally visible sign use, my methods are incapable of deciding exactly how this is accomplished. I have to rely on their self-report. What primarily indicates that they are using some kind of semiotically mediated remembering, is that the connection between major and minor relatives appears to be *meaningful* to them. In both cases this meaningfulness seems to be related to making sense of music-theoretical concepts in relation to musical practice. In Excerpt 8, Cecilia is talking about how she remembers the minor relatives while she is writing them down.

Excerpt 8: Remembering the minor relatives. From Interview 2 with Cecilia.

Participant	Turn	Says	Turn	Does
Cecilia:	59	Then I've learned that they go together too		
Niklas:	60	How do you mean?		



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Participant	Turn	Says	Turn	Does
Cecilia:	61	Yeah, but I like see that A and F-sharp minor go together, that they're relatives of each other [I'm thinking], it's [like] in the brain, kind of		
Niklas:	62	Mm, but yeah, how do you mean that you see it, what do you mean by that?		
Cecilia:	63	Or... (sigh) either it's because I've learned what the circle of fifths looks like, that it's like... but I think that it's that I... it's like, played the piano and thought about it at the same time, so it becomes like		
Niklas:	64	Mm		
Cecilia:	65	natural that it goes together	66	mimes piano playing in the air with her right hand

In turn 59, Cecilia is trying to account for how she reproduces the minor relatives in the circle of fifths, claiming that she has learned how they go together with their major counterparts. I ask for clarification in turn 60, and Cecilia says that she can “see” that e.g. A-major and F-sharp minor go together in the sense of being relatives (turn 61). She relies on saying that it is in the brain, perhaps as a way of saying that it is automatic (compare discussion on views on remembering above). In turn 62, I ask for further clarification, asking what she means by seeing it. Cecilia starts responding but hesitates and sighs, indicating that this is a difficult question (turn 63). She then offers two explanations. Interestingly, one seems to be about visual memory, similar to how Tobias and Monica talk about remembering. The other one is more about *how* she learned, that she has spent time playing the piano and thinking about the circle of fifths at the same time (turn 63), eventually making the connection between relatives “natural” (turn 65). It would seem, then, as if the connection between major and minor relatives has become naturalized to Cecilia, in the sense of becoming integrated into her experience of chord or key relations in musical practice. Joel also talks about relatives in terms of musical—and interestingly

pedagogical—practice. His way of making sense of the relation is connected to how he learned and teaches guitar. He says that he was first introduced to improvising using minor pentatonic scales, and that he subsequently learned that he could use the scale-pattern he had learned for e.g. B-minor when improvising over a song in D-major. This is how he remembers most relative keys, although he uses Martin's technique for those he cannot remember this way. Interestingly, he also says that when he is teaching guitar, he uses the circle of fifths to teach his students about this.

#### 7.1.4 Internalizing the Circle of Fifths through Externalizing Mnemonics

Later in Interview-round 2, Joel and Lena can be observed to use the same techniques they use to reproduce the circle of fifths on paper to represent the circle of fifths to themselves when trying to solve transposing tasks without having access to an inscription of the diagram. They both talk about this as having the circle of fifths in their heads. Lena is the clearest example, which is probably related to Joel being able to reproduce more of the diagram (especially the relative minors) without external sign use, as discussed above. In Excerpt 9, I have tasked Lena with doing a functional analysis of the chord sequence D G A D, and am asking her what she does to figure that out (turn 456). She starts by trying to determine the key.

Excerpt 9: Using semiotic means in cycles of externalization–internalization (A). From Interview 2 with Lena.

Participant	Turn	Says	Turn	Does
Niklas:	456	How do you figure out?		
Lena:	457	Well I still think the circle of fifths in my head		
Niklas:	458	Yeah THAT's okay of course!		
Lena:	459	Yeah		
Niklas:	460	(laughter)		
Lena:	461	(laughter)		

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Participant	Turn	Says	Turn	Does
Niklas:	462	I can't stop you from doing that		
	463	E:h		
Lena:	464	I would THINK then that		
	465	that I would think "ge dem"	466	holds her hands loosely together in front of her chest with her fingers pointing up and her pen loosely gripped and pointing forward. Moves the pen forward in a stabbing motion as she says "ge" and does the same as she says "dem", but aimed somewhat more to her right
	467	So then I have "ge"	468	points with her pen at a point on her paper as she says "ge"
Niklas:	469	Mm		Mm
Lena:	470	And (then) I have "dem" and then I have	471	points with her pen at another point on her paper as she says "dem"
	472	"alla"	473	points with her pen at a point on her paper as she says "alla" and lets the tip of her pen rest there while lowering the shaft until it is almost parallel with the paper
Niklas:	474	mm		mm
Lena:			475	points with her pen at different points, close together on her paper, ends the motion by pointing first farthest to the right and then farthest to the left in the area she has been moving within
	476	m:::		
	477	m (.) then I would say it's in D (.) and then I- eh SOMETIMES I can think that it's		
	478	or yeah then I do know "ge dem alla" and then D is in the middle (.) of the circle of fifths	479	points with her pen at her paper three times, marks out three points along an imagined line from left to right as she says "ge dem alla", then moves her pen back to the left, approximately to the mid-point between the first and third point, and makes a circling motion as she says "D is in the middle"

In response to how I have set up the task (taking away the inscription of the circle of fifths) and my question, Lena tells me that she still uses the circle of fifths in her head (turn 457). This leads to us spending the next few turns (458–463) clarifying that stopping her from doing that is not my intention and laughing at the somewhat absurd situation. In turn 464, Lena takes up the thread again and starts narrating how she would think. As her narrative progresses, however, the narration slides into simultaneous problem-solving.

As she telling me that she would use part of her mnemonic for the sharp-side of the circle of fifths (turn 465), she is simultaneously using a stabbing motion with her pen to mark two positions in the space directly in front of her (turn 466). The motion for “*dem*” being a bit further to her right—i.e. clockwise—indicates that she is pointing out positions in an imagined circle of fifths. If this interpretation is correct, the fact that the motion is clockwise for *her*—not for me who is sitting opposite her—indicates that the narrative is transforming into problem-solving. She is pointing for herself, not for me. (Perhaps one might term this egocentric gesturing in analogue with egocentric speech?)

In turn 467–473, it is possible to see how this (partial) reconstruction of the circle of fifths is brought to bear on the chord sequence. Pointing to her paper, where the chord sequence is written down, Lena uses the words of her mnemonic to identify the chords (*ge* for G, *dem* for D *alla* for A). This implies that the mnemonic is used to mediate the transition between two different ways of representing chord relationships: The circle of fifths’ two-dimensional representation of chord-relations grouped around a tonic, and the chord-sequence’s one-dimensional representation of temporal order. The mnemonic is central in upholding the organization of chords in the (imagined) circle of fifths.

After a short confirmatory sound from me (turn 474), Lena continues pointing at her paper, pointing out several points and then touching the rightward and leftward extremes of the area in which she has been pointing (turn 475). I suspect, but cannot confirm, that she is pointing along the written down chord sequence, since she remarks later (after end of the current excerpt) that the fact

that it has two D-chords is another clue that it is in the key of D-major. In that case, touching the left- and right ends of the area she has been pointing within would be pointing out the starting and ending D-chords, which would indicate that she is using two different methods of establishing the key, letting one confirm the result of the other. This would be supported by her stating her conclusion that the key is D-major (turn 477) after using “m:::” to mark a short pause for thinking (turn 476).

After stating her conclusion that the key is D-major, Lena sums up her argument using the circle of fifths (turn 478–479). She returns to the three first words of her mnemonic again (which are for the chords/keys G, D, and A), pointing out three points on her paper as she says the words. The points are roughly in a horizontal line. She then says that D is in the middle while returning to the midpoint and making a circling motion. As will be discussed below, the operation of circling or “boxing” a group of chords in the circle of fifths to represent a key named for the (major) chord that ends up in the middle, is very common in the lessons, in the interviews in general, and in Lena’s interviews in particular. This circling motion, the three points (rather than four) in combination with using the mnemonic, the return to the middle (rather than the end-points as earlier), indicate together that Lena is pointing in an imagined (partial) circle of fifths, this time on the paper instead of in front of her. If this interpretation is correct, it shows the central function of the mnemonic sentence in organizing not just the order of chords but the spatiality of the circle of fifths (where order and direction work as signifiers), as indicated by the circling operation. This episode shows how Lena uses feedforward-loops between externalization and internalization of semiotic means (Valsiner, 1997), to internalize a (partial) circle of fifths. That is, she is representing the diagram to herself by externally observable semiotically mediated mnemonic techniques, and using it in to mediate her problem-solving, as demonstrated by her use of visuo-spatial signs represented through gesturing.

When minor chords are involved, Lena does not only draw on her mnemonic sentences, but also her technique for generating minor relatives using the piano keyboard (i.e. Lena’s technique, see

analysis of Excerpt 4 and Figure 11). In Excerpt 10, Lena is trying to decide the key of the chord sequence  $E\flat$  Cm Fm  $B\flat 7$ . She has been exploring the hypothesis that the key is B-flat major, but rejected it because there was no G-minor chord present.

Excerpt 10: Using semiotic means in cycles of externalization–internalization (B). From Interview 2 with Lena.

Participant	Turn	Says	Turn	Does
Niklas:	550	e:h but those minor chords you have		
Lena:	551	yea:h		
Niklas:	552	Which ones are those relatives to		
Lena:	553	Then it becomes maybe	554	holds her hands together in front of her trunk with her pen sloping down toward the sheet of paper in her lap, holds her hands there but lifts the pen so it is pointing straight forward, makes two or three vague wavey motions with with the pen while the tip moves to the left
	555	"es:ters" [whispering:] [E-flat]		
	556	dn-dn-dn	557	brings her hands apart but still keeps both up in front of her, lifts her right hand holding the pen angled slightly upward and brings it down as if tapping on something with the tip of her pen as she says "(E-flat)", then makes three more tapping motions in sync with saying "dn-dn-dn", the first and third at a somewhat lower position than the second
	558	[normally:] "esters" that's C-minor	559	points with her pen at a point on her paper
Niklas:	560	mm		
Lena:	561	minor relative to E-flat		

At the start of the excerpt, I am suggesting that she look at the minor chords present in the chord sequence and try to work out their relatives (turn 550–552). Lena then starts a sequence of operations in order to solve this problem. It will be easier to understand what is

happening in turn 554 by looking first at turn 555–558. In turn 555, Lena is again using a word (*Esters*) from her mnemonic, this time for the flat-keys (*Frosten* (F) *bestal* (B-flat) *Esters* (E-flat) *aster* (A-flat) *dess* (D-flat) *gestalt* (G-flat)). Although the mnemonic sentences are not useful in ascertaining the minor relatives, this indicates that they still work as an organizing principle in the overarching activity of deciding the key using the circle of fifths.

She goes on to whisper—indicating that she is talking to herself more than to me—something that sounds like E-flat as she is making a tapping motion with her pen. This is followed by a rhythmic “dn-dn-dn” in time with three tapping motions with the tip of her pen (turn 556–557). The names of the flat pitches in Swedish sound very much alike, especially when whispered, so I cannot say with certainty that she is not naming some other pitch/chord/key than E-flat. The fact that she says “es:ters” immediately preceding it makes the E-flat interpretation likely, however. If this interpretation holds, Lena is pointing out the position of “E-flat” in front of her.

The position in/on what? I will argue here that it is the position of E-flat on an imagined piano keyboard. Firstly, this has been Lena’s technique for generating minor relatives in both the lessons and when reproducing the circle of fifths on paper earlier in the interview. Secondly, like Cecilia above, Lena is a pianist and could be expected to have a well internalized semiotic map of the piano-keyboard to work with. Thirdly, note the pattern in which she is moving her pen: Pointing out E-flat, then low on the first “dn”, higher on the second “dn”, and low again on the last “dn”. This is the way one would move one’s pointing device if one was counting out three descending semitone-steps from e-flat on a piano-keyboard drawn up on a whiteboard (as the teacher does in lessons, compare Excerpt 4). The pattern matches the pattern of black and white keys, that is, e-flat–d down, d–d-flat up, d-flat–c down (compare Figure 13, right).

This interpretation gains some support from a similar moment earlier in the same problem-solving episode (Excerpt 11, from when Lena is figuring out the minor relative of B $\flat$ , mentioned above):

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Excerpt 11: Using semiotic means in cycles of externalization–internalization (C).  
From Interview 2 with Lena.

Participant	Turn	Says	Turn	Does
Lena:	544	Then it should be B-flat (.) one two three then it should be a G-minor in it	545	lifts her hand from her paper and makes a stabbing motion forward with her pen as she says "B-flat", with her hand still in the same position she angles the pen somewhat downward and makes a stabbing motion as she says "one", then angles it upward and makes a stabbing motion as she says "two", and finally angles it somewhat downward again and makes a stabbing motion as she says "three", all this while moving the pen to the left

By virtue of Lena using bigger movements, Excerpt 11 fills in one piece of the puzzle that is only barely discernable in the video underlying Excerpt 10, namely a movement to the left during the pointing actions. In other words, an abductively formed explanation of Lena's behavior in Excerpt 11 can be applied to her behavior in Excerpt 10. This movement to the left together with the down-up-down pattern timed with counting, makes the interpretation that she is pointing out steps on an imagined piano keyboard more likely (compare Figure 13, left). The other prominent three-step technique for generating minor relatives in the material, Martin's technique, would instead involve movement to the right (or clockwise) if starting from B-flat.

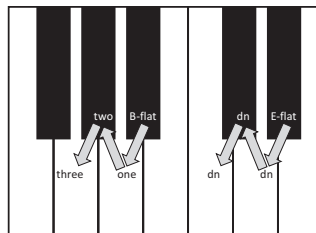


Figure 13: Lena's pointing pattern and verbal utterances while pointing in Excerpt 10 turn 557 (right) and in Excerpt 11 turn 545 (left), mapped onto a piano keyboard.



This movement to the left is also visible in Excerpt 10 turn 554, although the three steps (if indeed they are three steps) are less clearly defined. It is therefore possible that Lena is doing the same thing in turn 554 as she does in 556–557, counting three semitone-steps on an imaginary piano keyboard. However, this interpretation of turn 554 is made less probable by the difference in what Lena verbalizes after concluding the pointing operations. In turn 555, directly following turn 554, she says “es:ters,” leading to (likely) “E-flat” in the next turn (556), which forms the starting point of the next pointing-operation in turn 556–557. This pointing-operation also results in “esters” but immediately continues with concluding that the relative of E-flat is C-minor (turn 558–561). Why does she not come to this conclusion already after turn 554? There is always the possibility that she failed in performing the operation and therefore had to do it again, supported by more verbalizing. Another possibility is that she is not counting steps on a piano keyboard in turn 554, but is pointing out steps counter-clockwise in an imagined circle of fifths, using her mnemonic “*frosten bestal Esters*”. That would make her end up, as she verbalizes in the next turn (555), on “es:ters”.

This interpretation throws some doubt at the piano-keyboard interpretations of the other two pointing-movements-to-the-left, since it highlights how very similar movements can be interpreted in two different ways. At the same time, it is consistent with the interpretation of the similar pointing actions in Excerpt 9. Weighing the evidence, it seems to me that the most important clues are what the pointing actions accomplish in the problem-solving activity. It is important in microgenetic analyses to read *between* the observations (Valsiner & van der Veer, 2000; Wagoner, 2009). That means observing what their starting point is, and what results they seem to bring into the continuation of the operation. The interpretation offered here is based on such considerations. Hence, the pointing actions interpreted as relating to a piano-keyboard are distinguished by resulting in conclusions about relatives, while the pointing actions interpreted as relating to a circle of fifths are distinguished by resulting in words from her mnemonic sentence, major chord-names only, or both.

If this interpretation of Excerpt 9, Excerpt 10, and Excerpt 11 holds, what Lena is doing (and to some extent Joel, who displays similar behavior) is using the same techniques she uses to reproduce the circle of fifths on paper to represent the circle of fifths to herself, so that she can use it in similar problem-solving strategies. The presence of words from Lena's mnemonic sentences throughout these activities are important, since they serve to mediate the recollection of, and in the cases where Lena is using a piano-keyboard, reintegration of minor relatives in, the circle of fifths. This suggests that what is visible in these excerpts is a cycle of externalization–internalization in the sense of a turning inward of signs to regulate mental functioning (Toomela, 1996a, 1996b; Valsiner, 1997; Vygotsky, 1997a, 2012). That is, using psychological tools as a means of auto-stimulation to recreate an inscription with specific, signifying spatial relations between symbols, intramentally, to the mind's eye.

## 7.2 APPLYING THE CIRCLE OF FIFTHS

An understanding of conceptualization processes in terms of scientific and everyday concepts—mediated and situated conceptualization—suggests an analytical focus on how semiotic means are used to establish connections between concepts and to connect abstract concepts with concrete experience. This section considers how participants make sense of the circle of fifths by deploying it in different problem-solving contexts. Compared to concepts like FIFTH, CHORD, TONIC, or even KEY, which could conceivably be demonstrated by deictic reference (“that’s what a tonic-chord sounds like”), the circle of fifths as a whole is at a level of abstraction that makes it difficult to use it to directly denote musical phenomena. Hence, much of this section will be devoted to demonstrating how such—comparatively more empirically based—concepts are used to mediate between the circle of fifths and situated, particular musical (or not so musical) problem contexts. This in turn motivates an investigation of how these mediating concepts are made sense of, where I have focused primarily on the concepts TONIC (note and chord) and KEY.

## 7.2.1 Deploying the Circle of Fifths as a Transposing Tool

The way the circle of fifths is deployed in lessons is integrated into the overarching activity of demonstrating a problem-solving technique for transposing short chord sequences. There are two different ways of approaching this particular problem visible in the material: (1) Moving all chords the same interval up or down, or (2) recreating the same pattern of chords in relation to a new reference point. The circle of fifths is deployed as a visualization of, and means of achieving, the latter in the lessons, although this distinction is not made explicit.

These strategies rest on different conceptualizations of what it is that makes a chord progression *the same* or *different* from another chord progression (see Bamberger, 2006, on sameness and difference). In the first case, what makes the two chord progressions in different keys the same is that the same intervallic relation holds between each individual chord and its counterpart in the temporal order of the progression. In the second case, sameness consists of the pattern of relationships to a reference point, so that two chord progressions in different keys are the same if each individual chord and its counterpart in the temporal order of the progression stand in the same relation to their respective reference points.

On analysis, given assumptions of octave and enharmonic equivalence, both these conceptualizations amount to the same thing. In fact, transposing by moving patterns of chords in the circle of fifths works because the same (octave and enharmonically equivalent) intervallic relationships hold between all adjacent positions in the diagram (perfect fifth/fourth clockwise/counter-clockwise, minor third/major sixth concentrically). This means that regardless of which position in the diagram one selects as one's reference point, the same intervallic relationship will be conserved as long as the pattern in relation to the reference point is conserved.

In sociocultural parlance, one might say that the intervallic strategy is built into the inscription of the diagram (Säljö, 2013), not in the sense that the diagram facilitates an intervallic approach, however, but in the sense that it is at work under the surface. There is nothing in what the diagram usually (and consistently in this educational practice) looks like that tells a user that there is a fifth between adjacent po-

sitions. Instead, the surface features of the diagram invite a pattern-based interaction with it. This allows the user to benefit from the intervallic strategy without (necessarily) engaging in, or being aware of it.

As mentioned above, the circle of fifths is at a relatively high level of abstraction. Hence, when demonstrating how to deploy it in solving particular transposing-problems, the teacher needs to use lower level concepts to mediate the process. The following four excerpts demonstrate how the teacher accomplishes this by establishing a key and a functional analysis of the chord sequence, and by using this terminology to mediate the transition back and forth between linear representations of chord sequences and the circle of fifths. They are all excerpted from the same episode during Lesson 2 with Group 2. This episode has been selected both because it is typical of the way the circle of fifths-inscription is deployed as a transposing tool, because it is one of the episodes in which the steps in the teacher's method are made most explicit, and because it contains one of very few attempts by the teacher to explain the concept of TONIC. In other similar episodes, the function-concepts might not be written down but just used verbally, or applied after the fact as an explanation rather than mediating the transposing exercise. In the latter case, the teacher tends to rely on pointing out the same chord symbols in the chord sequence and the circle of fifths and on introducing the "boxes" earlier.

After these four excerpts, I will present a fifth excerpt, from Lesson 4 with group 2, which shows part of a similar transposing demonstration. Here, the teacher is leading the students through transposing to the key of G-flat major, and must therefore demonstrate a way to handle the problem of enharmonic equivalents. The teacher handles this problem through a technique that is very similar to Martin's extended technique for generating the minor relative keys (see Excerpt 5 with analysis and Figure 12). This episode is included because it is one of the clearest examples of the importance of the spatial layout of the circle of fifths for the transposing strategies investigated in this section. When Excerpt 12 begins, the teacher has spent most of the lesson on major and minor triads, but is now transitioning into demonstrating how to transpose a short chord sequence using functional analysis and the circle of fifths. The teacher

is situated by the whiteboard, while the students are sitting around a table in the middle of the room, listening and sometimes taking notes. On the whiteboard, the teacher has drawn up the circle of fifths furthest to the right, and he has written the chord sequence | C | Am | Dm | G7 | on the left side of the board. Between the circle and the chord sequence, a piano keyboard with the names of its white keys written underneath, is drawn up on the board. The teacher has previously been using this keyboard to count semitone-steps to illustrate the difference between major and minor chords. I will endeavor to illustrate throughout the analysis of the whole episode how the teacher works to establish *adequations* (Roth & McGinn, 1998) between these three inscriptions (chord sequence, circle of fifths, piano keyboard). The students have been working on copying the circle of fifths in their notes, and the teacher has been waiting for them to finish before commencing with the transposing-exercise.

Excerpt 12: Establishing key and tonic with explanations of TONIC and KEY-NOTE. From Lesson 2 with Group 2.

Participant	Turn	Says	Turn	Does
Teacher:	100	Hm? Ehm (clears throat) We'll start by writing down... Eh... which FUNCTION each chord has. Do you remember this which was called tonic?	101	points to the first chord (C) in the chord sequence
			Students:	102
Teacher:	103	This song is in C...	104	points along the chord sequence
	105	...major,	106	points to C again
	107	and then C is tonic and keynote, it can be the same thing, but not always, but eh, it depends on how you say it. [But/A]	108	points repeatedly at the C
	109	tonic is always, like, the fundamental... chord, what the song is in, that's the key it's- eh the song is in, simply. C in this case. So we'll write a T here underneath	110	writes "T" under "C" in the chord sequence[...]

In turn 100–101, the teacher calls the students’ attention and introduces the first subtask in the overarching activity of transposing the chord sequence, assigning a function to each chord and writing it down. He then introduces the TONIC-concept, using a turn of phrase that indicates that this has been covered before (“do you remember...”), and pointing to C in the chord sequence, implying that chord is to be understood as the tonic. While at least some students answer in a way that suggests that they recognize the word (turn 102), the teacher still sees a need to elaborate on what he means by tonic, which takes up the bulk of turn 103–109. I will return to this elaboration, and compare it to other, similar utterances by the teacher below (Section 7.3). Presently, however, I will focus on the problem-solving technique modeled by the teacher, and especially how he uses denoting actions to apply general rules to a particular problem.

The teacher begins by modelling a kind of deduction. First, he states a premise: The song, identified with the chord sequence by means of pointing, is in the key of C-major (turn 103–105). Although he does not use the word “key” (yet) it is signaled by the construction “*går i*” (literally “goes in” translated “is in” in the excerpt) which is almost exclusively used for designating keys in this context. The teacher gives no reason why C-major is the key—treating the key of a chord sequence as a given is the rule in these lessons. After establishing C-major as the key, the teacher concludes that C is the tonic and keynote (Swedish: *grundton*), and (after elaborating on tonics, keynotes, and keys) creates a record of this by writing “T” below “C” in the chord sequence (turn 107–109). By denoting C-major as an instance of KEY, and C as an instance of TONIC, the teacher creates a foundation for applying a number of general rules framed in those terms throughout the rest of the episode (the first of which is the one that lets him deduce that C is the tonic of C-major).

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Excerpt 13: Using the circle of fifths to perform a functional analysis. From Lesson 2 with Group 2.

Participant	Turn	Says	Turn	Does
Teacher:	111	What is A-minor's function	110	[...]points to Am in the chord sequence
	113	if we check in our little circle?	112	points to the circle of fifths
Student:	114	Relative of the tonic		
Teacher:	115	Relative of the tonic yes. (clears throat) then we'll write Tp	116	writes "Tp" under "Am" in the chord sequence
	117	there, like that. (.)	118	points to Dm in the chord sequence
	119	And D-minor	120	walks over to the circle of fifths
	121	do you remember what these were called here	122	points to C and G in the circle of fifths
	123	that were to the left and the right?		
Students:	124	[hesitantly and over each other:] sub-? subdominant		
Teacher:	125	Subdominant yes. Lies to the left of the tonic, in the circle of fifths. Always. The dominant lies to the right. So the subdominant in C-major is F	126	leans to his right
	127		128	points to C in the circle of fifths
	129		130	points to F
	131	and the dominant in C-major becomes G	132	points to G
	133	But now we had a D-minor, and then it becomes the subdominant's relative.	134	points to F and then to Dm in the circle of fifths
	135		136	walks over to the chord sequence
	137	Then it's called Sp	138	writes "Sp" below "Dm" in the chord sequence
	139	And then we land on	140	walks over to the circle of fifths and points at G
	141	the dominant, which is to the right of the tonic in the circle of fifths.	142	walks over to the chord sequence
	143	and then we'll write D there	144	writes "D" under "G" in the chord sequence, points along the row of functions
	145	So these are the functions of the chords, which I've written u- that we've written underneath now.[...]	146	points along the row of chord symbols
	147			

In Excerpt 13 (where the first turn is a direct continuation of the last turn of the previous excerpt), the teacher demonstrates how to deduce the functions of the remaining chords in the chord sequence using the circle of fifths. In turn 110–111, he initiates a known information question sequence (Mehan, 1979), asking the students for the function of the second chord in the chord sequence (Am). The teacher is also scaffolding the way in which he is expecting the students to arrive at an answer by directing attention to the circle of fifths (turn 112–113). A student answers correctly (turn 114), and the teacher confirms in the evaluation phase (turn 115). He then proceeds to create a record of this by writing down “Tp”<sup>27</sup> below “Am” in the chord sequence (turn 115–117).

Moving on to the next chord (Dm), the teacher becomes more explicit in his scaffolding strategy. He walks over to the circle of fifths and asks the students if they remember “what these were called here that were to the left and the right?” while pointing between C and G in the circle of fifths (turn 121–123). Several students answer simultaneously, if somewhat hesitantly, in turn 124, and it is possible to make out that some are saying “subdominant.” The teacher seems to pick up on this, since he answers “subdominant yes” in the next turn. The teacher is breaking down the problem of identifying the function of Dm into subtasks, the first of which is orienting oneself in the circle of fifths by identifying the dominant and subdominant in relation to the tonic (that which they are to the right and left of).

In order to identify the subdominant and dominant, the teacher offers a general rule, its generality indicated by the use of “ALways” (turn 125–127). The subdominant is always to the left of the tonic, and the dominant is to the right.<sup>28</sup> This rule is then used to model a deduction (indicated by “so”) of the identity of the subdominant

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27 Tp is short for Swedish *tonikaparallell*, which I have called relative to the tonic here. There does not seem to be a conventional shorthand for Riemannian functions in English (where English names differ significantly from German) however, so I have used the original abbreviation also in translation. I will do the same with abbreviations of relative of the dominant (Dp) and relative of the subdominant (Sp) as well.



and dominant (turn 127–132), based on the premise of C-major being the key and C being the tonic, as established in Excerpt 12. The verbal explanation is accompanied by pointing first from C to F (turn 128–130) and then to G (turn 132) in the circle of fifths, demonstrating the importance of the spatial layout of the inscription in organizing the teacher’s strategy.

Just as denoting C-major as the key and C as tonic allows for the application of a rule concerning directions in the circle of fifths to identify dominant and subdominant, denoting F as an instance of SUBDOMINANT is the foundation of the next step in the teacher’s problem-solving strategy. At this point, the teacher returns to the original problem, determining the function of Dm (turn 133). Utilizing that he has just established F as subdominant, he points first to F, saying “subdominant’s” (turn 133–134) and then to Dm, saying “relative” (turn 134–135, this works better in the original Swedish, where the conventional name *subdominantparallell* contains the words *subdominant* (subdominant) and *parallell* (relative) in the order that he is doing the pointing). Although not made explicit in a verbal rule, regularities in the spatial organization of the chords in the circle of fifths (relatives organized as pairs concentrically) continue to play an important part in the problem-solving strategy. As previously, the teacher creates a record of his conclusion by writing down the abbreviated function under the corresponding chord symbol in the chord sequence (turn 137–138).

The teacher moves on to the last chord of the chord sequence. Since he has already identified G as the dominant, he simply points

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28 The teacher consistently uses right for clockwise direction in the circle of fifths, and left for counter-clockwise direction. This is true even when talking about keys on the bottom half of the circle of fifths, where the subdominant ends up to the right and the dominant to the left of the tonic for an observer standing in front of the whiteboard. As indicated in turn 214 of Excerpt 15, the idea seems to be to mentally (or physically) rotate the circle so that the key one is working in is always at the top, or (in another lesson) to imagine oneself as standing in the center of the circle, turning to look at the key one is working in. This didactic choice does lead to some problems (see Excerpt 19) but is mostly a working local way of talking, and I will not make it the focus of this analysis.

out G in the circle of fifths (turn 140), names it as the dominant, and repeats that it is to the right of the tonic (turn 141), before writing down “D” below “G” in the chord sequence (turn 143–144). Having completed the analysis of the full chord sequence, the teacher sums up what has been achieved so far. By pointing first along the row of function-symbols (turn 144) and then along the row of chord-symbols (turn 146), and stating that the former corresponds to the latter in the sense of being “the functions [...] of the chords” (turns 145 and 147), the teacher is mediating the adequation of the chord-symbols and the function-symbols.

This strategy for using the circle of fifths to perform a functional analysis is mediated by a second, implicit, adequation of inscriptions, relying on the chord sequence and the circle of fifths utilizing symbols of a similar form. That is, it is possible to read the symbols in the chord sequence and the symbols in the circle of fifths as *the same* (to locate “C” in both, “Am” in both, etc.). The function-symbols the teacher writes down underneath the chord sequence are not strictly necessary for solving the upcoming transposing problem, but work as a means of mediating the conceptual content of the adequation of the chord-sequence inscription and the circle of fifths inscription. In the circle of fifths, non-temporal relations between chords are signified through spatial organization. The function-terminology offers a way of denoting these relations within the syntax of the chord-sequence inscription, where the salient spatial dimension (right–left) instead signifies temporal order. Note, however, that only the TONIC-concept gets an explanation that goes beyond directions in the circle of fifths (in Excerpt 12).

Having thus accomplished the subtask of creating a functional analysis of the chord sequence, the teacher returns to the overarching activity of demonstrating how to transpose the chords to a different key. In Excerpt 14 he re-introduces this task.

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Excerpt 14: Introducing the transposing exercise. From Lesson 2 with Group 2.

Participant	Turn	Says	Turn	Does
Teacher	147	[...]Ehm, now it became, eh ehmmm, this- this is like the base... [Swe: grund...] key if you say, it was written in this key this song. But eh the singer, he can't get down- or he can't get up this high, so we have to lower it... Eh, a minor third. That is three steps backwards... on the piano. And what key do we land in then? [pauses, waiting for a reply from the students]		
Students	148	(whispering)		
Teacher	149	Say it louder		
Student	150	[inaudible]		
Teacher	151	Yes A. But not A-minor then, but A-Major	152	Points to C in the chord sequence
	153	Three steps backwards from this one, so now we're LOWering the song	154	walks to the keyboard drawn on the whiteboard
	155	we're changing the key, getting a new key, and it's so high here so we have to lower it, three steps backwards a minor third	156	points to the keyboard on the whiteboard
	157	so then it's A-major instead, that becomes the tonic.	158	walks to the chord sequence, writes "A" below "C" and "T" [according to field notes he also writes "T" below "A"]
			159	walks over to the circle of fifths
	160	And then we end up in this box instead.	161	points to A in the circle of fifths
	162	If A-major is the tonic- we had this box before	163	circles the chords of C-major in the circle of fifths
	164	do you remember that, when we- we were dividing up into boxes when we were transcribing mello <sup>25</sup> -songs? Now we came to A instead. The A-box	165	points to A in the circle of fifths
	166	which is here.	167	draws a circle around the chords of A-major in the circle of fifths
	168	So we'll circle A and its subdominant	169	makes a gesture to the left
	170	Dominant	171	makes a gesture to the right

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Participant	Turn	Says	Turn	Does
	172	and relatives. So that the tonic has become A instead	173	walks over to the chord sequence
	174	there's the tonic	175	points to "T" then to "Tp"
	176	the relative of the tonic	177	walks over to the circle of fifths
	178	in A then	179	points to A in the circle of fifths
	180	what is that? Well it must become F-sharp minor then	181	points at F#m in the circle of fifths
	182	Because it's positioned as A-major's relative	183	points at A and then at F#m
	184	Before, we had C-major, and then it became A-minor	185	Points to Am
	186	that was the relative of the tonic	187	points back and forth between C and Am
	188	But now we've changed the key to A-major instead and then we start from A instead	189	points to A in the circle of fifths
	190	as tonic	191	points at A and then at F#m
	192	And then it becomes F-sharp minor	193	walks over to the chord sequences, writes "F#m" below "Am" and "Tp"
	194	'll write Tp underneath there too	195	writes "Tp" underneath "F#m"

In turn 147, the teacher is using a small improvised narrative to frame the transposing task, referring to a situation the students are presumably familiar with from their ensemble lessons—having to change the key of a song to accommodate the range of a singer. Based on this narrative, the teacher articulates the specific problem to be solved as transposing the chords a minor third down. In doing this, he also makes an oblique reference to how the students can use the piano keyboard he has drawn on the whiteboard to mediate the operation of calculating what the new key should be, a strategy that is made more explicit in turn 154–156. The teacher ends turn 147 by posing a question to the students, making the next step in the solution of the task—identifying the new key—explicit.

The students respond (in turn 148) by whispering amongst themselves, and the teacher asks one of them to speak up (turn 149), presumably because he has heard the student give a plausible

29 “*Mello*” short for “*melodifestivalen*” the Swedish local level of the Eurovision Song Contest.

answer. One student does reply to the teacher in turn 150, but the reply is inaudible in the recording. The teacher's reply in turn 151 ("Yes A. But not A-minor then, but A-MAJor") indicates that the student has replied correctly or somewhat correctly (based on the teacher's response, possibly giving the answer A (no major or minor) or *A-minor* instead of *A-major*). This fairly basic known-information-question sequence (Mehan, 1979), consisting of question (turn 147), answer-prompt-answer (turn 148–150), and evaluation (turn 151), results in the classification of A-major as the target key of the transposing exercise. That is, "A-major" is denoted as an instance of KEY, which—as with C-major in Excerpt 12—forms the basis of the application of the teacher's problem-solving strategy.

Following the teacher's evaluation and clarification in turn 151–153, he goes on to restate what the task is, or what activity they are engaged in, by saying that they are "changing the key" (turn 155) and by referring back to the narrative in turn 147 ("it's so high here so we have to lower it," turn 155). He also makes more explicit how one might solve the task by using a strategy mediated by the piano keyboard-inscription, memorized rules, and chord/key/note-names: counting "three steps backwards a minor third"<sup>30</sup> (rule) from c (chord/key/note-name) on a piano keyboard. This explanation is supported by pointing to the "C" chord symbol in the chord sequence, as that which one is supposed to count three steps from, and indicating the keyboard-inscription (turn 153–156). The teacher then proceeds to denote A-major as the tonic, which is presented as the result of the procedure above (it "becomes" the tonic, turn 157), and to write down "A" under "C" and "T" in the chord sequence.

Here, the teacher is again establishing an adequation between two of the inscriptions on the whiteboard. The chord symbol "C" is adequated with a corresponding key in the keyboard-inscription, also marked "C." The keyboard-inscription, in turn, affords the

30 The teacher consistently uses "backwards" to denote left (direction) or down (frequency) and "forward" to denote right/up on a piano keyboard. Avoiding left and right allows him to avoid confusion with his terminology for directions in the circle of fifths.

operation of counting (semitone-)steps. The piano-key one lands on after three steps “backward” can then be read as representing a chord rather than a key or a pitch, relying on the polysemous names for these (compare the transition between chords in the chord sequence and chords/keys in the circle of fifths above, also reliant on the form of the signifiers). Through establishing this adequation between keys in the keyboard-inscription and chord-symbols in the chord-sequence inscriptions, the teacher can visualize in what way the old chord sequence in C-major and the new sequence in A-major can be considered the same. This is an example of the intervallic approach to understanding transposition, discussed above. But through involving function-terminology and the circle of fifths, the teacher transitions to a pattern-based approach to sameness.

As when performing the original functional analysis, establishing a particular key (A-major) as an instance of *KEY*, and denoting a particular chord (A in this case) as an instance of *TONIC* forms the starting point. These classifications are sub-tasks in the problem-solving strategy the teacher is modelling for the transposing-task. Writing down “A” as the first chord in the transposed chord sequence creates a record of the finished first steps of that strategy, and the classification of A-major as *TONIC* (chord) will serve the purpose of deploying problem-solving strategies mediated by the *TONIC*-concept in solving the rest of the problem using a pattern-based approach in the circle of fifths.

After having established A as the tonic, the teacher transitions over to the circle of fifths and remediates parts of what he has been doing in terms of “boxes” in the circle of fifths (turn 160–172)—that is, circling, or boxing in, the tonic, dominant, subdominant, and corresponding relatives of a certain key (e.g. C, G, F, Am, Em, and Dm for the key C-major). This operation of circling or boxing in groups of chords representing keys was important in several interviews as well. I wish to highlight two different things going on throughout these turns:

Firstly, I want to highlight that the teacher is referring back to musical experiences during a previous lesson. After circling the chords of C-major, the teacher interrupts himself and refers back

to a previous lesson which was not observed during this study, asking “do you remember that, when we- we were dividing up into boxes when we were transcribing mello-songs?” (turn 164, for the meaning of “mello” see Footnote 29 on p. 156). This is important to highlight because it is one of very few references to what is presumably students’ previous experiences of sounding music in the observed lessons pertaining to harmony, keys, and transposing.

Secondly, I want to highlight the structure of the teacher’s argument leading up to reaffirming A-major as the (new) tonic. What is interesting about this argument is that it appears circular in concluding its own premise, starting with “If A-major is the tonic” (turn 162) and ending with “So that the tonic has become A instead” (turn 172). This indicates that the teacher’s point is not actually to (re-)establish that A is the tonic of the target key. Rather, he can be said to remediate parts of what he has already done—that is, establishing C-major as the key of the original chord progression (compare Excerpt 12) and A-major as the target key—by means of a new set of semiotic tools and operations using those tools. While the C-box is created without much comment (turn 162–163), the teacher gives an explanation of how the A-box is generated, by circling A, its subdominant, dominant, and their relatives in the circle of fifths (turn 164–172). Deploying the circle of fifths and the concept of BOXES in the operation of circumscribing or boxing in groups of chords in the circle of fifths-inscription, the teacher is introducing a new way of representing keys as visually delimited groups of chords in the circle of fifths.

Mediating between these different ways of representing chord functions and keys is in turn mainly the concept TONIC and the chord-symbols being classified as tonics (C and A here). Specifically, the TONIC-concept mediates this transition through the adequation of chord symbols—in the linear representation of the chord sequence on the one hand, and in the circle of fifths’ two-dimensional representation of chord-relationships on the other—as tonics (compare the analysis of Excerpt 15, turn 204 and forward). As in the original functional analysis of the chord sequence in C-major (compare Excerpt 12 and Excerpt 13), denoting

particular chords as tonics allows for the application of semiotically mediated rules by means of which the other functions are identified by their spatial relation to the tonic in the circle of fifths. These classifications of further chord-symbols as SUBDOMINANT, DOMINANT, etc., make sense of the circling operation delimiting the BOX. This reliance on the TONIC-concept in mediating between different representations of key and harmonic relations explains why the teacher's argument appears circular. In other applications of the BOX-concept (see Excerpt 20), it is possible to see it being deployed to mediate a key- or tonic-judgement, which is possibly why the teacher presents A as the tonic as though it was a result of the boxing-operation.

Probably, the introduction of the boxes at this stage in the demonstration should be understood as part of the teacher's attempt at restating what the overarching task is, changing the key. Circumscribing groups of six chords in the circle of fifths in this manner, especially in conjunction with the function terminology, offers a way of visualizing in what sense the original chord sequence and the transposed version are the same (and conversely, how they are different) using a pattern-based approach to transposing.

After having restated that A is the tonic, the teacher moves back to the chord sequence, pointing out the "A" and denoting it as the tonic (turn 174–175), thus reinforcing the adequation of the two inscriptions. He then swiftly moves on to the second chord (Am, relative of the tonic), pointing it out using the function-terminology before moving back to the circle of fifths (turn 175–176). There, he points to A and says "in A then[...], what is that?" (turn 178–180), scaffolding the manner in which the relative of the tonic-designation should be interpreted at this point in the problem-solving strategy. The teacher answers his own question (F-sharp minor), supported by pointing to F#m in the circle of fifths (turn 180–181), and offers an explanation (indicated by "because"): The answer is F-sharp minor because of its position relative to A in the circle of fifths (again supported by pointing between the two, turn 182–183).

The teacher expands on this explanation in a way that illustrates the logic of the pattern-based approach to transposing. He



points at C in the circle of fifths, referring back to the original key (and/or chord or box), saying that then A-minor was the relative of the tonic, and supporting this by pointing back and forth between Am and C in the circle of fifths (turn 184–187). In a way that sums up his attempts to illustrate the meaning of changing keys throughout Excerpt 14, the teacher says that now they have changed the key to A-major, and that this means that they “start from” A as tonic, that is, A is the new reference point (turn 188–190). Supported by pointing from A to F#m in the circle of fifths (turn 191), the teacher concludes that this means F-sharp minor is the relative of the tonic and the next chord in the chord sequence (turn 192). It is worth noting here how the repeated pattern of pointing in the circle of fifths (compare turns 179, 181, 183, 185, 187, 189, and 191), supported by the teacher’s use of concepts, reinforces the adequation between the two boxes and the function-terms denoting (in this context) positions within them. As previously, the teacher creates a record of this in the chord-sequence inscriptions (turn 193–195).

Excerpt 15: Position of tonic (chord) in the circle of fifths used to find relative of the subdominant and dominant. From Lesson 2 with Group 2.

Participant	Turn	Says	Turn	Does
Teacher	196	Eh, what was it then?	197	points to “Sp” in the functional analysis
	198	The relative to the subdominant, where was the subdominant [Tobias]?		
Tobias	199	[inaudible] becomes, like, it’s underneath, yeah...		
Teacher	200	There’s dominant and then there’s subdominant		
Tobias	201	Yeah		
Teacher	202	And one is to the left and one is to the right, it’s- it’s not always so easy to remember that.		
Tobias	203	No, yes I- well, I know what it is but, like [inaudible]		

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Participant	Turn	Says	Turn	Does	
Teacher	204	Yeah	205	Walks over to the circle of fifths	
	206	it is- the subdominant is always to the left of the tonic	207	points at "A" in the circle of fifths	
	208	in the circle of fifths	209	points at "D"	
	210	But now we had the relative to the subdominant, so then we'll first find the subdominant from A	211	points at "A" in the circle of fifths, then at "D"	
	212	well that's D	213	points from "A" to "D"	
	214	is to the left if we spin the clock-face a bit	215	makes twisting motion with both hands, points at "D" again	
	216	then it's to the left, and then we were supposed to get the relative of the subdominant	217	points from "D" to "Bm"	
	218	and then it becomes B-minor	219	pauses, looks at the students	
	220	for this one.	221	walks over to the chord sequences, writes "Bm" below "Dm" and "Sp"	
	222	And then to finish it up with the dominant	223	points to the empty space below "G7" and "D"	
	224	in A-major, and the dominant is always to the... [waits for the students]			
	Student	225	Right		
	Teacher	226	To the right. Of the tonic.	227	walks over to the circle of fifths
228		So then it becomes an E there	229	points to E in the circle of fifths	
230		Which is the dominant	231	points from "A" to "E" in the circle of fifths, walks over to the chord sequences, writes "E" under "G7" and "D"	

In Excerpt 15, which is the last excerpt from the episode, the teacher moves on to the last two chords of the chord sequence (Dm and G(7)), but he does so in a way that involves the students to a higher degree. In the teacher's scaffolding attempts, the structure of the problem-solving strategy he is demonstrating becomes especially clear. What is happening here (and also with the relative of the tonic toward the end of the previous excerpt) is that the teacher is deploying the same rules he used to accomplish the original functional analysis (in Excerpt 13) in reverse. Instead of starting from a chord-symbol, finding it in the circle of fifths, applying rules for

how functions are positioned relative to a tonic in the circle of fifths, and ending up with a function-symbol, he is starting from a function-symbol, applying rules for how it is positioned relative to a tonic in the circle of fifths, and ending up with a chord-symbol.

In turn 196, the teacher is refocusing on the task at hand, indicating the next step in the transposing method he is demonstrating by pointing to “Sp” in the functional analysis inscription (turn 197) and clarifying what the abbreviation stands for verbally (turn 198). Next, he starts a known information question sequence (Mehan, 1979) by asking the student Tobias “where was the subdominant [Tobias]?” (turn 198, in which “where” refers to where in relation to A/the tonic in the circle of fifths). Already in how the question is asked, the teacher is scaffolding the problem-solving strategy he is expecting Tobias to demonstrate. By asking not where the relative of the subdominant is, but where the subdominant is, he is dividing up the operation of finding the relative of the subdominant into smaller (and presumably easier) steps. This scaffolding strategy will become clearer below.

Tobias gives a partially inaudible reply in turn 199, including the word “underneath” which might be an attempt at indicating a chord clockwise of A or on the inside of the circle. In the evaluation-phase of the known information question sequence, the teacher launches into an explanation, indicating that he is not satisfied with the answer given. He starts by summarizing why the problem might be difficult, by saying that “there’s dominant and then there’s subdominant” (turn 200), and after a brief response from Tobias (turn 201) the teacher continues (in turn 202) by saying that “one is to the left and one is to the right” (implicitly, of the tonic). Which one is which, the teacher goes on to say, is not easy to remember.

I interpret this last addition as an attempt to make the subject less intimidating for the students without much prior formal training, by downplaying the importance of remembering these kinds of details (something that is quite common across the observed lessons). But this statement also contributes to a construction of what music-theoretical knowledge is in the context of these lessons. By pointing to this difficulty while omitting how an understanding of the concepts

in question and of the organizing principles of the circle of fifths could make rote learning unnecessary, the teacher is constructing music-theoretical knowledge as something arbitrary, which is learned by rote without an understanding of underlying principles.

At this point, Tobias attempts to clarify that he knows at least part of what the teacher is saying (turn 203), but since Tobias' talk is partly inaudible it is difficult to ascertain what he is trying to communicate. In turn 204, the teacher acknowledges ("yeah") what Tobias has said and pushes on with his explanation and demonstration. Here, the problem-solving strategy that the teacher starts scaffolding already in turn 198 becomes clearer. It is mediated by concepts and symbols (e.g. tonic, subdominant, A, D), the two-dimensional layout of the circle of fifths, and by rules connecting the two. The difficulty of remembering these rules is what the teacher has been talking about in turns 200 and 202, and he now proceeds to repeat one of these rules: "the subdominant is always to the left of the tonic [...] in the circle of fifths" (turn 206 and 208, compare Excerpt 13, turn 125–127, regarding "to the left" see footnote 28 on p. 209). The teacher supports this by pointing first to A (tonic) and then to D (subdominant) in the circle of fifths (turns 207 and 209). With this, the teacher has implicitly answered the question he posed to Tobias in turn 198, and thus completed the first step of the problem-solving strategy he is demonstrating—identifying the subdominant.

This means he can present the next step in the strategy, "but now we had the relative of the subdominant" (turn 210). Before proceeding, the teacher recapitulates what has been done and achieved so far, and how, saying "then we'll first find the subdominant from A[...] well that's D" while pointing repeatedly from A to D in the circle of fifths (turn 210–213). He also repeats the rule that it (the subdominant) is to the left (implicitly, of the tonic/A, and adding "if you spin the clock-face a bit" (turn 214) to clarify what he means by "to the left"). The concept TONIC is here deployed to mediate between a general rule (the subdominant is always to the left of the tonic in the circle of fifths) and the specific situated application of that rule on a specific group of chord-symbols in the circle of fifths (in this case "D" and "A"). This operation is in turn dependent on

denoting a specific symbol in the circle of fifths (“A” in this case) as a tonic, so that the rule can be applied. The output of applying the rule is the identity of the subdominant in a specific key or to a specific tonic chord, expressed as a chord symbol (D in this case).

Given this output, the next step in the problem-solving strategy can be performed, which is checking what the corresponding minor chord on the inside of the circle is, thus identifying the relative of the subdominant. In this step of the problem-solving strategy, the concept *SUBDOMINANT* serves the same function as the concept *TONIC* did in the previous step. The teacher proceeds to do this, but he does not make the corresponding rule explicit.

When the teacher moves on to the next chord in the chord sequence (G7, the dominant), the same kind of problem-solving strategy is used again: Identify the function of the chord to be transposed and the target key or the tonic chord of the target key (“And then to finish it up with the dominant[...] in A-major”, turn 222–224), identify the appropriate rule (“the dominant is always to the...” to which a student answers “right”, turn 224–225), and apply the rule by pointing at the chord symbol identified as dominant in the circle of fifths (pointing to E, turn 229). Although the word “tonic” remains unsaid here, the concept serves a vital function in mediating the operation by providing that of which the dominant is to the right in the rule.

The rules for locating subdominants, dominants, and their relative minor chords break down at the bottommost position of the diagram (in the keys G-flat major and F-sharp major), where the subdominant of G $\flat$  becomes B instead of C $\flat$ , and the dominant of F $\sharp$  becomes D $\flat$  instead of C $\sharp$ . In order to avoid such enharmonic equivalents, the teacher introduces a technique that is similar to Martin’s extended technique for generating relative minor keys. In Excerpt 16, the participants need to apply this technique since the task is to transpose the chord sequence | G | Em | Am | D7 | into the key G-flat major (for part of the process of classifying the original key as G-major, see Excerpt 20). The teacher has already provided a functional analysis of the chords, and based on that, he has led the students through transposing G to G $\flat$  and Em to E $\flat$ m. The problem of enharmonic equivalents becomes salient when they arrive at the

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A-minor chord, since the teacher's regular technique would have led to classifying G#m as the relative of the subdominant.

Excerpt 16: Avoiding enharmonic equivalents when transposing. From Lesson 4 with Group 2.

Participant	Turn	Says	Turn	Does
Teacher	178	Then we have a relative to the subdominant		
Students	179	(mumbling)		
Monica (?)	180	[E-flat/S]- yeah, you mean there		
Teacher	182	So then it should be to the left of this one	181	Walks over to the circle of fifths, points to Gb
Student 2	183	Don't you turn it around?		
Monica	184	Either it becomes- or does it become C-sharp minor?		
Teacher	186	Then we jump up to here, right?	185	Points from Gb to C in the circle of fifths
Monica	187	C-flat minor		
Students	188	(mumbling)		
Teacher	189	No		
Monica	190	Aha, A-mi- no, A-flat minor		
Student 3	191	Ahaaa		
Teacher	192	We end up on C-flat major, which is like		
Monica	193	It becomes A-flat minor then		
Student 4	194	But-		
Teacher	195	Exactly, we add a flat sign, simply. When we do-		
	197	go up here again	196	Points from Gb to C, then at Gb again
	199	When we come from here, from the flat-side, then the C becomes a C-flat	198	Points at C
	201	And F-flat, and B-double-flat and so on	200	Points at F and Bb
	203	So that all- all the minor keys they come along into this flat-swamp. They get a flat sign in front. So that here it becomes A-flat minor.	202	Points at Am
	203	Just as [Monica] said		

When continuing to the next chord (Am, the relative of the subdominant, turn 178), however, the teacher's technique of finding the subdominant and its relative counter-clockwise (or to the left, turn 182) of the tonic in the circle of fifths (turn 181) will not work, since it yields the enharmonic equivalents of these chords (B and G#m instead of C<sup>b</sup> and A<sup>b</sup>m). In response to the teacher's statement, one student asks if you should "turn it around" (turn 183), indicating that the teacher's use of "to the left" requires the students to rotate the diagram so that counter-clockwise becomes to the left. Next, Monica attempts to answer, showing some uncertainty but providing the suggestion C-sharp minor (turn 184). This prompts the teacher to provide some scaffolding regarding how he expects the students to solve the problem, by pointing from G<sup>b</sup> to C in the circle of fifths and saying "then we jump up here" (turn 185–186).

Within this structure, Monica can come up with a new (erroneous) answer, C-flat minor (turn 187), which indicates that she is aware that in order for this technique to work, one must add a flat-sign when jumping up. The teacher rejects this answer (turn 189), which prompts Monica to try again. This time, she comes up with the correct answer, A-flat minor (turn 190). It is possible to see that Monica is following the strategy modeled by the teacher (jump up, find the minor relative, add a flat sign), since first misspeaks and starts saying A-minor, and then corrects herself to A-*flat* minor.

Although Monica appears to have cracked the code, and another student responds with an "ahaaa" (turn 191), the teacher still sees a need to go through the solution step by step. He takes up the thread of his demonstration from turn 186, giving the conclusion to that step (jumping up to C from G<sup>b</sup>) as C-flat major (turn 192). Monica might take this to mean that the teacher is saying she is wrong, since she repeats her answer (turn 193). This prompts the teacher to respond with an "exactly," before clarifying that you are supposed to add a flat-sign when you have performed such a vertical jump (turn 195). This is supported by pointing from the bottom of the circle to the top. The teacher then points back down at G<sup>b</sup> (turn 196) to support the deictic reference in his next statement (turn 197), which further clarifies the rules of the operation: It is

when you come from the flat side of the circle and jump up that you add a flat-sign, making the C at the top of the circle into a C-flat (again supported by pointing).

Having established this step in the procedure, the teacher expands on how the same rule could be applied to further (counter-clockwise) steps in the diagram (as we have seen with the sharp-side of the diagram in Martin's technique), pointing at F and naming it F-flat, and at B $\flat$  naming it B-double-flat, finally using "and so on" to indicate that the same will hold as one continues along the circle (turn 199–200). The teacher then states that this also applies to the minor keys which are pulled down into the same "flat-swamp" and get a flat-sign (turn 201, note again how the symbols in the diagram go back and forth between representing keys and chords). With this rule (the minor relatives also get a flat-sign), the teacher has returned to the task at hand, identifying the minor relative of the subdominant in G-flat major. He points to A $\flat$ m in the circle of fifths (turn 202), saying that it becomes A-flat minor (turn 201), adding that this is what Monica said (turn 203).

What is notable about Excerpt 16 and the episode from which it is excerpted, is that the rule of jumping up is constructed as wholly arbitrary. There is no mention of the fact that B is enharmonically equivalent to C $\flat$  nor that G $\sharp$ m is enharmonically equivalent to A $\flat$ m, and that therefore, if one had followed the teacher's normal approach, one would have ended up with a misspelled but otherwise correct transposition. As with Martin's extended technique (compare Excerpt 5 with analysis and Figure 12), this technique for avoiding enharmonic equivalents is designed to solve a problem with the design of the diagram when certain techniques are applied to it, which in turn is only a problem because of how our way of representing pitch has developed historically. The logic of the representation supersedes the logic being represented.

In relation to using the circle of fifths, and concepts such as names of chords and functions, as semiotic tools, the important points to make about these rules are (1) that the application of concepts consists largely of using them to mediate between the general rules and their application on specific groups of chords



in the circle of fifths (i.e. boxes or keys), and (2) that the rules are constructed as arbitrary, in the sense that they are something to be memorized by rote rather than understood.

This use of the concepts to mediate the transition between general rules (and seemingly arbitrary, remember the teacher saying that it is easy to forget the rules) and their application on specific symbols in a specific diagram limits the ways in which the concepts' relations of generality can be apprehended. In some cases (as with DOMINANT and SUBDOMINANT in Excerpt 13 and Excerpt 15) rules are made explicit through verbal language, and in other cases they are not, or only communicated through pointing. But even when the rules are made explicit verbally, the relations of generality underlying the rules are not.

As pointed out above, only the TONIC-concept gets an explanation that goes beyond directions in the circle of fifths (see Section 7.3 for further analysis). As far as these episodes go, DOMINANT means *to the right of the tonic in the circle of fifths*; RELATIVE OF THE TONIC means *on the inside of the tonic in the circle of fifths*; SUBDOMINANT means *to the left of the tonic in the circle of fifths*; and RELATIVE OF THE SUBDOMINANT means *on the inside of the chord to the left of the tonic in the circle of fifths*. (Except in the key G-flat major, where the subdominant and its relative are across the circle with an added flat-sign, and in F-sharp major, where the dominant and its relative are across the circle with an added sharp sign.) The underlying reasons for why this is so must be abstracted by the learner from how the concepts are used in specific, situated cases. Hence, the conceptualization process being modeled here is mostly of the situated kind (the meaning is implicit in the application of the concepts in practice), although there are semiotically mediated conceptualization processes going on simultaneously (the rules), which pertain mostly to how to use the diagram in classification and problem-solving.

## 7.2.2 A Minor Problem

During the observed lessons, the transposing strategy above is only demonstrated for chord sequences that can be understood as being in major keys. The chord sequences always start on the tonic and end on the dominant (they are probably intended to be understood as excerpts from a longer progression or as loops). The key is most often stated by the teacher as a given, with no discussion about how it is arrived at, and then used as a premise from which to deduce the identity of the tonic and/or the box. Although the teacher claims that they have previously talked about minor keys and functions in minor keys, it is clear that the students are not as used to thinking about these matters in minor as they are to thinking about them in major. Therefore, it is interesting to highlight a few episodes where students attempt to use concepts and techniques from these lessons when reasoning about minor keys. These episodes show a high degree of hypothetical statements (of the form *if X then Y* or similar). These statements work as attempts to view the same material based on different assumptions, showing how students attempt to make sense of the content by reasoning within the conceptual system as they understand it.

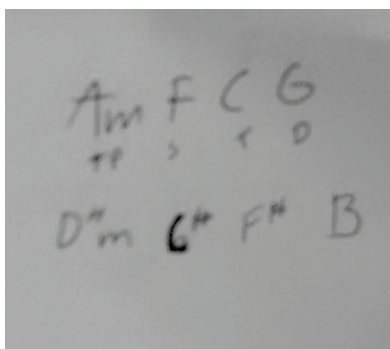


Figure 14: Part of Joel's sheet of notes. From Lesson 2 with Group 1.

One such episode is reproduced in Excerpt 17–19. It takes place just after the teacher has dismissed the students at the end of Lesson 2 with Group 1. One student, Joel, has walked up to the teacher and

is asking a question. The question is inaudible in the recording, but as I move closer with the camera, more of the conversation can be made out. They are talking about something on Joel's sheet of notes from the lesson (which has contained a demonstration of transposing very similar to the one in Excerpt 12–15). The relevant section of Joel's notes is reproduced in Figure 14. This inscription works as a reference point throughout the episode. It shows the chord sequence "Am F C G," a functional analysis of this chord sequence ("Tp S T D"), and an attempt to transpose it an augmented fourth up (D#m C# F# B). As the conversation unfolds, it turns out that this chord sequence has been given to Joel by John, another student, as a challenge to see if Joel can transpose a chord sequence in a minor key.<sup>31</sup>

Excerpt 17: Transposing in minor (A). From Lesson 2 with Group 1.

Participant	Turn	Says	Turn	Does
Teacher	383	[inaudible] if it's in A-m- right, you made your own...		
Niklas, John and Peter			384	Walk over and join the group
Joel	385	[inaudible]		
Teacher	386	...chord progression		
Joel	387	Yeah		
Joel or John	388	If you think that it's in C, then it's correct, right?		
Student	389	Yeah		
Teacher	390	Euuuh, the dominant...		
Student	391	The dominant		
Teacher	392	The dominant of		
Joel or John	393	F-sharp		
Teacher	394	D-sharp minor... isn't B		

31 The chord sequence, at least in isolation, appears more modal than tonal to me, but the participants treat it as in a minor tonality.

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Participant	Turn	Says	Turn	Does
Joel:	395	No but I was thinking, like if it's in C, if there's a C in front		
John (?)	396	Then it becomes F-sharp		
Teacher	397	Yeah		
Student	398	Mm		
Joel:	399	Then it's correct		
Teacher	400	Yeah		

In turn 383, the teacher is in the midst of answering a question from Joel. The question and the beginning of the answer are inaudible in the recording. Nevertheless, it is possible to make out that the teacher is using the construction “*går i*,” which usually indicates key, and that he says “A-m-” before interrupting himself, making it very likely that he was going to say A-minor (A-major in Swedish is *A-dur*). This, together with what happens later in the episode (see Excerpt 18), indicates that Joel has presented the problem as trying to transpose a chord sequence in the key of A-minor. The teacher’s use of “if” indicates that he is about to evaluate Joel’s work based on that assumption. He goes on to try to coordinate his own and Joel’s understandings of what it is that he is looking at, stating that it is a chord progression that the students have made up themselves, which Joel confirms (turn 383, 386–387). While Joel and the teacher are talking, John, Peter, and myself walk up to them (turn 384) and the rest of the students exit the classroom.

Although Joel first seems to have presented the original chord sequence as being in the key of A-minor, he (it is somewhat unclear if Joel or John is speaking) proceeds to present another option, inviting the teacher to view it as being in C(-major) instead, and asking if, under that assumption, his solution is correct (turn 388). Like the teacher did in turn 383, Joel uses a construction with “if” while specifying a particular key (indicated by “*går i*”), indicating an attempt to draw conclusions from the assumed key-classification. Viewing the chord sequence as being in C-major is consistent with the functional analysis on Joel’s paper, where he has marked Am as relative of the tonic (Tp) and C as tonic (T, compare Figure

14). The teacher does not address this in his response, but instead brings up the dominant (turn 390). He says “the dominant of” (turn 392) and one of the students (Joel or John) quickly supplies “F-sharp” (turn 393), indicating that he understands F-sharp to be the tonic of the transposed chord sequence. The teacher, however, continues his utterance differently, saying that “the dominant of [...] D-sharp... minor, isn’t B” (turn 394). This indicates that the teacher is still working under the assumption that the chord sequence is in minor.

Joel appears to pick up on this lack of coordination and rephrases his request, saying “if it’s in C,” and clarifying “if there’s a C in front” (turn 395). The way Joel puts this is interesting. I interpret “in front” as meaning before, i.e. as the first chord in the chord sequence. This indicates that Joel has picked up on a regularity in the lessons that is only explicitly addressed once in this material (with another group of students, see Excerpt 20), namely that all chord sequences used in the teacher’s demonstrations of how to transpose using the circle of fifths start on the tonic. In other words, Joel has generalized based on experience so that one meaning of TONIC has come to be *first chord*. As can be seen from his functional analysis, this generalization has been challenged in his attempt to apply the teacher’s transposing method in a minor key, but he can still use it to make sense of the chord sequence when viewed as being in major.

John (likely him, but not perfectly clear from the video) follows up Joel’s if-statement with a then-statement in the next turn (396), concluding either that the target key (and/or its tonic) is F-sharp. To this, the teacher and a student (Joel, John, or Peter) make concurring sounds in turn 397–398. Nevertheless, Joel asks again for confirmation in turn 399, which the teacher gives in the next turn. On the basis of the sense of intersubjective understanding thus established, Joel can launch into his next question, again trying to understand what happens if one views the chord sequence as being in a minor key. This is reproduced in Excerpt 18, which is a direct continuation of Excerpt 17.

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Excerpt 18: Transposing in minor (B). From Lesson 2 with Group 1.

Participant	Turn	Says
Joel	401	Yeah, but it's, yeah, that it was in A-minor now
John or Peter	402	Mm
Joel	403	That was what you [inaudible]
Peter	404	[Teacher], I'm stealing your stuff... (theatrical laughter)
Joel	405	[inaudible] how do you say it, how do you say it, like, transpose up a song that's in minor, do you transpose it like then, augmented fourth, four steps, and then take it in minor then?
Teacher	406	If you're to transpose a song that's in minor
Joel	407	To a
Teacher	408	An augmented fourth up
Joel	409	Yeah
Teacher	410	Then you just do that
Joel	411	Yeah, but then it becomes
Teacher	412	There's nothing th- there's nothing that makes it tricky, except that [it becomes a different] key
Joel	413	But do you write- [inaudible] if a song is in A-minor, is it still relative of the tonic then? Or is THAT the tonic then?
Teacher	414	Yeah, the function- the f- the f- the function is always the same
Joel	415	Mm
Teacher	416	Even if you change key, so- that's what's convenient with transposing that you
Joel	417	[talking over the teacher] so it becomes A to
Teacher	418	Know which function it has
Joel	419	Yeah
Teacher	420	so it becomes easier to remember
Joel	421	So it becomes- so you can write out the roots and just add minor after? So it would have become A, that is, augmented [fourth] from A

In turn 401, Joel (re-)introduces the notion that the chord sequence could be viewed as being in A-minor, which was probably part of his original statement of the problem (compare the analysis of Excerpt 17). The next few turns (402–404) are difficult to make sense of, but might serve to highlight that there are other things going on in the background as the conversation is unfolding (e.g. Peter “stealing” stuff). This could help explain some of the trouble

the participants are having in coordinating their perspectives throughout this episode.

Joel continues to try to specify the problem in turn 405. Here, he moves from talking about a particular key (A-minor), to the more general “in minor” (using the Swedish “*gåår i*” construction to mark that he is talking about a KEY). This indicates that Joel is interested in general principles, in understanding how the concepts and techniques he has learned applies in a minor-key context, rather than just whether his attempt at transposing this particular chord sequence is correct. The specific transposition that Joel has attempted still works as the main device to exemplify such principles in the concrete, however, as indicated by him using an interval concept to specify the particular operation. He then asks if you, once you have transposed an augmented fourth up, “take it in minor then.” At this point in the conversation, it is difficult to ascertain exactly what Joel means by this. I will return to this question below, in relation to what Joel says in turn 421.

The teacher spends turns 406 and 408 summarizing Joel’s problem, “If you’re to transpose a song that’s in minor [...] an augmented fourth up,” and Joel confirms (turn 409). But the teacher does not seem to see the problem as a problem. Instead, he says that “you just do that” (turn 410), and when Joel seems to object (indicated by “but,” turn 411), the teacher goes on to say “there’s nothing that makes it tricky, except that [it becomes a different] key” (turn 412, given that my hearing of the less clear part, in square brackets, is correct). The implication seems to be that there is no difference between applying the teacher’s problem-solving strategy in major and minor keys.

This is technically true, if one limits oneself to the pattern-based aspect of the strategy, i.e. if one limits oneself to making sure the same spatial pattern of chords relative to an arbitrary reference point in the circle of fifths is preserved. But Joel asks “if a song is in A-minor, is it still relative of the tonic, or is THAT the tonic then? (turn 413). As indicated by Joel’s follow-up question, the core pattern-based strategy *as demonstrated* by the teacher is mediated by a number of concepts, and within that conceptual framework, reference points are not arbitrary.

The question uses an if-construction to set up an assumption using music-theoretical concepts, that the song is in a particular (MINOR) KEY (signaled by “*går i*”), that of A-minor, and attempts to work out how the concepts TONIC and RELATIVE OF THE TONIC should be applied given that assumption. While the question still concerns general principles, minor keys in general, Joel needs to specify a particular key, A-minor, in order to work out the implications of his assumption. The pronouns in the questions “is it” and “is THAT” refer back to “A-minor,” using the polysemy of the word to make it refer to the chord, not the key. At its core then, this question concerns the relation between the concepts KEY and TONIC, particularly whether statements such as “tonic is always[...] what the song is in, that’s the key [...]the song is in, simply” (Teacher, Excerpt 12, turn 109) can be generalized to minor keys.

Let me be clear. If this analysis of Joel’s question holds, there is a correct answer within this conceptual system: The A-minor chord is the tonic chord of the key A-minor. This is a central consequence of what the TONIC-concept is conventionally taken to mean, a consequence of proceeding along its relations of generality with the KEY-concept. If one assumes that Joel’s chord sequence is in A-minor, then his functional analysis—marking Am as relative of the tonic and C as tonic—is incorrect, and that is true even if that functional analysis helped him solve the transposing problem (almost, see Excerpt 19) correctly. In other words, there is a difference between understanding the concepts and being able to deploy them in problem-solving, and Joel’s question concerns precisely this difference.

Given this, the teacher’s reply—“yeah, the function [...]is always the same[...] even if you change the key” (turns 414 and 416)—is difficult to interpret. A lot hinges on what, if anything, “yeah” is intended to affirm, on the meaning of “the same,” and on the meaning of “change the key.” One possibility is that “yeah” is understood as affirming the first of Joel’s options (Am=relative of the tonic), and that “the same” therefore means the same regardless of whether one is in C-major or A-minor. “Change the key” would then mean change between major and minor relative keys. It could also be that “yeah” is used as a filler-word, only signaling



that the teacher is about to speak, but that “the same” still should be understood as meaning the same regardless of major or minor (relative) key. In both these cases, the teacher is just plain wrong, either because he misheard the question, because he understood it differently, because he is oversimplifying his answer, or because he does not know (the last option is unlikely).

If, on the other hand, “yeah” is understood as affirming Joel’s second option (Am=tonic), what does “the same” and “change the key” mean? In that case, “change the key” would seem to refer to transposing, and “the same” would therefore not refer to any particular chord (Am, C, etc.) being the tonic of more than one key, but to every key having the same set of functions. This interpretation gets some additional support from the continuation of turn 416, and the rest of the teacher’s response in turns 418 and 420, where he connects what he has just said to transposing.

Nevertheless, the teacher’s response is not very clear, and when Joel tries to articulate his conclusions from this exchange (turns 417 and 421), a different interpretation becomes visible. Joel appears to conclude that one could simply ignore whether the chords and the key are in major or minor. Instead, he proposes to just work with the roots of the chords, and add back any m’s for minor after the transposing is done (similar to Martin’s technique for generating minor relatives). It is common to use just the letter name (without any major or minor qualification) not only for major chords, but also for major keys and for the boxes (compare “the A-box” in Excerpt 14) in this context, but rare to do so for minor chords or keys. This means that when Joel says “So it would have become A, that is, augmented [fourth] from A” (turn 421), it is possible that he is not referring to the chord A but to the key A-major or the A-box in the circle of fifths. If that is the case, his solution to how to handle minor keys when transposing using the circle of fifths would be to treat the *parallel* major key (i.e. A-major for A-minor), or its box, as though it represented the minor key, which would have been problematic had he tried it. It is also possible that he is referring to the A-major chord in the circle of fifths, which would break the neat box-organization in favor of an even more pattern-based

approach. Unfortunately, the teacher does not follow up on Joel's utterance, so this remains unexplored.

Instead, the teacher returns his attention to Joel's inscription, the specific chord sequence, and where it comes from. This leads to John telling him he made up the chord sequence and the transposing task as a challenge for Joel. Joel then defends his work by saying that it is correct if you assume that C-major is the original key, which leads to the conversation in Excerpt 19.

Excerpt 19: Transposing in minor (C). From Lesson 2 with Group 1.

Participant	Turn	Says	Turn	Does
Joel	428	But it's correct if it had gone from C, like if [inaudible]		
Teacher	429	Because the tonic... becomes F-sharp, yes. And the dominant...		
Joel	430	Is B		
Teacher	431	To which- to which dominant, is it to the A-minor?		
Joel	432	The dominant of F-sharp, the dominant of F-sharp. So I was thinking it was in C		
Teacher	433	The dominant of F-sharp isn't B		
Joel	434	(pauses) sure it is, isn't it?		
Teacher	435	No		
Joel	436	Yeah right, yeah turns that way	437	makes upside-down turning gesture with the paper
	438	it's the other way around	439	looks at the paper
	440	it should be there and C-sharp should be there		
Teacher	441	Yeah		
Joel	442	That's how it should be, okay, I'm following. [to John:] Shit! Almost!		
Teacher	443	Good job!		

In turn 428, Joel returns to the line of reasoning he held previously (see Excerpt 17), using an if-statement to (re-)re-conceptualize the chord sequence as being in the key of C-major, or at least selecting

the C in the circle of fifths as his reference point (“if it had gone from C”). The teacher confirms that in that case, the tonic in the target key is F-sharp. He starts saying something about the dominant (turn 429), but Joel cuts in and identifies the dominant as B (turn 430). This is incorrect, and the teacher’s request for clarification in the next turn indicates that he is trying to reestablish common ground to pinpoint the origin of the error. In turn 432, Joel contributes to the attempt to coordinate perspectives by clarifying that he is talking about the dominant of F-sharp, again tying this back to the original key being C(-major). The teacher responds that B is not the dominant of F-sharp (turn 433), which seems to genuinely surprise Joel, who pauses, questions the teacher’s statement (turn 434), and gets another negative response (turn 435).

This prompts Joel to turn his focus to the inscriptions on his sheet of paper and he arrives at a solution. In his transposed chord sequence, Joel has switched the dominant and subdominant (compare Figure 14). He says “turns that way” (turn 436) and rotates the sheet of paper in his hands (turn 437). Appearing to read from the paper (turn 439), he amends his solution to the transposing problem (turn 438 and 440). This indicates that Joel has been using the circle of fifths-inscription in his notes (all students were told to copy it in their notes earlier in the lesson) in his problem-solving strategy. As mentioned above, the teacher consistently uses right and left to designate clockwise and counter-clockwise direction in the circle of fifths, including in his rules for identifying dominant (to the right of the tonic in the circle of fifths) and subdominant (to the left of the tonic in the circle of fifths, compare Excerpt 13 and Excerpt 15).

However, when looking at a circle of fifths, (the enharmonic equivalent of) the dominant of F-sharp is actually to the left, and the subdominant to the right, which explains Joel’s error and why he could amend it by rotating his inscription. This is the only situation I have found where the teacher’s use of left and right for directions in the circle of fifths causes a problem. The error could also have been especially easy to make since John and Joel decided to set the problem as transposing to the key of F-sharp major/D-sharp minor, since the teacher introduces a rule that prohibits crossing over

from the sharp- to the flat-side of the circle. Solving the problem in this way would have required Joel to jump up to C from F-sharp and add a sharp-sign, instead of looking for the dominant to the right, or clockwise, from the tonic (compare again Excerpt 16 for an example of the use of this rule for flat keys). With this extra step to remember, which applies to the dominant in F-sharp and to the subdominant in G-flat, it becomes easier to make mistakes.

Another example of participants attempting to reason about minor keys is displayed in Excerpt 20. This excerpt is a better example of how these matters are handled in the lesson-context, as part of the teacher's normal problem-solving strategy for transposing. At the beginning of the excerpt, the teacher is just starting another transposing demonstration, similar to the one analyzed above in Excerpt 12–15, and Excerpt 16 shows part of the continuation of this transposing exercise. The goal of the activity is to transpose the chord sequence | G | Em | Am | D7 |. The chord sequence and a circle of fifths is drawn up on the whiteboard. The episode covers the very beginning of the problem-solving strategy the teacher is demonstrating, the same stage as in Excerpt 12, where the key is identified so that the chords can be classified by function. Unlike in Excerpt 12, however, the teacher does not provide the key, but asks a student what the key is and how she arrived at the answer.

Excerpt 20: Identifying key from chord sequence. From Lesson 4 with Group 2.

Participant	Turn	Says	Turn	Does
Teacher	280	Here we have a little chord progression, what key is it in?		
Students	281	(Mumbling)		
Student 1	282	It's in G		
Teacher	283	It's in G, how can you calculate that?		
Monica (?)	284	Because it has G, E-minor, A-minor and D		
Students	285	(talking over each other)		
Janna			286	raises her hand

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Participant	Turn	Says	Turn	Does
Teacher			287	walks over to the circle of fifths
	288	How can you cal-	289	circles the chords of G-major
	290	Then you can circle this little box there.	291	points at Janna who is raising her hand
Janna	292	Couldn't it just as well be E-minor that's... or doesn't that work?		
Student 4	293	[inaudible] isn't in [inaudible]		
Teacher	294	Yeah, it could be in E-minor too		
Janna	295	[because I'm thinking] since it, like, [inaudible] or it's like [the same stuff/thing] [inaudible]		
Teacher	296	Yeah		
Janna	297	[inaudible]		
Teacher	298	It could be in E-minor, but in that case eh, you probably wouldn't put those chords in that chord progression, and put a D-seven at the end, since there's such a clear dominant color to it. But purely theoretically, then it's n- ts- the same tonal language, absolutely. Same key [inaudible]	299	mimes playing a chord on a piano while twisting his body as if facing some kind of resistance
	300			
Janna	301	I just think it's so difficult to understand which it is, if it's like the first one or the second one that's... the dominant, or eh, how do you say it?		
Student 5	302	The tonic		
Janna	303	The to- yeah the tonic		
Teacher	304	Yeah. The first one or the second one?		
Janna	305	[inaudible] no but in a chord progression		
Teacher	306	In a chord progression		
Janna	307	[inaudible] [so different] sometimes		
Teacher	308	Yeah. It can definitely be like that, it doesn't have to start on the tonic		

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Participant	Turn	Says	Turn	Does
Janna	309	Mm		
Teacher	310	No		
Janna	311	But how do you know [inaudible]		
Teacher	312	But based on which chords are in it, then you can look at	313	points along the chord sequence
	314	G, E-minor, A-minor, D-seven		
	316	G, E-minor, A-minor and D-seven, then there's, like, one on each side here	315	points out the chords in the circle of fifths
Student 6	317	Mm		
Teacher	318	So based on the circle of fifths	319	smiles, tilts his head from side to side
	320	eh, then you can calculate or figure out that it's this, like, box	321	circles the chords of G-major in the circle of fifths
	322	that we're in, and then it's either G-major or E-minor. Then the chords could change	323	points to the chord sequence
	324	further on in the song i- so that eh	325	mimes playing a piano
	326	it comes back to a [m] ore- re- eh a bit more minor-ish harmonically, kind of	327	indicates the mimed keyboard
	328	in the chords, so that you end up on E-minor eventually, that could also [inaudible] do. Ehm, but more on the- [you/ we]'re in the right box, so to speak. [...]		

In turn 280, the teacher indicates the chord sequence and scaffolds his problem-solving strategy by isolating the first step—identifying the key—in the form of initiating a known information question-sequence (Mehan, 1979). After some mumbling among the students (turn 281), one student (not identifiable on the video) provides a reply, “it’s in G” (turn 282, implicitly, G-major), which the teacher confirms in the evaluation phase (turn 283). So far, this episode does not differ much from other similar episodes where the teacher provides the correct key. To the rest of the student group the key is still provided, but this time by a student instead of the teacher. What makes this episode different is that the teacher follows up his confirmation by asking *how* one might arrive at this answer (turn 283). As can be seen in the rest of the excerpt, this seems to open up

for a range of follow up questions from one student, Janna, which perhaps illustrates the degree to which the process of identifying key has been left unexplored.

A student (who sounds like Monica, but I cannot confirm that based on the video) gives an answer in turn 284, giving as reasons the set of chords in the chord sequence in the order that they occur. The student's answer does not give reasons for why this set of chords or their particular order indicate that the key is G-major. It appears to be self-evident to the student in question. It might not be so to some of the other students, since several students start talking over each other (turn 285), and one student, Janna, raises her hand to indicate she has a question (turn 286).

The teacher seems to be aware that the answer provided in turn 284 needs further elaboration. He starts providing that elaboration by demonstrating a strategy where the boxes used frequently in these lessons are used as tools to determine key from a set of chords (compare Excerpt 14). He walks over to the circle of fifths, seemingly starts repeating his question but interrupts himself, and then proceeds to circle the chords of G-major in the circle of fifths (i.e. G, Em, C, Am, D, Bm, turn 287–289). As he is circling these chord-symbols, he refers to what he is doing as circling a particular "box" (turn 290). By using "then" he indicates that this follows from the student's listing of the set of chords making up the chord sequence (in turn 284). In doing this, the teacher is starting to establish an adequation between the chord-sequence inscription and a particular box in the circle of fifths-inscription, but he interrupts himself again when he notices Janna's raised hand (turn 291).

The teacher returns to the establishment of an adequation between the two inscriptions later in the excerpt, so here I will only point out that some principles of the "boxing in-" or circling-operation and of the adequation between the inscription remain implicit: (a) that the "box" should consist of six chords, (b) that these should be three major and three minor chords, (c) that these chords should be each other's relatives (d) that if a major chord is part of the chord sequence its corresponding minor relative on the inside of the circle should be part of the box and vice versa, even if they are

not part of the chord sequence. Out of these (a–d), only (d), which is about how to translate between the different representations, seems to create enough problems so that aspects of it needs to be made explicit later in the episode. The main problem, however, seems to be in how the box is to be interpreted once it has been created, which is indicated by the question Janna asks in turn 292.

Janna asks if the answer could not have been E-minor just as well as G-major (it is unclear if she is asking whether E-minor could have been the tonic chord, which is what the conversation turns toward later, or the key). The question indicates an awareness that in interpreting the boxes as indicating the key or tonic, one should attend to which chord ends up in the middle. The problem in this strategy that Janna has identified is how to decide whether it is the middle major chord or the middle minor chord that one should conclude is the tonic or represents the key (note again the reliance on polysemy in the latter case, or at least how the symbols in the circle of fifths seem to effortlessly change between standing for chords and for keys).

Janna's hesitation and question as to whether the answer being E-minor would work also indicates that she is more familiar with working with major keys than she is with minor keys. This interpretation gains some support from a similar question by the student Ingrid later in the same lesson, which does not get a satisfactory answer: "If you want to transpose, kind of like... C minor as tonic[...] Do you kind of flip it [referring to the circle of fifths] then, so the inside becomes the outside?" (Ingrid, Lesson 4 with Group 2). Indeed, using the box-strategy to identify the key would be more difficult in case of a minor key, because the major dominant chord does not fit into the box in a straightforward way.

In turn 293, a student seems to be contradicting the interpretation that the key could be E-minor (uncertain because the key (ha!) words are inaudible, although the Swedish "*går i*," which is almost exclusively used for keys in this context, can be discerned), but the teacher agrees with Janna in turn 294. Most of what Janna says in turns 295–297 is inaudible, but it is likely that Janna and the teacher spend these turns further coordinating perspectives. This



leads to the teacher offering reasons for why the chord sequence should be interpreted as being in G-major in turns 298–300.

The teacher starts by again acknowledging that “It could be in E-minor” (turn 298), but goes on to say that in that case the chords would not be in that particular order or end with a D7. He then expands on why the D7-chord is an indicator that the chord sequence is in G-major, by ascribing a “dominant color” to it while demonstrating a kind of resistance or pull with his body language (turn 298–300). By introducing the concept *DOMINANT(1C)*, the teacher is connecting the discussion of determining key to the previous lessons on transposing and the circle of fifths, where the interconnected concepts *TONIC*, *SUBDOMINANT*, and *DOMINANT* have been used repeatedly to mediate back and forth between linear chord sequences and operations using boxes in the circle of fifths. He is possibly also referring back to an episode from the previous lesson with this group (Lesson 3 with Group 2, compare Section 7.4) where he used the term “dominant” to talk about chords with minor sevenths.

As with that episode, this is one of the very few times the teacher is dealing with the sound of the phenomena under discussion, and importantly, he lets this form the basis of his argument. This argument based on how the D7-chord would be experienced as dominant is then contrasted with what amounts to saying that “purely theoretically” E-minor and G-major are indistinguishable. In this way, the ability to judge whether the chord sequence is in a major or minor key is constructed as a question of mastering partly implicit rules of thumb based on the order of chords in the chord progression and on judging dominant-ness. The latter of these is something that has previously been done based on already knowing the key and/or the tonic.

Perhaps based on the teacher’s comments about individual chords and their order, Janna, with some help finding the correct term from another student, attempts to rephrase her question in terms of deciding which chord is the tonic, the first chord or the second chord (turn 301–303, the first two chords of the chord sequence are G and Em). As mentioned above, the chord sequences

the teacher uses as examples in these lessons always start on the tonic, and never end on it. This is the only time in the observed lessons that this is problematized. Again, the teacher and Janna spend some time coordinating their perspectives on what the question is about (turns 304–311): The teacher repeats part of the question in turn 304, and Janna clarifies that she is asking about the chord progression (turn 305, presumably in contrast to the circle of fifths). The teacher replies by again repeating the key words (turn 306) and although much of turn 307 is inaudible, it seems as though Janna is expressing that she is aware that the position of the tonic in a chord progression can vary. The teacher first offers an answer that only confirms that the first chord does not have to be the tonic (turn 308). Janna follows up seemingly specifying that her question is not so much about whether that can be the case or not, but about how you know which chord is the tonic given that you cannot assume it is always the first one (turn 311).

This prompts the teacher to try to make the transition between the linear chord sequence and the box in the circle of fifths more explicit (turn 312 and forward). He points along the chord sequence (turn 313), enumerating the chords in the order in which they occur (turn 314), and then points to the corresponding chords in the circle of fifths (turn 315), enumerating them again in the same order (turn 316). By keeping the chord names and their order constant, the teacher is mediating the adequation between the different inscriptions (chord sequence and circle of fifths). The circle of fifths cannot convey the order of the chords, but the teacher can use the order in which he is indicating the chords in the circle of fifths and the labels of the chords to convey how the two inscriptions correspond to each other. What the circle of fifths can convey that the linear chord sequence cannot is non-temporal relations between chords, represented as spatial relationships. This is what the teacher is utilizing in the next step of his explanation, where he says that “there’s, like, one on each side here” (turn 316). It is difficult to discern visually from the video-recording exactly what the teacher is referring to by “here”, but it is very likely that he is indicating that G and Em is the only position in the circle with one of the named

chords to each side (Am on one side and D on the other), i.e. G and Em are in the middle. Here, the teacher is making explicit the kind of reasoning that was only implicit in Excerpt 14. This idea can also be observed in one of the interviews, where a participant is identifying the tonic based on it being in the middle “when you circle it” (Interview 1 with Lena, see Excerpt 25, turn 1115).

After a brief concurring sound by a student (turn 317), the teacher goes on to state that based on this pattern in the circle of fifths one may conclude that one is dealing with a particular box (turn 318–320), which he again marks by circling it (turn 321). What he has demonstrated so far is thus a semiotically mediated strategy for how to generate a box from a chord sequence: Find the chords in the circle of fifths and check which pair of relative chords have at least one chord on each side and circle the group of six chords where that pair of relatives are in the middle (which will work as long as the chord sequence contains a IV-chord or a ii-chord together with a V-chord or a iii-chord). Based on this, he states, you know that you are either in E-minor or G-major (turn 322)—that is, the chords in the middle of the box can be read as indicating the key. Here, the relationship between the BOX concept and the KEY concept is made clear.

Note that this still does not answer Janna’s question, but leaves them with the same problem, namely to decide whether the chord sequence is in E-minor or G-major. This is partly because the teacher has abandoned his previous attempts to explain how the order of the chords contribute to key-judgements, in favor of moving to a representation that is unable to represent temporal order. The move to the circle of fifths could have been used to elaborate on the dominant-ness of the D7-chord in terms the students are familiar with from previous lessons (the dominant is always to the right of the tonic, etc.) but this is not done. Instead, the teacher explains that it is possible to imagine a continuation of the chord sequence that makes it end up in E-minor, seemingly to justify the relevance of Janna’s question (which was possibly challenged by another student in turn 293), and he ends up saying that by using the method detailed above, you at least know you are in “the right box”. In this last statement,

the teacher has a point. It is not necessary to know what key you are in, which chord is the tonic, etc., to use the method of transposing with the circle of fifths that he is demonstrating. You only need to make sure you conserve the same *pattern* of chords.

What is interesting about this episode, on comparison with Excerpt 12 is that despite being about a superficially similar problem, classifying a specific instance of a concept, it does not provide the same kind of solution. Instead of a general rule that will always work given that you have certain information to start from (usually the name of the key or the tonic), several heuristic rules of thumb are offered. These rules of thumb are not designed for deducing one classification from another, but to generate a likely classification of the whole from classifications of its parts that do not take the whole into account (i.e. chord symbols, which do not reflect the function of the chord in its context). Hence, the task becomes one of relating the elements to each other—e.g. by considering their temporal order, the pattern they make in the circle of fifths, or the dominant-ness (i.e. its function in relation to another chord, the tonic) of the D7-cord—and of weighing the importance of these relations against each other.

This involves the movement from one level of abstraction to a more general one, where that movement depends on making the abstract objects at the first level (generalizations over isolated chords) meaningful in terms of their interrelation. Mediated conceptualization requires generalizations of generalizations. As such, it is less easily expressed as an algorithm, i.e. as rules for symbol manipulation that can be performed also in the absence of an understanding of the phenomena the symbols denote (which would include their interrelation in the case of such phenomena being structural in nature). This is because these algorithms depend on such an analysis already having been performed so that it can form the starting point of the process. For example, the methods for deciding the identity of the subdominant or the dominant (in Excerpt 13 and Excerpt 15) using directions in the circle of fifths depends on the tonic already being known. Similarly, deriving the name of the tonic from the name of the key or vice versa is

dependent on an implicit analysis already having been performed.

When student participants attempt to extend the concepts and techniques they have learned to the new domain of minor keys, they encounter difficulties. These difficulties, and the participant's attempts at solving them, reveal something about the relations of generality between concepts that have been established in the educational practice. What both Joel's and Janna's attempts reveal is that the concepts involved, and the circle of fifths, are mainly made sense of in terms of techniques for solving situated, particular problems. But while these problem-solving techniques in some sense rely on the underlying conceptual system, they do not necessarily make it evident in a way that can be used to support reasoning outside the narrow problem-context the techniques are designed for. I will take up this thread again below.

### 7.2.3 Thinking In- and Outside the BOX

It is possible to see the boxing operation deployed as a means of determining key (though ultimately unsuccessfully) in Excerpt 20. Similar ways of using the BOX-concept in organizing operations with musical phenomena were common in the interviews. Lena's interviews are particularly clear examples of how the operation of boxing in a group of chords in the circle of fifths (deploying the BOX-concept) was central to attempts at accounting for music-theoretical concepts like TONIC. But interestingly, it also appears as though Lena uses the circle of fifths while engaging in musical practice, specifically, in setting chords to her melody. In order to understand how the circle of fifths and the boxing-operation structures Lena's conceptualization of TONIC, it is instructive to explore how she (in collaboration with me) first arrives at a tonic in her composition and compare that to how she accounts for the process.

Lena was one of the participants who chose to use a pre-prepared beginning for her melody. This beginning was designed to create some ambiguity regarding the tonality of the melody, initially suggesting C-major and then suggesting a secondary tonic (by moving from c-sharp to d). The pre-prepared melody and the

final result of Lena's composing process can be seen in Figure 15. Note how the ambiguous tonal center is reflected in the finished composition. The secondary tonic D-minor—implied by the end of the last phrase of the pre-prepared melody—remains central in the following two bars, melodically as well as harmonically. The harmonization starts out as quite unconventional but becomes very conventional as C-major is (re-)established as tonic by the reprise of the first phrase in bar 7–8, ending in an S-D-T-cadence.

Student's harmonization:

C F F+5 Dm F

Pre-prepared melody

F+5 Dm C F G C

Figure 15: Lena's melody and harmonization, with pre-prepared melody marked out. From Interview 1 with Lena.

The part of Lena's composing process that took the most time was deciding how to continue the melody after bar 6 had been established (note that the chords were added after the melody was finalized). In looking for a continuation, Lena tended to experiment with phrases that were structurally similar to bars 3–4 and 5–6. It appears as if she was improvising using the range of pitches in the pre-prepared melody (except the lower g) and that her intuition that c-sharp should lead to d was strong enough that every time she played c-sharp this led to an ending of the phrase on d. However, while Lena appeared dissatisfied with these continuations (as indicated primarily by her unwillingness to settle for one) she also seemed unable to break out of the D-minor tonality. At this point, I provided some scaffolding by suggesting that we reprise the first phrase (i.e. bar 1 with upbeat to the third beat of bar 2) after bar 5–6, and then try to find a good conclusion from there. Excerpt 21 starts a little bit after we have established this reprise as bars 7–8, and shows how we get from a point where the tonality is still ambiguous, to a point where the melody ends unambiguously in C-major. That is, it shows the microgenesis of a tonic.

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Excerpt 21: The microgenesis of a tonic. From Interview 1 with Lena.

mm:ss.ms: 20:23.916 20:26.692  
 Turn: 359

Lena voice

slutar den på ett e in- nu innan vi ska fortsätta?  
 does it end on an e be- now before we're continuing?

Lena piano

Turn: 358

Niklas guitar

Turn: 361

Niklas voice

Turn: 360

ehm

L. vo. 20:32.216 20:36.532  
 365

L. pno. mm 363

N. guit. 366

N. vo. 362 364 367

jäg vet inte I don't know hm-ja hm-yeah spelade you

L. vo. 20:37.329 20:40.174 20:44.896  
 369 371

L. pno. 368 370 372 374 376

N. guit. 373

N. vo. 375

du sen tror jag played then I think tror jag du spelade I think you played

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Just before turn 359 (L.vo), Lena has attempted to play the reprise-motif but failed, which prompts her to seek support by asking which note it should end on. Note that I do not know how the phrase ends either (turn 360, N.vo.), but I can play it on the guitar and from that conclude that the phrase ends on an e (turn 361 (N.guit.) and 364 (N.vo.)). Lena confirms this conclusion by playing an e on the piano (turn 363, L.pno.) and making a confirmatory sound (turn 365, L.vo.). Having thus established a sense of intersubjective understanding of (the ending of) the phrase in question, we move on with the composing activity. Before turning to that, however, it should be noted that this interlude focusing on the reprise, which in isolation from its continuation in D-minor in the pre-prepared melody suggests C-major, may have contributed to the change in sense of tonal center displayed by Lena later in the excerpt.

In turn 366 (N.guit.) and 367 (N.vo.), I bring the activity back to what is to follow after the phrase we have just (re-)established. In doing this, I co-opt the position as memory aid given to me by Lena's question in turn 359 (L.vo), by playing a version of a motif Lena had played previously (turn 366, N.guit.) and saying "you played then I think" (turn 367, N.vo.). The same thing is repeated in turn 373 (N.guit.) and 375 (N.vo.). In doing this, I am editing away the D-minor context in which this motif first appeared, while still ascribing it to Lena. It is technically true that Lena played something like this motif after we first established the reprise, but in my reconstruction, all the D-minor material in between and around these two have been edited out. By semiotically mediating a version of the melody where this motif follows directly after the reprise, I can restructure the musical



material in a way that makes the expectation of a cadence in C-major more prominent. In other words, an ending in C-major is within our zone of proximal development, and by directing our co-remembering process I can regulate Lena's action in a way that helps her solve the problem of finding a satisfactory (though not the only possible) conclusion to the melody. (Since one of those satisfactory conclusions is an ending that establishes C-major, this seems to me to be a good example of what Miller (2011) means by "the meaning of the task resides in the actions that constitute its solution" (p.173).)

As I am busy reconstructing the composing process in this way, Lena seems to be trying out different things on the piano. She also appears to be responding to my statement by saying "I played wha-" (turn 369, L.vo.) and playing f"-d" (turn 370, L.pno.). The following "no:-o" (turn 371, L.vo.) could be an objection to my representation of events or a reaction to what she played in the preceding turn. After I have played the motif and ascribed it to her a second time (turn 373 (N.guit.) and 375 (N.vo.)), the D-minor material makes its last appearance (turn 376 (L.pno.)). This could be interpreted in connection to what Lena says in turn 369 and 371 (L.vo.), as Lena's contrasting (and truer) version of what she played after we first established the reprise. But turn 376 (L.pno.) could also be understood as the product of more local and immediate factors while still contributing to our co-remembering process. When Lena experiments with playing c-sharp the tendency to let this lead to d kicks in, which leads to Lena reproducing the same kind of phrase as she did earlier in the process. Regardless of which interpretation is correct (if any), the hesitant "hm" in turn 378 (L.vo.) could indicate that Lena is not altogether satisfied with what she has just played.

At this point, I play a version of the motif that contains the note c (379, N.guit.), which is only the second time this note is played during our composing process. The first time c was played it was quickly discarded and did not seem to affect Lena's sense of the piece's tonal center. This time, there seems to be a resulting shift in Lena's sense of tonal center, probably affected by the scaffolding work analysed above. Lena imitates me (380-381, L.pno), but playing an e where I played a c, possibly indicating that she is

not yet fully aware that I played a c. She stops and lets the final d” ring out, and then pauses (381, L. pno). While the d is ringing out and during the pause (approximately three seconds) she is looking down at the keyboard, making subtle movements with her right arm and hand suggesting that she is positioning herself to play a black key (possibly c-sharp). This is my transcription of her tactile interaction with the keyboard at this point:

With her right hand in the same position, her little finger resting on g” (or a”?), lifts her index finger from d”(? At least she played d” with her index finger just before), moves her hand forward (as if to better reach a black key), hesitates, pulls her hand back, angles her elbow inward, closer to her body, and spreads her fingers some (as if to reach c” with her thumb), hesitates, then moves her hand faster, raises it a little and brings it down to play c” (turn 382, 20:58.657–21:01.897, Interview 1 with Lena.)

It looks like these new expectations are incongruent with what Lena expects to hear if she plays a c-sharp causing her to hesitate—in the action of moving her hand to play, the incongruence between expectations based on what she has just heard and her expectations based on her familiarity with the instrument becomes clear. She hesitates and then plays a c” (383, L.pno.). When hearing this note, she immediately starts laughing, displaying a pervasive change of posture, expression, and directedness (from piano to me) as illustrated in Figure 16.



Figure 16: Lena’s reaction to playing tonic note. From left to right: (1) pressing the key (21:01.875); (2) high point of laughter (21:02.595); (3) shrug (21:04.115).

This reaction indicates that playing and hearing the c (in its context) is a significant event. Even if Lena’s sense of tonal center had already shifted from D-minor or an ambiguous state to C-major,

playing and hearing the note *c* creates a focal point in which that shift becomes available to awareness. She can hear the *c* as an endpoint for the piece that works, and she can classify it as a *c* through her familiarity with the semiotic organization of the keyboard (its inscriptional aspect). The third image, showing a shrug-like gesture directed towards me, indicates that part of the comedy of the situation results from the realization that the solution we spent so much time and effort looking for seems so obvious and simplistic once discovered—the whole preceding process and its resultant musical structure suddenly makes sense in light of (or is made sensible by) the establishment of a clear C-major tonality.

Lena's reaction can thus be seen as stemming from the culmination of the process of moving from an ambiguous sense of tonality (or possibly one revolving around D-minor) to an unambiguous C-major tonality—a sort of *Gestalt* shift. The theoretical and methodological ideas underpinning this study stresses that *Gestalt* shifts, although they appear to be instantaneous, either-or phenomena to introspection, are actually processes. In fact, the origins of microgenetic methodology (in the *Aktualgenese*-tradition) was the attempt to slow down such processes to a point where they could be reported and studied (Diriwächter, 2009; Valsiner & van der Veer, 2000; Wagoner, 2009; cf. Werner, 1956). The basic structure of a microgenetic experiment—a gradual change in the clarity of a stimulus (Diriwächter, 2009; Wagoner, 2009)—is mirrored in the structure of the composing activity, but the changing stimulus is the degree of scaffolding rather than (e.g.) tachistoscopic projections.

Hence, the episode in Excerpt 21 can be viewed as the microgenesis of a tonic-experience. As in Werner's (1956) experiments, the final awareness of the unambiguous structure is preceded by a global sense of it. In Lena's case this is indicated by her not being content with the continuations in D-minor, and perhaps by the (relatively) long pause she makes between imitating my final version of the motif (turn 379 (N.guit.) and 380 (L.pno.)) and playing the note *c* (turn 383, L.pno.).

In summation then, this episode demonstrates how establishing key, an operation that has become so naturalized (Säljö, 2013) as

to not require conscious reflection, suddenly becomes the focus of Lena's conscious awareness. This happens when Lena's normal means of identifying the tonal center of a piece of music (whether by analyzing the collection of pitches on the piano keyboard or by a less explicit aural judgement) is challenged by the ambiguous tonality of the pre-prepared melody, requiring an externally mediated and inter-mental process instead. This co-constructive process, and the focal point it creates (in playing/hearing the c) for conscious awareness of the tonic-experience, allows us to start accounting verbally (cf. Wallerstedt, Pramling, et al., 2014) for what just happened. The conversation immediately following Lena's laughter in turn 385 is reproduced in Excerpt 22.

Excerpt 22: What was funny and why? From Interview 1 with Lena. Turns 391–398 consist of reinforcing the final phrase of the melody and are excluded here.

Participant	Turn	Says	Turn	Does
Niklas	388	Or? What- what is it that makes you laugh there? (laughter)		
Lena	390	That a C comes in, but it was kind of nice! (laughter)	389	Melody: descending line to c
(...)	(...)	(...)	(...)	(...)
Niklas	399	Wh- why was it funny that a C came in?		
Lena	401	'cause (.) eeh I- eh ha- we hadn't used that one before (and then) I thought that it was funny to [singing:] ehm [speaking:] finish it like that like a typical little (.) song, like that!	400	Plays melody

Firstly, it should be noted that what is of interest in Excerpt 22 is not primarily Lena's retro- and introspective descriptions of what she found funny *as evidence of what she found funny*. Such retrospective and introspective evidence is notoriously problematic (Säljö, 1997; Wagoner, 2009). Rather, what is of interest here is *how* Lena draws on semiotic means to account for this experience, because this

indicates how the experience is drawn into a semiotically mediated process of conceptualization.

In reply to my question about *what* made her laugh, Lena plays a version of the final phrase of the melody and says “that a C comes in” (turns 388–390). The identification of the final note—the one that prompted the laughter—as *c* indicates a semiotically mediated analysis of the situation in terms of pitch-names, which is extended to the whole melody and composing process later in the excerpt. The statement is qualified with “but it was kind of nice” (in turn 390). The qualification with “but” indicates that in Lena’s semiotically mediated analysis of the music, the *c* is still seen as surprising, an anomaly. That is, she has not yet conceptualized the *c* as tonic, or the song as being in the key C-major. At the same time, the fact that we have both accepted this *c* as the final note of the piece (as can be seen by Lena’s use of “finish” in turn 401), and Lena’s judgement of it as “kind of nice”, indicates that Lena has made the auditory judgement that the *c* is the tonal center of the piece. There is, so to speak, a gap between Lena’s understanding of the music as it is expressed in musical practice, and her semiotically mediated account of the music.

When I ask *why* it was funny (turn 399), Lena gives two explanations (turn 401) which are interesting to separate analytically. The first explanation, that we had not used *c* before, is local in scope. This conceptually mediated account of our composing-process and its product, using pitch(-class) concepts and possibly also the semiotic organization of the piano keyboard, can be viewed as an analysis unfolding in real time. If every concept is a generalization, using semiotic tools *is* analyzing, and whether or not part of it happens intramentally before Lena expresses it in communication is unimportant. By asking questions and attempting to answer them we are co-constructing a semiotically mediated understanding of the music and the musical experience.

The second explanation, that it becomes like a “typical little (.) song” (turn 401), goes beyond our immediate (musical) context and compares our composition with other music. Lena generalizes over concrete musical experiences using an ad hoc concept “typical little song” (for the notion of “ad hoc” concepts, see Wallerstedt,

Pramling, et al., 2014). Note however, what this says about Lena's musical understanding. It is unlikely that she is saying that she has heard many songs that end *exactly* like this one. Rather, it is about similarities on a structural level (e.g. stepwise descent from the third to the tonic). Kaladjev (2009) calls such regularities musical generalizations (*musikaliska generaliseringar*).

I have argued above (Section 4.5) that Kaladjev's musical generalizations are akin to Vygotsky's (2012) potential concepts, in that they involve isolating and abstracting features of (in this case, musical) objects, which can be generalized in (in this case, musical) action (cf. Miller, 2017). Generalization and conscious awareness of potential concepts is limited to concrete, situated instances because they lack a sign component. By signifying such a generalization as "typical little song," Lena creates a psychological tool that can mediate conscious awareness of the experience of (structural) similarity. By means of this sign, she can draw those concrete experiences into conceptually mediated conceptualization processes—everyday concepts mediate between scientific concepts and potential concepts.

Although Lena has not classified her melody as being in a particular key at this point in the interview, when she transitions to setting chords to her melody, her strategy appears to be constrained by some kind of assumption about which chords go together. This appears most clearly by comparison with other cases, who appear to use strategies for selecting chords based on other mediational means. It should be noted at the outset that the strategies that are possible to reconstruct to some degree become visible in the material in cases where the task is difficult enough for the participant to require externalization of part of the process, either by testing different options using an instrument, by engaging in self- or other-directed talk, or by some combination.

For example, although facing a similar problem to Lena's, having started from the same ambiguous pre-prepared melody, Cecilia's harmonizing process was very quick, with little to no experimentation. Therefore, I would mostly have to rely on her self-report after the fact to gain access to what strategies she may have used, a more unreliable method. I only get some insight right at the beginning

of the process, as she is transitioning from finalizing the melody to figuring out the chords. At this point, she wonders aloud which key the melody is in and decides it must be C-major. When I ask her how she knows which key it is, she answers:

I'm thinking that... because it is (plays c) because it's... so it sounds like it fits with this (plays ascending C-major scale), and you don't use f-sharp, because otherwise you could have thought it is in G, because it's close. Then this one (plays d to c-sharp) didn't sound... and then it sounded good when you ended on c too, it sounded kind of like it was over. (Cecilia, Interview 1)

It seems likely that Cecilia solved the harmonizing problem so efficiently because she had already established a key. She could then use the KEY-concept to structure her selection of chords and accompaniment patterns in a way that let her finish the task with very little experimenting. But since she faced almost no obstacles in the process of selecting chords, very little of her thought processes were externalized and made available for analysis.

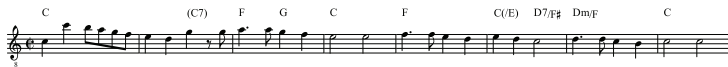


Figure 17: Joakim's melody and chords. From Interview 1 with Joakim

Contrast this with Joakim, who also composed a melody in C-major with relatively conventional harmony, especially in the first half (Joakim's melody and the chords he set to it are reproduced in Figure 17). As we work our way toward what ended up as a S-D-T-cadence, Joakim's harmonizing strategy becomes visible as he encounters a problem in bar 3 (bar numbers refer to Figure 17). This process will be reproduced in Excerpt 23 and Excerpt 24. At the outset we have already established a C-major chord as accompaniment for the first two bars, the F-major chord in the first half of the third bar, and (less certainly) the return to C-major in bar 4. Joakim is trying out different chords for the penultimate position on his guitar while one or both of us sing the melody.

Excerpt 23: Joakim's harmonizing strategy (A). From Interview 1 with Joakim.

mm:ss.ms: 12:53.314  
Turn: 181  
13:01.704  
188

Joakim voice  
nah - nn - nn - uh      äh nej jag  
oh no I

Turn: 182      183      185      186      187  
C      F      C      F

Joakim guitar

Niklas voice  
Turn: 184  
(ny) - ny - nuh

13:05.659      13:09.764      13:12.980  
15<sup>ma</sup> 190      193

J. vo.  
vet! ä:h      (visslar)      ä:h hm  
know! e:h      (whistling)      e:h hm

189      191      192      194      195      196  
F      B      Bm      C      F

J. Guit.

The melody in turn 184 (N.vo.) and the end of turn 181 (J.vo.) show where we are in the musical context, bar 3. While we sing the melody, Joakim plays the already established F-major chord (turn 183, J.guit.), and then, where the next chord would fall, a slow glissando by moving his index finger along the A-string from the second to the fifth fret (turn 185, J.guit.). After briefly playing an e on the D-string, Joakim returns to a C-major chord (turn 186, J.guit.). Already at this point, it is possible to see the outline of a S–D–T-cadence, with F as antepenultima, the glissando (starting on the third and ending on the fifth of a G-major chord) as penultima, and C as ultima.

The C-major chord in turn 186 also seems to function as a recapitulation of the beginning of the piece, because Joakim proceeds again from the C-major chord to an F-major chord (turn 187, J.guit.). This time, instead of playing something on his guitar after the F-major chord, he exclaims “oh no I know!” (turn 188, J.vo.). It is possible that within the incomplete cadence structure he has created, Joakim can imagine what the missing chord should sound like. In a sense, he is scaffolding his own creative process through playing the partial cadence. That does not mean, however, that he is immediately able to realize this intuition through his guitar. He needs a way to externalize what he “knows” in a way that lets him operate on it in a conscious manner.



Joakim does this by again playing the F-major chord (turn 189, J.guit.), and, at the moment when the next chord should sound, whistling a high b-flat or a low b-natural (turn 190, J.vo.) while with only a slight delay imitating this on the guitar by sliding from the first to the second fret on the A-string (turn 191, J.guit.). B-natural is, of course, the third of the G-major chord he eventually decides is appropriate in this position. He is thus recreating the preconditions that precipitated his original intuition by playing the F-major chord, then externalizing (part of) what he has imagined by whistling, and imitating himself with the guitar. Through this chain of operations, what he “knows” becomes successively more concrete, from something imagined, to a pitch somewhere in between b-flat and b-natural, to a particular finger, on a particular string and a particular fret.

Importantly, to Joakim this is not just a finger on a string happening to produce a similar sound as his whistling. As a guitarist, positions on the guitar fretboard are meaningful to him. The guitar fretboard, just like the piano keyboard, can be said to have an inscriptional aspect (see discussion in Section 4.2). To someone familiar with this semiotic map, positions on the fretboard can be read as pitch names, simultaneous combinations of positions—embodied as grips—can be read as chords, consecutive combinations of positions as scales, and vice versa. Through transferring his imagined chord or pitch, externalized via whistling, to the guitar fretboard, it becomes possible for Joakim to bring this semiotic system to bear on solving the problem. He can engage in a semiotically mediated problem-solving strategy.

Joakim starts engaging in this strategy already in turns 192 and 194 (J.guit), trying out the chords B and Bm before again recreating the cadential framework in turns 195–196 (J.guit). He then goes on to, in addition to testing Bm one more time and B three more times, test and reject B<sub>7</sub>, B<sup>°</sup><sub>7</sub>, and BMaj<sub>7</sub>. These five chords share two features: (1) They are all named B-something, and (2) the way Joakim plays them, they all have the b on the second fret of the A-string as their bass note. This indicates that Joakim is engaging in a strategy for selecting chords to try out, which is structured by

either the common name of the chords, by their position on the fretboard, or both. The hypothesis that the relevant mediating device is the common name of the chords gains some support from the way in which Joakim talks about them as he is working.

Excerpt 24: Joakim's harmonizing strategy (B). From Interview 1 with Joakim.

Participant	Turn	Says	Turn	Does
Joakim	201	Not, not a seventh here	200	Chord: B7
Niklas	202	mm	202	Melody: g'-f'
Joakim	205	T'sounds a bit flat with a e:h	204	Chord: B
	207	We'll take [that/D/dim]	206	Chord: B
	209	No, that does not work well	208	Chord: B°7
	210	E:h, it doesn't it sound a bit flat with a common eh		
Niklas	211	(laughter) yeah		

In turn 200–201, Joakim plays a B7-chord, and comments “not, not a seventh here,” to which he gets a vaguely confirmatory reply in turn 203. He tries a B-chord again in turn 204, says that it sounds a bit flat (turn 205, in Swedish: *platt*, note that *platt* in Swedish does not mean flat in the musical sense of the opposite of sharp), continues “with a e:h” and instead of naming the chord plays it again (turn 206). He then says he will take either “that,” “D,” or “dim,” it is difficult to hear the difference in the recording (turn 207). Given that the next chord he plays is a diminished chord (turn 208), it seems likely that he is saying “dim.” Having tried the diminished chord, Joakim concludes that it does not work either (turn 209), and turns more explicitly to me, asking if it “a common” sounds “a bit flat” (turn 210).

What is taken for granted throughout Excerpt 24 is the names of the chords Joakim is talking about. He only differentiates between them in terms of their qualities—seventh, diminished, common—because it is a given to him that they are all some kind of B-chord. Whether or not this interpretation is correct in its details, it seems obvious that Joakim's strategy is not mediated by any concept of KEY, or of BOXES understood as collections of chords that go together.

The T–S–D–T–progression is very common, of course, and it turns up in Lena’s piece as well (see the last two bars of Lenas piece, Figure 15). Interestingly, when Lena and Joakim are attempting to set chords to what ends up as this kind of cadence in their respective pieces (both in C-major), they end up playing almost same number of chords (Joakim=33, Lena=34). But as can be seen in Table 6 and Table 7 there is a big difference in how many different chords, and which chords, they try out.

Table 6: Joakim’s choice of chords to try out when harmonizing T–S–D–T. Based on Interview 1 with Joakim.

Chord	C	F	B	G	Bm	Em	Am	B7	Bmaj7	B°7	Sum:
Times	9	8	5	3	2	2	1	1	1	1	33

Table 7: Lena’s choice of chords to try out when harmonizing T–S–D–T. Based on Interview 1 with Lena.

Chord	C	G	Dm	F	D	Sum:
Times	12	7	6	5	4	34

While Joakim tests five chords which are outside the key of C-major (or four, if one views the B°7 as a G7-9 in second inversion, with the root excluded), Lena tests only one, D. The D-major chord is the one Lena plays the least number of times. Her four most played chords are all part of C-major. In contrast, Joakim has one chord from outside C-major among his four most played chords (B). Lena’s one non-C-major chord is also closer to C-major than many of Joakim’s. This indicates that Lena and Joakim are using different strategies to solve a similar problem.

I will be proposing here that Lena’s strategy is based on some kind of knowledge about which chords tend to go together, whether that is conceptualized in terms of KEYS, or in terms of BOXES. The latter gains some support from Lena’s comments directly after having established the T–S–D–T–progression discussed here. When asked why she thinks this harmonization sounded good, Lena answers: “Because it was- I’m thinking that it was- they go together in the

circle of fifths”, and a little later she clarifies, “that it’s still some chords that... are next to each other” (Lena, Interview 1, turns 786 and 800). While this kind of retrospection should not be taken as direct evidence, the fact that Lena’s first choice for accounting for her choice of chords was the circle of fifths is at least congruent with the hypothesis that it was close at hand for her since she was already using it in her problem-solving strategy.

When, later in the interview, I ask Lena more detailed questions about how she decided which chords to try out, an understanding of TONIC that is founded on the BOX-concept and the operation of boxing in a group of chords in the circle of fifths becomes visible. While Lena is telling me how she decided that the first chord should be C, she also goes into how she decided which other chords to try. She demonstrates by playing C, F, and G on the piano while she says: “[...] I do KNOW which chords that could (.) work [...] If you (.) pick C as a tonic, kind of” (Lena, Interview 1). This made me interested in what she meant by picking (or choosing, or selecting, Swedish *väljer*) a tonic.

Excerpt 25: Picking a tonic (A). From Interview 1 with Lena.

Participant	Turn	Says	Turn	Does
Niklas:	1085	Bu- but eh:- okay, so you pick C as a tonic		
Lena:	1086	yeah		
Niklas:	1087	E:h how do you know it’s the tonic? (0.80)		
Lena:	1088	Yes- (.) e:h (.) that- eh because I have- [it] (.) so there is subdominant and dominant	1089	Chord: C
Niklas:	1090	mm		
Lena:	1091	And the subdominant becomes F	1092	Chord: F
Niklas:	1093	mm		
Lena:	1094	And the dominant becomes G, because	1095 1096	Chord: G Raises her right hand in front of her face with palm facing inwards and upraised fingers
Niklas:	1097	yeah		

## 7. ANALYSIS AND RESULTS

Lena:	1099	It becomes	1098	Raises left hand to meet right hand palm to palm
			1100	Starts lowering her hands
			1101	Raises her hands again, holds her right hand centered while moving her left hand a little bit clockwise, then starts lowering her left hand
	1102	yes	1103	Starts lowering both hands, stops and moves them a little bit clockwise (left hand) and counter-clockwise (right hand), stops the movement to reach for pen and paper, starts drawing
Niklas:	1104	Do you need to draw a circle of fifths?		
Lena:	1105	Yeah but- h- yeah, that's how it is		
Niklas:	1106	(laughter)		
	1107	right		
Lena:	1108	[G-] and then [you] circ[le] around those three, and their minor relatives then, it's supposed to be	1103	ends drawing cont
Niklas:	1109	mm		
	1110	right		
	1111	e:hm: (.) so- but- but then- (.) so that (.) F is subdominant and G is dominant and C is tonic		
Lena:	1112	Yeah		
Niklas:	1113	Mm, but how DO you KNOW that C is the tonic?		
Lena:	1114	E::h (.) eh-YEAH (.)		
	1115	that it one is- eh:: in the middle, I'm thinking (1.13) When you've- when you circle it anyhow		

In turn 1085, I am bringing the conversation back, after a brief interlude, to Lena's comment about picking a tonic, and go on (turn 1087) to ask how she knows that the chord she picks is the tonic. Lena pauses to think (silence duration at the end of turn 1087) before launching into an explanation. After a few false starts, Lena approaches the problem by first talking about the subdominant and dominant (turn 1088). While demonstrating by playing first C, then F and G on the piano (turns 1089, 1092, and 1095), she explains that the subdominant and dominant "becomes" F and

G respectively (turns 1091 and 1094). Using a construction with “becomes” (Swedish: *blir*) indicates that the status of F and G as subdominant and dominant follows from something else. Indeed, Lena follows this up with a “because” (turn 1094), indicating that she intends to give reasons for her classification of F and G as subdominant and dominant. But instead of verbalizing her reasons, she begins a series of gestures, supported only by brief utterances (turns 1096–1103).

The series of gestures in turns 1098, 1100, 1101, and 1103 are organized around one hand, raised in front of her face, with the palm facing inward and fingers pointing up, signifying some kind of mid- or reference point. Around this, the other hand—held up in a similar manner—makes motions to the side. It is reminiscent of the hands of a clock pointing to twelve o'clock, five past, and five to. In the situation, I interpret this as a reference to the circle of fifths, which Lena has already mentioned in relation to selecting these three chords (compare quotes above), and ask her if she needs to draw one (turn 1104). Lena immediately reaches for pen and paper and starts drawing up the inscription reproduced in Figure 18. (Note that turn 1103 and 1104 actually overlap, even though the transcript makes it look like I am asking the question after she reaches for pen and paper, note also that Lena continues drawing throughout turns 1104–1108.)

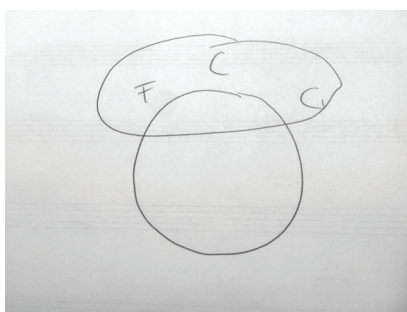


Figure 18: Rudimentary circle of fifths with C-box from Interview 1 with Lena. Drawn during turns 1103–1108 in Excerpt 25.

Lena draws a circle and writes C at the top of it, F counter-clockwise of C, and G clockwise of C. This is an economical representation of the circle of fifths, containing only the elements she needs to make her point. She confirms to herself that it is correct in turn 1105, and gets confirmation from me in turn 1107. She then narrates the last part of the operation, “(you) circ(le) around those three,” while *circumscribing* F, C, and G, adding that their minor relatives should be included as well (turn 1108). By doing this, she has created what would be named a C-box in the lessons (compare Excerpt 14 and Excerpt 20). What we have established so far is thus that there is subdominant and dominant, that they are F and G respectively (turn 1088–1095), and that this is because (turn 1094) something that is expressed by circling the chords F, C, and G (and their minor relatives) in the circle of fifths (turn 1103–1108).

I offer confirmation and recapitulate in turns 1109–1111, naming F as subdominant, G as dominant, and C as tonic. Lena confirms my recapitulation in the next turn, which serves to establish a sense of intersubjectivity. Based on this sense of shared understanding, I return to my original question on how she knows that C is the tonic (turn 1113), stressing “do” and “know” in a manner that indicates that I am still not quite satisfied with Lena’s answer. This prompts Lena into an attempt at clarifying further. After some hesitation, she says that “it,” referring back to “C” in my question, is “in the middle” (turn 1114), and after a pause she adds “when you circle it anyhow” (turn 1115).

This retrospective elaboration should not on its own be taken as evidence that Lena decided to treat C as the tonic in her harmonization based on performing this operation. Rather, it shows how Lena accounts for decisions she made in musical practice using the semiotic means she has access to and believes to be appropriate. The nature of her answer is probably influenced by the interview being held in an educational context, and by the nature of the question itself, which is unlikely to arise outside such a context. Nevertheless, within these constraints Excerpt 25 demonstrates that Lena’s way of making sense of the TONIC-concept is grounded in the operation of boxing in a group of chords in the circle of fifths,

rather than in an aural judgement. That does not mean she is unable to make such distinctions aurally—her composing process shows that she is very able to handle tonics in musical practice—but only that she does not account for her classification of C as the tonic on that basis.

Although Lena's first interview was conducted before the period of lesson observations, this way of talking about the TONIC-concept is very consistent with how it is dealt with in the observed lessons, an indication that this way of dealing with the concept was not isolated to the lessons I happened to observe. Reasons for why a certain chord is denoted as tonic are rarely given, and when they are, they usually boil down to the identity of the tonic-chord following from the identity of the key, which is in turn treated as a given. In the interview-context, Lena cannot rely on already knowing the key, which makes the problem similar to the one faced by the participants in Excerpt 20. The way Lena frames her explanation, starting with the subdominant and dominant, is also telling. If, in this educational context, SUBDOMINANT means *to the left of the tonic in the circle of fifths*, and DOMINANT means *to the right of the tonic in the circle of fifths*, then it is not a big leap to conclude that TONIC means *between subdominant and dominant in the circle of fifths*. As in Excerpt 20, the tonic is identified by having "one on each side" (Excerpt 20, turn 316) in the box, that is, it is "in the middle [...] when you circle it" (Excerpt 25, turn 1114–1115). There is a circular quality to this argument, comparable to the teacher's circular argument in Excerpt 14. I will discuss some possible reasons for this in Section 7.3 and Section 8.4.1.

The idea of picking or choosing a tonic by circling a group of chords in the circle of fifths returns again a little later in the same interview (Excerpt 26). In this episode, unlike in Excerpt 25, Lena argues that she could have picked a different tonic, which perhaps indicates the distance between the circle of fifths and practical music making activities at this stage in her development.



## 7. ANALYSIS AND RESULTS

Excerpt 26: Picking a tonic (B). From Interview 1 with Lena.

Participant	Turn	Says	Turn	Does
Niklas:	1197	Ehm (.) would you say that you- (.) that you tried the F (.) because you knew that it was the subdominant to C, or would you say that you found the F (.) when you were testing and then (1.24)		
Lena:	1198	Ye:::ah mh I- sm- I do know that it- that it's- I wasn't really thinking subdominant and dominant at FIRST (0.14)		
Niklas:	1199	mm		
Lena:	1200	E:h then when I did- because I was testing a little- (.) did a little bit of these, hm	1201 1202 1203 1204	Chord: C Chord: G Chord: D Chord: D
Niklas:	1205	mm		
Lena:	1200 cont	A bit of D and a bit of G and so on (.) eh (.) because it could be that I had started on C but that I would have chosen to have C- (.) that is (.) G and D	1206 1207 1208 1209	Chord: D Dissonant chord Chord: C arpeggio Points with pen in rudimentary circle of fifths
Niklas:	1210	m-hm		
Lena:	1211	That I would've chosen to do THAT ring instead, so it's C, G and D, and then G would have been the tonic	1212	Makes circling motion
Niklas:	1213	Yeah rig[ht]		

As with the previous episode, the conversation develops out of an attempt to account for the selection of chords during the composing process. In this case, I do not ask about the tonic, but about the subdominant, specifically if her knowledge that F is the subdominant in C-major (as demonstrated in the previous conversation) was a reason for her testing that chord (turn 1197). After pausing to think, Lena claims that she was not thinking in terms of functions at first (turn 1198). She goes on to say that she was testing different chords (turn 1200), demonstrating by playing C, G, and D on the piano (turns 1201–1204, 1206–1208), specifically naming G and D (turn 1200 (continued)).

In the rest of turn 1200 (continued), Lena transitions from talking about the particulars of what she did to attempting to provide an explanation in more general terms. As pointed out in the introduction of Excerpt 25, the conversation about the tonic reproduced there emerged out of a question about how she picked the first chord of the piece. In that respect, the conversation in Excerpt 25 did not really grapple with the tacit assumption that the first chord can unproblematically be identified as the tonic (compare Excerpt 17, turn 395, and Excerpt 20). This assumption is present in Lena's interview as well, but in order to make her point here, she needs to both make that assumption explicit ("it could be that I had started on C") and deploy a set of semiotic tools to circumvent it (after "but"). She therefore turns from the piano keyboard to the rudimentary circle of fifths-inscription she produced in the previous excerpt (turn 1209). By pointing out the chords she names (including an imaginary D-chord not in the inscription) in the circle of fifths instead of playing them on the piano, Lena can deploy the BOX-concept and the boxing-operation to make sense of her choice of chords. After pointing out the three chords in her circle of fifths, Lena concludes the boxing operation by using a circling motion and saying "THAT ring" (turns 1211 and 1212).

Much like in Excerpt 17–19 above, music-theoretical concepts are used to explore different hypothetical scenarios by making different assumptions about the identity of the KEY, BOX, or TONIC, mediated by the spatial relations of chord-symbols in the circle of fifths. In Lena's case this hypothetical quality is marked by "it could be" (turn 1200 (continued)) rather than "if" (as especially Joel tends to do), but the conclusion is still indicated by "then," as in "then G would have been the tonic" (turn 1211). As in Excerpt 25 and Excerpt 20, the logic proceeds from enumerating chords, via their organization in a box in the circle of fifths, to a conclusion of the identity of the tonic. Unlike in Excerpt 20, however, the ambiguity to be resolved is not between relative keys but between two different major keys, which makes the application of the technique more straightforward.

Although this is a retrospective account of Lena's harmonizing process, it should be noted that it is quite a consistent explanation of her selection of chords in Table 7 above—they all fit comfortably within either the C-box or the G-box. Compare the quote from Cecilia above, who encounters a similar problem and briefly considers whether her melody could be in the key of G-major. It seems quite plausible then, that like Cecilia, Lena has been using a strategy for selecting chords that is somehow constrained by knowledge of which chords “go together,” but without having resolved the ambiguity between G-major and C-major as efficiently as Cecilia did, and that this is indicated by her selection of chords in Table 7. It is impossible to say, given the nature of my data, whether this knowledge is mediated by the circle of fifths in the way that it is in Lena's accounts of the process. But the circle of fifths definitely seems to be Lena's main way of accounting for this knowledge in collaboration with me in the interview setting, which does not make the hypothesis that she is using it also in collaboration with herself less likely. If that hypothesis is correct, it is an interesting case of using the circle of fifths in musical practice, precisely the kind of engagement with the diagram that Joel and Cecilia refer to when they talk about how they came to “just know” parts of the diagram.

It should also be noted that in both of Lena's accounts of picking a tonic, there is no reference to any aural strategies, although they are plainly evident in the actual composing process (compare the analysis of Excerpt 21 and Figure 16). This is part of what makes the episodes in Excerpt 25 and Excerpt 26 so interesting, because arguably, Lena had (in collaboration with me) picked a tonic already before beginning the process of setting chords to her melody. This indicates that there is still a gap to be bridged both between the different concepts and representations Lena employs in her account, and between these semiotic means and the musical phenomena they supposedly refer to. It is probably not a coincidence that although Lena introduces the concepts TONIC, SUBDOMINANT, and DOMINANT, the circle of fifths and the boxing-operation (although she does not speak of it as creating a BOX), the KEY-concept is absent until I introduce it in Excerpt 27. This conversation follows after

I have asked Lena why the melody ended the way it did, and she has offered the explanation that “you always want to go back to the tonic” (Lena, Interview 1, turn 1313).

Excerpt 27: Going back to the tonic? From Interview 1 with Lena.

Participant	Turn	Says	Turn	Does
Niklas	1326	buut now we had never played c (.) before then, in the melody		
Lena	1328 1329	No-o! so that was v- very strange	1327	Chord: F
Niklas	1330	Yeah		
Lena	1331 1333	but it was still a- it was a-	1332 1334 1335	melodic: ascending scale g-a-b-c-c#-d-e-f-g, then c p5 down melodic: ascending d-e-f-g-a melodic: ascending g-a, then an arpeggiated C-major chord, second inversion
Niklas	1337 1338	mm if I say (.) eh (.) key		
Lena	1339	Yeah!		

In turn 1326, I point out that the note c did not occur in the melody before the very end, implicitly referring back to the episode in Excerpt 21 and the following conversation in Excerpt 22. Note that while I am talking about the tonic-*note*, Lena has likely been talking about the tonic-*chord* (as indicated by her consistently treating TONIC as referring to chords and exemplifying by playing chords on the piano). But Lena appears to take the change in her stride. She responds in a way (e.g. by experimenting with melodic instead of chordal playing on the piano, e.g. turn 1332, 1334, and 1335) that suggests that she sees the parallel between the tonic as a note and as a chord.

When faced with this counter-example from our own musical practice, Lena expresses bewilderment (turn 1328–1329) in a manner that indicates that she sees the contradiction. She immediately starts searching for a better explanation but seems unable to

find the word she is looking for (turns 1331, 1333). Instead she uses the piano, playing an ascending g-mixolydic scale with an added c-sharp—i.e. the pitches we used in the melody organized as a scale and filling in the missing b (compare Figure 15)—and ending the phrase on the c a perfect fifth down from the top g (turn 1332). She then plays the first five pitches of an ascending D-minor scale and an arpeggiated C-major chord (turn 1334-1335). This use of the piano can be viewed as a means of communicating with me, but also mediates her thinking about the problem. Lena can use the inscriptional aspect of the piano keyboard to experiment with different meaningful patterns (scales, arpeggiated chords). Still, she does not seem to be able to formulate a verbal answer on her own (turn 1336). At this point, I step in and give a suggestion based on what she has been doing on the piano (“key” turn 1338), to which she answers with an enthusiastic “yeah!” (turn 1339).

KEY works here as a superordinate concept by means of which the incongruence in the application of the tonic-concept can be resolved. But Lena does not seem to be able to initiate, or does not see the point of initiating, the use of that concept, but rather relies on demonstrating or experimenting using the piano keyboard, or on the BOX-concept (Excerpt 25 and Excerpt 26). The BOX-concept and the accompanying boxing-operation work as the primary way of visualizing keys in the observed lessons, while the KEY-concept is never expanded upon. What becomes evident in Lena’s talk about picking a tonic is that the BOX- and KEY-concepts are not equivalent—in musical practice, keys cannot be reduced to chord relationships, nor to which note a melody starts on or to the set of pitches a piece contains.

If Lena, as Cecilia seems able to, could parse her melody in terms of deciding its key, the question of picking a tonic would not arise at the stage in the process that it does, because unlike the BOX, KEY is not exclusively a matter of harmony. As such, the KEY-concept can mediate between melodic and harmonic expressions of tonality. Thinking inside the box is not enough. Put differently, a concept such as KEY is the missing link that could bridge the gap between Lena’s grasp of tonality as expressed in

musical practice (see Excerpt 21 and Figure 16) and the conceptual system, with the circle of fifths as its central representation, she uses in accounting for that musical practice. As will be discussed further in the upcoming section, this is an example of how the concepts, tools, and models being introduced in the music theory subject end up as self-contained systems.

### 7.3 Defining, Explaining, and Algorithms for Denoting Action

Above, I promised to return to the teacher's elaboration on the meaning of TONIC and KEYNOTE, which occurred in Excerpt 12, turn 103–109, and compare it with other, similar utterances. These kinds of elaborations on the meaning of a concept are rare in my material (as pointed out previously in regard to elaboration on the meaning of the circle of fifths), but deserve to be highlighted. They are examples of using concepts to talk about other concepts, and as such are the closest things to definitions of central concepts in the lessons. In other words, they are examples of the teacher modeling mediated conceptualization processes. For ease of reading, I will quote the teacher's elaboration here:

This song is in C... (points along the chord sequence) ...major, (points to C again) and then C is tonic and keynote, it can be the same thing, but not always, but eh, it depends on how you say it. [But/A] (points repeatedly at the C) tonic is always, like, the fundamental... chord, what the song is in, that's the key it's- eh the song is in, simply. C in this case. (Teacher, Excerpt 12, turn 103–109)

Firstly, I should reiterate that in context this elaboration is situated as a sub-task in a larger activity where these concepts are used to classify specific tokens (writing down the function of the chords) and where this classification mediates a particular strategy for solving a specific problem. The teacher has already set up the topic of the elaboration by asking the students if they remember “this which was called the tonic” (Excerpt 12, turn 100). As pointed out in the analysis of this episode above, the teacher then models a deduction from the key being C-major to the “tonic or keynote”

being C. This is not the only time the teacher uses some variation of the concepts TONIC and KEYNOTE connected by “or”, thereby creating an implicit equivalence between the two. This equivalence is reinforced by the polysemous—given that he means tonic chord, not tonic note—use of “C” to indicate both. The “or” in this case should not be interpreted as indicating that the two concepts mean the same thing, but that they are functionally equivalent in the problem-solving strategy the teacher is demonstrating. Unlike in other, similar situations, however, the teacher tries to qualify what he means by this implicit equivalence. He starts by saying that tonic and keynote “can be the same thing,” and then expands on this by saying that this is not always the case and that “it depends on how you say it.”

Superficially, this looks like the teacher is trying to say something about the relation between the phenomena tonic and keynote or use the two terms to elaborate on each other’s meaning. But the last part of the statement—that it depends on how you say it—indicates that what he is trying to convey is one or both of:

- The conventional usage of the word “tonic” (*tonika*) namely that it can refer to a note or a chord, and that in the former sense it is synonymous with the term “keynote” (*grundton*).
- The conventional usage of the Swedish term *grundton*, which I have translated as “keynote” (compare Section 1.3), that can refer to either the tonic-note of a key or the root note of a chord, and that it is in the former sense that it is synonymous with the term “tonic” (note).

That is, the statement is not so much about the identity and non-identity of the two concepts TONIC and KEYNOTE, as it is about the distinction between the two concepts TONIC-NOTE and TONIC-CHORD, or about the distinction between the two concepts GRUNDTON (KEYNOTE) and GRUNDTON (ROOT), or about both these distinction between polysemous words at the same time. However, these distinctions are only made by pointing out that the two terms can be synonymous sometimes (i.e. two different words can sometimes have the same meaning), without providing semiotic means to mediate the distinction between the polysemous words

(i.e. to decide when the same word means different but related things and what those differences are). This limits the utility of this statement in differentiating between the different meanings of TONIC and KEYNOTE.

Perhaps in order to clarify this, the teacher moves on to trying to delimit the meaning of the TONIC-concept. Here, the teacher is putting his statement in a clear *X is Y* pattern with “always” conveying that the definition is of a general nature. He proceeds to give two examples of what the tonic is.

Firstly, he uses the Swedish expression “*grund... ackordet*”, approximately “the fundamental... chord”. The first element “*grund-*” is clearly related to the prefix in *grundton* (tonic-note or root), but the teacher substitutes “chord” (*ackord*) for “note” (*ton*). In another lesson (Lesson 2, Group 1), the teacher uses this term twice as a synonym of tonic-chord. I am unaware of whether this use of the term is a conventional one or not, although *grundackord* is sometimes used to mean “chord in root position.”<sup>32</sup> In either case, the use of the *grund-* prefix has connotations of basic, simple, and foundational in Swedish, both in the music domain (e.g. *grundton*—root or tonic-note; *grundläge*—root position) and in other domains (e.g. *grundläggande*—basic, literally foundation-laying; *bakgrund*—background).<sup>33</sup> A plausible interpretation is that the teacher is using these connotations, and especially the connection between *grund-* in *grundackord* and *grundton*—the latter of which

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32 Although I have not delved into the historical development of the usage of the term *grundton* in Swedish (it almost certainly goes back to German usage), there is a certain intuitive connection between the two meanings in that the root fulfills the same kind of function as point of reference in the musical microcosm of the chord, as the tonic-note fulfills in the music as a whole.

33 Compare also the figure/ground-distinction in e.g. Gestalt psychology, *figur/grund* in Swedish as well as in German. Regarding *grund-* in music-terminology, compare also Rameau’s concept *Basse fondamentale* as a precursor of harmonic theories where the root-concept is central, and Swedish *grundton* in the sense of the fundamental frequency or the lowest partial of a tone.



he has just mentioned in relation to the tonic (note)—in an attempt to convey the centrality of the tonic-chord. Here, the teacher is modelling a semiotically mediated conceptualization process connecting the tonic-concept with (a) the chord-concept (i.e. defining TONIC as a kind of chord), and (b) with the connotations of the prefix *grund-* in intra- and extra-musical discourse. This is one of very few times in this material where the teacher is talking about what a concept means without that explanation or definition being reducible to a problem-solving strategy for identifying particular instances of the concept in question. The attempt to distinguish between polysemy and synonymy regarding the terms “tonic” and “*grundton*” above is another example, and one more example will be briefly discussed below.

Note also that the teacher is directly contradicting his previous statement here. Saying that the “tonic is *always*” (emphasis added) a kind of chord contradicts his previous statement that the tonic is sometimes the same thing as the keynote (*grundton*). This is a case where mediation by the same word-label for two distinct (but related) underlying concepts (polysemy) creates problems, in contrast with how polysemy between pitch-class names, chord names, key names and box-names mediate the transition between different concepts, representations, or inscriptions.

Secondly, the teacher says that the tonic is always “what the song is in” (using the Swedish phrase “*går i*” which is almost exclusively used for talk about keys in this context), and he clarifies that he is talking about the key of the song. Here, the teacher is modelling a semiotically mediated conceptualization process relating the TONIC(-CHORD)-concept and the KEY-concept. This connection as expressed by the teacher makes explicit a strategy for how to perform denoting actions. That is, it is an algorithm for how to identify any particular chord (as a chord symbol or chord name) *as* a tonic, given that one knows the name of the key. The strategy relies on the polysemous use of the same words for naming keys and chords, ultimately based in our system for naming pitches. What the teacher is getting at is simply that if you know the name of the key, you also know the name of the tonic. The teacher does not elaborate on why

this is so. Although someone who is conversant with the underlying theory can reconstruct the argument from the teacher's talk—the tonic-note is the keynote of the key, the tonic-chord (which has that note as its root) is the most central chord in the key, and since it is built on the tonic-note using notes from the scale of the key, it has the same name as the key—it is doubtful whether all of the students are able to do the same. What remains is again the logic of polysemy. These kinds of statements are in fact the most common kind of general statements about concepts in this material. Some of the clearest expressions of this function of definition-like statements, as algorithms designed to generate specific instances of the concept in question based on previously known information, is the teacher's recurring way of talking about roots. These statements are also examples of the same reliance on polysemous use of letter-names to name pitch-classes and chords as can be seen above. They are presented here without the surrounding mono-/dialogue:

And the root is the same note as the name of the chord[...] (Teacher, Lesson 2, Group 1)

We'll switch eh root here then, and what was the root? Well, the root is the note... that the chord is called[...] (Teacher, Lesson 2, Group 1)

The root is always what the chord is called (Teacher, Lesson 2, Group 2)

These statements are all made in the context of demonstrating how to calculate which pitches are in a specific major or minor chord by counting 4+3 or 3+4 semitone-steps from the root. Hence, like the other examples, these statements are situated within a problem-solving activity. They are making explicit a general rule for identifying roots which in turn is a subtask in a problem-solving activity aimed at identifying the notes making up a particular chord. In this sense, they are algorithms aimed at solving a very specific task: Generating classifications of specific pitch-classes as roots given certain known information—classification by deduction. But while the rule is made explicit, the relations of generality underlying the applicability of the rule remain implicit. Arguably, the chord C is called “C” because the root of the chord is c, not the other

way around, a state of affairs that these statements obscure. The strategy relies implicitly on the logic of polysemy between words for pitch-classes and chords, which mediates the application of the rule in each specific case.

Another example of definition-like statements of this kind are the rules for identifying subdominants and dominants by their position in relation to a tonic in the circle of fifths, discussed above (see Excerpt 13, Excerpt 15, Excerpt 20, Excerpt 25, and Excerpt 26). Here the concepts *SUBDOMINANT* and *DOMINANT* are in a sense defined, using the concepts *TONIC*, *CIRCLE OF FIFTHS*, and terms for directions as definiens. However, these definition-like statements do not contain genera, and only help us enumerate particular instances of the concepts in question—they are means of generating denoting actions, one might call them rules for deductive classification.

These definition-like statements can be understood as algorithms. One that takes the name of a *KEY* as input and produces the name of the *TONIC* as output, another that takes a chord-symbol as input and produces a *ROOT* name as output, a third that takes a chord symbol (whatever chord that is classified as *TONIC*) as input and produces another chord symbol as output, classified as *SUBDOMINANT* or *DOMINANT* respectively. They make explicit the steps involved in a certain technique for classifying something as a tonic, root, subdominant or dominant. Importantly, this can be done without understanding the underlying reasons why. This is because all the information about what the concepts actually mean—that is, *why* the rules work—is hidden beneath the surface of the operations. The logic of the representation supersedes the logic being represented.

In the case of the *KEY–TONIC* and the *CHORD-name–ROOT-name* algorithms, the logic of the representation is that we happen to be able to use the same sign (e.g. “c”) to refer to a pitch, a chord, and a key in this discourse. The fact that we are able to do that, in turn, represents the logic of a particular system for describing keys and chords—the logic being represented. But when general statements about these concepts are subsumed in a problem-solving strategy

focused on denoting particular chords as tonics, or particular pitches as roots, this underlying logic ends up not being explicitly addressed. The surface features of the representation—that is, the polysemous use of the same signifier—is enough to solve the problem at hand.

Likewise, in the case of the SUBDOMINANT- and DOMINANT-algorithms, the meaning of those concepts is hidden inside the phrase *to the left/right of... in the circle of fifths*, which can be operationalized without an understanding of the diagram's organizing principles. It relies on the surface features of this particular diagram, the logic of the representation. As mentioned above, the circle of fifths can be viewed as an inscription that has the intervallic approach built in, but not directly visible. There is nothing in the surface features of the diagram that tells a user that there are specific intervallic relations between all neighboring symbols. But the underlying logic of the diagram cannot be assumed to automatically transfer to the students' understanding. Even when a genera (here, chord) is added, making the rule more akin to a true definition, a statement such as *the subdominant is the chord to the left of the tonic in the circle of fifths* actually says very little about what SUBDOMINANT means, as long as the student does not already understand the underlying logic of the circle of fifths. This underlying logic is rarely explicitly addressed in the observed lessons.

The common denominator between the rules for classifying SUBDOMINANT, DOMINANT, and ROOT, and the elaboration on TONIC and KEYNOTE in Excerpt 12, is that they are all modeling relations of generality between concepts that apply at a more general level than the specific situated instances which the statements pertain to. That is, the transcendence of specific situated instances is mediated by the concepts used in the rule, definition, or explanation, rather than implicit in repeated patterns of classification and application. Note, however, that the fact that a statement has general applicability does not necessarily entail that it elucidates the systematicity that underlies that general applicability. It appears as though Zimmerman Nilsson's (2009) findings about teacher's treatment of content in this subject from about a decade ago are applicable also in this study: The content is treated as a toolbox, where the teacher instructs the

students in how to use the tools to achieve a correct answer, and different tools are treated as self-contained units.

When surface features are what serve to connect different concepts together, rather different conceptualization processes are supported depending on a learner's previous knowledge: (a) At one level, the person who knows something about what the concepts making up the *definiens* (e.g. TONIC and CIRCLE OF FIFTHS in the examples from Excerpt 12, Excerpt 13, and Excerpt 15) mean, gets a semiotically mediated way of incorporating the *definiendum* into those preexisting relations of generality. At this level, the definition or explanation can mediate conceptualizing action, which can in turn allow the learner to solve problems by means of thinking within the generalizational structure (Vygotsky, 2012) thus created. At another level, (b) these statements are instructions for algorithms that allow someone who does *not* understand the concepts involved to perform operations with them that can solve the same sort of problems as someone who *does* understand the concepts involved. At this level, the statement can work as an algorithm for denoting and problem-solving actions, given certain established premises and available inscriptions.

This means that depending on the previous experience of the learner, different zones of proximal development can be opened up based on the same instruction by the teacher. This is not surprising in itself (the opposite would be surprising), but it highlights a potential weakness in studies of learning conceived of as appropriation of cultural tools and conducted in supposedly naturalistic settings, since these differences cannot be distinguished by the outcome of the learner's problem-solving action(s). The product is the same but the underlying process differs. If this is viewed as an illustration of what sociocultural theorist mean when they say that knowledge is built into cultural tools, it also shows the weaknesses of a view of learning as appropriation of these tools. There seems to be a qualitative difference between *understanding the tool* and *being able to use the tool* that is not apparent in an analysis of mediated action.

## 7.4 THE ABSENCE OF MUSIC

One of the most unexpected findings about the relevant lessons is the absence of music, both actual sounding music and references to sounding music. This stands in sharp contrast to the lessons devoted to rhythm, in which the students composed, notated, and performed short rhythmic compositions. I only have three examples of actual sounding music in the lessons concerned with harmony, transposing, and the circle of fifths. In one case, the music had nothing to do with the content being treated. In another, more relevant example, a student sings the first phrase of *Twinkle Twinkle Little Star* in response to the teacher mentioning fifths. In that case the teacher acknowledges the student's musical comment as appropriate but does not elaborate on it further (see Excerpt 2, turn 36–37). The same student (Joel) offers a musical comment in another lesson, which can be viewed in Excerpt 28. The teacher is in the midst of another transposing demonstration. A circle of fifths and the chord sequence | C | Am | Dm | G7 | is on the whiteboard.

Excerpt 28: Joel musicalizing chord sequence. From Lesson 2 with Group 1.

Participant	Turn	Says	Turn	Does
Teacher	261	[...] But now he wanted to transpose a minor third down to A	262	Walks to the staff-part of the whiteboard, writes "A" below "C" in the chord sequence
Joel	263	[singing the bass-line of Stand by me:] a, a, a-a-a, a, a, a-a-a, a	264	drumming with his pen against the table
Teacher			265	walks back to the circle of fifths while silencing Joel with a gesture
	266	and then we have a little bit of a different box to start from		

While the teacher is introducing the transposing problem (turn 261), Joel starts drumming with his pen and singing the bass-line of *Stand by Me* (turn 263–264). The teacher silences him with a hand gesture in the next turn (265), and resumes his demonstration (turn 266), which positions the musical comment as an interruption. This is worth highlighting because it is one of very few times where the

material the participants are working with is translated into sounding music. The bass-line fits well with the first two chords (which is about as far as Joel gets before being silenced by the teacher in turn 265) of the chord sequence on the whiteboard, and it fits reasonably well with the whole chord sequence (*Stand by Me* has IV instead of ii). The episode also indicates that at least one student (Joel) has the ability to relate the chord sequence they are working on to previous musical experiences. Since this bass-line is so iconic and well known, it is a plausible assumption that other students can pick up this way of making sense of the chord sequence from Joel.

This is all to say that while sounding music does occur in the relevant observed lessons, it does not occur as a pedagogical choice by the teacher, and that even when the music is somewhat relevant to the task at hand, this relevance remains unutilized. It is difficult to say why this is, but a contributing factor could be that all except one of the relevant observed lessons were conducted in Classroom 1, where there is no piano or other musical instrument close to the teacher's usual position in front of the whiteboard (compare Figure 5).

This absence of tools close at hand should not, however, affect the teacher's ability to refer to (presumably) shared experiences of sounding music outside the lesson context, and therefore cannot explain why this too is rare in the relevant observed lessons. I have already highlighted how the teacher seems to be referring back to a previous lesson in which they transcribed songs and used boxes in the circle of fifths in Excerpt 14, turn 164. The lesson the teacher refers to was not observed by me, but it seems reasonable to assume that it involved listening to the songs in question. If that is the case, the students (who were present) might have been able to connect the BOX-concept to a concrete experience of what music based on closely related chords (inside the box, so to speak) can sound like.

An aspect of the lack of musical examples, whether they are in the form of sounding music in the classroom or of references to music not present in the moment, is that there is almost no talk about what the phenomena denoted by concepts such as TONIC, SUBDOMINANT, DOMINANT, and KEY actually sound like. The

only exceptions I have been able to find in the observed lessons come from Lesson 4 with Group 2 (the teacher talking about the “dominant color” of a chord, which occurs in Excerpt 20, turn 298), and Lesson 3 with Group 2. The latter lesson was not video-recorded because of equipment failure, so the only available documentation is my field notes and the extended notes I took based on memory once I realized that the camera had not worked. Hence, this episode is also a lesson in why absence of evidence is not evidence of absence. Had I not thought to record the exchange below in my notes, I might not have remembered it, and would have concluded that there was even less talk about how these concepts sound in the observed lessons.

Lesson 3 with group 2 was mainly focused on triads and tetrad, and in relation to the latter the question of how chords with major and minor sevenths sound came up. I have recorded this exchange in my field notes (translated from Swedish):

What does C $\Delta$  sound like?

Student: Ending

What does C7 sound like

Student: and here comes the next chord

[The teacher] develops

C $\Delta$  works as T & S

C7 has a more dominant character. (Field notes, 2017-04-24)

This brief episode is primarily directed toward explicating the difference between major chords with major and minor sevenths. But it does this by connecting the concepts TONIC, SUBDOMINANT, and DOMINANT(ic) with chord-names, and via these chord names to semiotically mediated descriptions of the phenomenal character of the sound of the chords—their function in a very literal sense—in an implicit musical context. While these semiotically mediated descriptions of chord-functions are necessarily over-simplifications,



they are precisely the kinds of semiotic means which might be used to mediate learners' conscious awareness toward their experience of music (compare the quote from Cecilia, p. 188 above, where *c* sounding like an ending was given as a reason for assuming the key was C-major). By doing that they also provide a semiotic structure for that experience in such a way that it might be incorporated (by the teacher's "development" in my notes) into the conceptualization process for a concept such as TONIC. In other words, this is an example of how everyday concepts and scientific concepts interact in development. As Vygotsky put it:

In working its slow way upward, an everyday concept clears a path for the scientific concept and its downward development. It creates a series of structures necessary for the evolution of a concept's more primitive, elementary aspects, which give it body and vitality. Scientific concepts, in turn, supply structures for the upward development of the child's spontaneous concepts toward consciousness and deliberate use. (Vygotsky, 2012, p. 205)

Everyday conceptualizations such as "ending" and "here comes the next chord" generalize over concrete situated experiences of chords in their musical context, and they can thus mediate between scientific concepts and such experiences. Scientific concepts (here, the chord-names and the function-terms) provide the generalizational structure within which these distinctions become more than isolated experiences and can be used deliberately in (for example) directing attention toward regularities in musical structure (or conventions).

In addition to this episode, some of the interviews provide indirect evidence that there has been talk about how the concepts sound (especially TONIC (chord)) in lessons before the commencement of this study. For example, in Lena's first interview, she says that "I think it's something about that you- you always want to go back... to- you always want to go back to the tonic." Prefacing the statement that you always want to go back to the tonic with "I think it was something about that..." indicates that this is not her own reasoning, but that she is repeating something she has been told previously, likely in a lesson.

In summation, while there is indirect evidence of sounding music being deliberately used in lessons pertaining to the topic of this thesis, and of talk about how the phenomena that the focused concepts denote sound, there is very little direct evidence of how these things are handled by the teacher or the students in the classroom. The only direct evidence of how this could happen is the episode from Lesson 3 with Group 2, where the sound of major seventh and minor seventh chords is discussed in terms of TONIC, SUBDOMINANT, and DOMINANT, and a less clear example in Lesson 4 with Group 2 where the “dominant color” of a seventh chord is used to justify a key-judgement (see Excerpt 20). The fact remains, though, that these two episodes are exceptions, and that the rest of the relevant lessons are dominated by a treatment of the circle of fifths and its associated concepts that is removed from the sounding qualities of the phenomena in question.

## 8. Discussion

In this chapter, I will first discuss some methodological points, and how they apply to the conclusions drawn from this study. I will then discuss the results, organized in three sections roughly corresponding to Research Question 1 (Section 8.2), Research Question 2 (Section 8.3), and the research problem (Section 8.4). Based on this discussion, I will draw out some implications for practice (Section 8.5) and for further research (Section 8.6).

### 8.1 METHODOLOGICAL REFLECTIONS

It appears to be customary to put a methodological discussion towards the end of one's discussion chapter. Here, I have chosen to put it at the beginning instead. I do this because I think the conclusions this research project has led to should be read in the light of the study's strengths and weaknesses, but also because I think that my methodological assumptions have consequences for how I frame and spell out those conclusions. Before going into the nitty gritty of my methodological choices, I want to expand a bit on the second point.

Approaching analysis abductively implies generalization to theory rather than attempting to generalize patterns in a sample to patterns in a population. Thus, I cannot claim to be able to say

something about whether the educational practices and learning trajectories documented in this thesis are representative of aural skills and music theory education, or even aural skills and music theory education in Swedish upper secondary schools. But taking the notion of generalizing to theory seriously also means adopting a different approach from much inductively based qualitative research, which often avoids making generalizing claims and argues that its results are valid only in the studied context. In this chapter, I want to at least *attempt* to strike a balance between, on the one hand, overgeneralizing based on conditions which may be particular to the context, participants, or methods of this study, and, on the other hand, hedging my bets by claiming that my results are only valid for the context in which they originated.

Although I believe striking such a balance is important, I also believe that while the former problem would be the most likely to draw critique against this thesis, the latter problem is the greater one for the fields to which I seek to contribute (qualitative research in music education, arts education, and education). If we keep hedging our bets—and take that hedging seriously, not just as performative handwaving to escape critique—we ultimately undermine both the conditions for a cumulative growth of knowledge (or shrinkage of ignorance, if you prefer) and the conditions for applications of our research in the practices we study (which, in turn, affects the conditions for further growth of knowledge for a practice-oriented field). Therefore, while I have tried to strike a balance, I have also tried to make sure that if I err, I err on the side of making strong claims.

This is because strong claims are easier to critique, and easier to build on, test, and develop in both further research and practice. Hopefully, I have managed to make my theoretical and methodological assumptions, my methods, my presentation of data, and my mode of analysis clear enough that the basis of any overly strong claims can be scrutinized and critiqued. And hopefully, I will manage to make claims that are both strong and theoretical, so that they can be challenged and developed in further research.

## 8.1.1 Main Limitations of the Study

In this section, I will discuss aspects of the study which I think should be kept in mind when evaluating my conclusions. I have selected these particular issues because I believe they are the ones that place the most severe limitations on the strength of my conclusions. I will also consider some alternative design choices, partly in order to clarify how the choices I actually made influenced the results, and partly as suggestions for other researchers who may want to use a similar design. In addition to what I write here, I want to encourage the reader to refer to Section 5.2.1, where I discuss practical ethical challenges encountered during the course of the study, and Section 6.4.1, where I discuss limitations of the lesson-material.

If a study should be designed to address the research problem and answer the research questions, it should be correspondingly important to highlight how these have changed over time. In this study, not all design-choices were made with the present formulation of problem and questions in mind (as described throughout Chapter 6). On the other hand, one of the strengths of qualitative research is its lack of predefined variables, which creates opportunities to follow unexpected leads. If I had stuck to my research problem and questions as I first formulated them, and had not decided to refocus my investigation on the circle of fifths, I believe that I would have been able to make sense of very little of my material. I simply needed to understand the function of the circle of fifths in these educational practices and learning-processes in order to understand the rest. Naturally, this means that some design choices made early on in the study become less important than expected, or come to play a different part than originally intended.

Still, it is possible that these changes over the course of the study could lead to problems in relation to my methodological approach, especially regarding the interviews. By this, I am referring to my decision to think of the interviews in somewhat experimental terms, for example by formulating tasks that I believed—on the grounds of theory, previous research, professional experience, and experience in the studied context—would provoke revealing

responses. This may very well have limited the utility of the material generated through (especially) the first round of interviews, which represents a lost opportunity.

Related to this issue is my choice to make one participant (Lena) central to the analysis of the interview-material. While this choice was motivated by the productive material generated from both her interviews, part of what made the choice sustainable even after the change of focus to the circle of fifths was that Lena's first interview also happened to revolve around the diagram to an unusual degree (it came up in several interviews in the first round, but was not elaborated upon to the same extent).

The choice to foreground Lena's case in the presentation of my results was, as pointed out in Section 6.7.1, based on this case being central to the generation of many of my interpretations. This choice has upsides and downsides. I would claim as upsides that being clear about where many of my interpretations originated makes the process of analysis and interpretation of the whole material more open to scrutiny, and that the relatively rich presentation of Lena's case makes it easier to critique my interpretation of her case in particular. Although I have tried to show how Lena's case compares to other student cases, the presentation of the results will often exclude interesting interpretations of Lena's case that did not bear fruit in the interpretation of other student cases or the lesson material. This is a downside of my choice, because it means that the reader will have less insight into other student cases, and therefore is less able to scrutinize how correct my comparisons are, as well as the quality of my analysis of the remaining student cases.

The documentation and analysis of the lessons suffer from similar issues, but perhaps less due to the specific research questions and more due to assumptions about what and how do document. I have discussed some of these issues in Section 6.4.1, and will not rehash that discussion here. I do, however, want to raise another point. Had I, at the outset, known the importance I would later ascribe to inscriptions, a different camera setup would have been useful. For example, a camera directly above the table around which the students sit in Classroom 1 (see Figure 5) would have been

interesting, since it might have made it possible to follow how the students developed their own notes and relate them to the teacher's writing on the whiteboard, rather than just documenting them after the fact. This is a reason that the students' notes play a relatively limited part in the analysis, they were only documented as finished products rather than in their process of becoming.

The equipment failure during one observed lesson (Lesson 3 with Group 2, see Table 3) revealed problematic aspects of how the presence of recording equipment affected what I found relevant to record in notes. Because of this equipment failure, I ended up not having a recording of the lesson, and once I had discovered this, I had to attempt to reconstruct it as well as I could, based on my notes and memory. I quickly discovered that I had failed to write down important information, because I was relying on that information to be captured by the video camera.

While the loss of the fine-grained details of this particular lesson was tragic (it was a very interesting lesson), that loss in itself does not present a threat to the integrity of the research project as a whole. The incident does however point to the wider issue of how relying on recording equipment affects not only what I find worthy of recording in notes, but also my attention as an observer. In this particular case, the lack of a recording made it very clear what I had missed, but might it be equally likely that I have failed to pay attention to and record things in lessons where the video camera worked flawlessly? In those cases, because the camera creates the illusion of capturing reality faithfully, it will be much more difficult to tell.

Lapses such as these, combined with the general format of the lessons selected for analysis, contributes to the teacher and his actions in the classroom becoming the main focus of the lesson analyses. While the dominance of the lecture-format in lessons pertaining to the circle of fifths, harmony, and transposing is an interesting finding about the studied educational practice, and while I have tried to select excerpts containing some dialogue between the teacher and students, this limits my ability to analyze students' learning in the lessons. Using terms borrowed from varia-

tion theory, I could say that the observed lessons mainly give access to the *enacted object of learning* while the *lived object of learning* is mostly accessible through the interviews (cf. Ling & Marton, 2012; Marton & Booth, 1997).

Having better data regarding how students work with the circle of fifths in the lessons could have given me firmer ground to stand on regarding the answer to Research Question 2, on how students' processes of learning are facilitated by patterns of use in the educational practice. Likewise, if I had anticipated the importance of how the teacher conducted the lessons, I could have developed a design which involved him to a greater extent so as to get more insight into his pedagogical choices. This would probably have aided in the analysis of some choices that appear difficult to explain, and may also have had ethical benefits.

#### 8.1.2 Methodological Development

In this project, I have experimented with what I have called interviews *in* music (as outlined in Section 5.1.6 and Section 6.3.1). This aspect of the interviews has come to play a lesser part in the analysis than anticipated, largely due to the shift in focus from the KEY- and TONIC-concepts to the circle of fifths. I still believe that a brief evaluation of this method would be of interest, especially to anyone in the music education research community who would like to adopt something similar in their own research. Having now conducted ten interviews where a large part of each was organized as a joint music-making activity, I can point to some possible refinements of the method.

I have learned that adapting the difficulty of the task to the kind of data one wants to produce is important. In the interviews as conducted, I let the participants choose between composing a melody from scratch or starting from a pre-prepared (ambiguous) melody. Both produced interesting results, but the latter did so more consistently. When the participants composed their melodies from scratch, many of the phenomena I was interested in remained hidden. Because the task was solvable by means of internalized,



more or less automatic strategies, I could mostly access the finished product, not the process of arriving at it. When these participants faced more difficult challenges, necessitating some kind of externalized problem-solving, the resulting data also proved more useful. For example, Joakim, who composed his melody from scratch, still faced a problem in setting chords to it, which resulted in the analysis of Excerpt 23 and Excerpt 24. The problem is that giving up control over the difficulty of the task also means giving up control over what problems the participant will face and hence, what kinds of questions one's data is pertinent to. Having some control over this is a major reason for electing to do interviews instead of, for example, simply observing someone working on a composition.

Similarly, the one interview with a participant who did not use an external musical instrument, but instead relied on her voice while composing the melody, yielded much less information about how she arrived at her solution. This is partly because (at least to a participant at this level of musical skill) using the voice is simply *too* intuitive. Compare, again, with Joakim, who claims he “knows” what chord to play (i.e. he has an intuition). In order to find this chord on his guitar, however, he must go through a sequence of first whistling, then finding the whistled note on the guitar, and finally testing a number of chords containing that note. Not using an external musical instrument also makes it more difficult to *talk* about the musical activity, both during and after. This is because unlike with the external instruments used, the voice has no inscriptional aspect that helps us denote individual pitches, identify intervals (other than by ear), and so on. This tended to lead to the conversation revolving around larger units of music, e.g. phrases, that had to be referred to by singing or playing them.

Thus, I would recommend considering not just how the musical activity “asks” the kids of questions one is interested in investigating, but also how it can be structured to elicit responses that can be analyzed. This requires both adapting the difficulty of the activity in a way that challenges the participants standard ways of solving similar problems, and considering which mediational means to introduce (for example instruments, but I can also imagine quite

different results if I had initiated writing down the compositions in some way or other). In considering these questions, I believe it can be useful to think of the interview in somewhat experimental terms by drawing on microgenetic methodology (especially as outlined by Wagoner, 2009). The idea of introducing ambiguity and documenting the process of resolving it has shown itself to be fruitful. But I would also encourage anyone who wishes to draw on this method in their own research to consider Wagoner's (2009) analysis of the introduction (and use) of mediational means in microgenetic experiments. This is something I wish I had paid more attention to myself in designing the musical activities in this study, and I will briefly turn to an aspect of that now.

Analyzing the video-recordings of the composing activities, I have regretted that I only had one camera angle to work with. As I pointed out above regarding one participant who worked with her voice, using an external musical instrument whose inscriptional aspect creates better conditions to talk about the music both during and after the musical activity. But I have also noted in my analyses that the participants frequently appear to use the inscriptional aspect of their instruments in their problem-solving (see e.g. the analysis of Excerpt 23 and Excerpt 24). These analyses would have been helped by a second camera focused on the keyboard of the piano (ideally from above), or the fretboard of the guitar or bass, to capture the participants' tactile interactions with their instruments, and perhaps also a camera focused on their faces, to better track gaze-direction.

## 8.2 INTRODUCING, REPRODUCING, AND USING THE CIRCLE OF FIFTHS IN AN EDUCATIONAL PRACTICE

The first research question concerned how participants introduce, reproduce, and use the circle of fifths in the educational practice. Although there are a few exceptions, it is possible to claim that the circle of fifths is primarily constructed as a tool for solving a particular kind of transposing problem, and as something to be remembered so that it can be reproduced and deployed thusly. It is not primarily constructed as something to be understood or as a

means of explanation. This result is in line with Zimmerman Nilsson's study of the aural skills and music theory subject in Swedish upper secondary school, conducted more than a decade ago. As she puts it, "the content gets the character of a toolbox where the teacher instructs the students on how to use the tool so that a 'correct' answer is produced" (Zimmerman Nilsson, 2009, p. 118, my translation from Swedish).<sup>34</sup>

In use, the symbols in the circle of fifths are treated as standing for chords, and boxes (circumscribing a group of six adjacent major- and minor-chords) as roughly equivalent of keys. The teacher's explanations of what the circle of fifths means or represents, however, the individual symbols (C, Am, G, Em, etc.) are constructed as standing for keys, and the diagram as a representation of relationships between keys, organized in a flat-side and a sharp-side. In relation to the three challenges involved in learning to interpret graphs (identified in Section 2.6), it is possible that this could lead to difficulties in the intersection of (a) learning the basic visual grammar of the diagram (cf. Leinhardt et al., 1990) and (c) learning what the elements of the diagram represent (cf. Glazer, 2011; Leinhardt et al., 1990; Shah & Hoeffner, 2001). The structure of the diagram, when explicitly addressed, is expressed through keys and number of accidentals, while the elements of the diagram are identified as chords and functions in practice. The main similarities between these different ways of mediating the diagram are the construction of visuospatial relations as signs for interval-concepts (PERFECT) FIFTH and (MINOR) THIRD, which often end up in the background in comparison with mnemonic strategies for reconstructing the order of symbols.

Being able to reproduce the circle of fifths from memory was highly valued in this educational practice. Reproduction of the circle of fifths-inscription was mainly facilitated by mnemonic techniques, many of which had little to do with the meaning of

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34 Original quote: "Innehållet får funktionen av att vara en verktyglåda där läraren instruerar eleverna att använda verktyget på ett sådant sätt att ett 'korrekt' svar levereras."

the diagram. The focus on being able to reproduce the circle of fifths from memory, together with the lack of concern for the mnemonic devices' relation to the diagram's place in a larger conceptual structure, is also indicative of the purpose of the circle of fifths in this educational practice. The reason why one is expected to be able to reproduce the circle of fifths from memory is so that it can be deployed as a tool in solving a particular kind of transposing problem in a practice where bringing an inscription with you is not an option. The goal appears to be to make the circle of fifths *portable* in a form that is allowed in situations where ready-made inscriptions (e.g. on paper or readily accessible through a smartphone) are frowned upon—most likely testing situations in educational contexts, including but not limited to the present one. In other words, to the extent that the means of remembering the circle of fifths do not contribute to explicating the meaning of the diagram, the focus on being able to reproduce it appears to be a solution to a problem that is quite particular to educational testing-practices.

Implicit in this practice is the notion that the relevant difference between knowing and not knowing is whether information is carried around in the head or as an inscription. I would argue that this difference might be necessary, but not sufficient. Being able to reproduce the circle of fifths using mnemonic sentences and Martin's technique is more akin to carrying around a laminated circle of fifths-inscription in one's wallet, having it tattooed on one's forearm, or being able to search for "circle of fifths" on the internet, in the sense that they all result in having a circle of fifths-inscription at hand, but say very little about what the diagram represents. But say that instead of by a mnemonic sentence, one would remember the circle of fifths by having learned that there is a perfect fifth between consecutive positions? There seems to be a qualitative difference here, in that the latter says something about what being adjacent on the circle of fifths means (given that one knows, or can find out, what a perfect fifth is). Hence, a distinction between knowing and not knowing the circle of fifths may want to take into account whether it is integrated into a structure that is both meaningful

and relevant to what the circle of fifths is supposed to represent. I will return to this issue below.

The way in which the circle of fifths is used as a transposing tool in the educational practice can be understood as an algorithm—a set of rules for manipulating symbols that take one string of chord-symbols as input and produces another string of chord-symbols as output. In some ways, this algorithm is comparable to those used by children to add and subtract time to a clock (e.g.  $x:50+30$  minutes, compare Section 2.6), documented by Friedman and Laycock (1989). Firstly, because of the possibility to count steps or five minute intervals to solve the problems, and secondly, because the  $x:50+30$  and  $x:23-30$  problems could require an extra step (to account for change in hour), roughly analogous to how crossing the boundary between the sharp- and flat-side of the circle of fifths requires an extra step to avoid enharmonic equivalents.

At its core, the transposing algorithm can be reduced to (re) creating the same a pattern of chords in relation to two different reference points in the circle of fifths. In the absence of musical examples, without the option of making aural judgements of sameness, the circle of fifths-inscription becomes the primary way of demonstrating what it means to say that transposing produces the *same* chord sequence in a *different* key. In other words, the algorithm can be understood as way of establishing an adequation between two, on the face of it, different chord-sequence inscriptions.

The circle of fifths seems intended to work as a common representation of pitch-, chord-, or key-relationships accessible to the whole student group. It can be reproduced through mnemonic devices requiring little to no use of music-theoretical concepts, and it can be deployed in problem-solving without requiring much understanding of why it works. Again, this can be understood as teaching to the test, by making sure that the students can perform a transposing task without necessarily having a good understanding of the underlying principles. But ideally, this kind of performance without competence could also work as a way of bootstrapping conceptual understanding.

It is important to point out that the particular way in which the teacher organizes the transposing procedure—using concepts like *KEY*, *BOX*, *TONIC*, etc., to establish adequations between inscriptions and scaffold the problem-solving process—is not strictly necessary for the central algorithm to work. The algorithm does not require that the reference points in the circle of fifths be the tonics of the original and target keys, it simply requires two reference points, any reference points, at a particular intervallic distance from each other.<sup>35</sup> Hence, the teacher framing the task as changing the *KEY*, and his use of the *TONIC* as reference point, makes sense of transposing (as visualized by the circle of fifths inscription) in specifically tonal terms. Concepts like *KEY*, *BOX*, *TONIC*, and other function terminology can be understood as a tonal interface for a tonality-agnostic software. They mediate a particular way of using the algorithm, and make sense of its output in a particular way.

This could be read as a strong critique of the teacher who volunteered for this study, but that is not my intention. I believe that any teachers' practice (certainly including my own), when scrutinized this closely over a limited period of time, could be shown to contain similar lapses. Most likely, teachers who directed all their efforts toward painstakingly planning out their every word and gesture in order to avoid any such mistakes would be spectacularly ineffective. After all, closely scrutinizing researchers are not the intended audience for teachers' actions in the classroom, students are. The teacher's goal with his lessons is not, and should not be, to look good for the duration of this study. He has more long-term goals for what he wants his students to learn across their time in upper secondary school.

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35 For example, if we are to transpose the chord sequence C F G C a minor third up, we can simply: (1) Pick two reference points in the circle of fifths that are a minor third apart, say B and D. (2) Check how many steps clockwise or counter-clockwise C is from B (that's seven and five respectively). (3) Check which chord is an equal number of steps from D (that's E-flat). (4) Repeat steps 2 and 3 for the rest of the chord sequence.

The focus on reproduction and application can be understood as a way of teaching to the test, but also as way for the teacher to implicitly reinforce a structural understanding of chord relationships. There are two different ways of thinking about transposing visible in the material: (1) Moving all chords the same interval up or down, or (2) recreating the same pattern of chords in relation to a new reference point. The circle of fifths is deployed as a visualization of, and means of achieving, the latter in the lessons, although this distinction is not made explicit. This pedagogical choice also makes sense given the group of students the teacher is working with. As becomes evident in the interviews, the teacher cannot assume that all students can calculate what pitch is some arbitrary interval from another given pitch. Nor can he assume that all students are sufficiently conversant with means which could be used to facilitate such an operation, for example music notation or a musical instrument with an inscriptional aspect (several are primarily singers).

Many of the analyses in the preceding chapter that could be read as critiques of the teacher's pedagogical choices, appear that way under the assumption that the goal is to teach the students what the circle of fifths represents, or what the concepts he uses in conjunction with the circle of fifths mean. Although I will admit that I believe this is an important part of teaching music theory, it should not be taken for granted that this is the teacher's primary goal. Instead, many of the teacher's choices could be understood as stemming from an ambition to help the students orient themselves in a system of signs rather than in a system of concepts. This is a possible explanation for why, as I have pointed out repeatedly above, the logic of the representation tends to supersede the logic being represented in these lessons. When I say that the logic of the representation supersedes the logic being represented, I am claiming that what mediates many of the activities in these lessons are not necessarily conceptual relations of generality, but surface features of representations and/or their constituent signifiers.

In some cases, these surface features map onto relations of generality in the conceptual system being represented, as when the sign "C" (or more commonly the spoken sound [sē]) is used inter-

changeably for the pitch(-class), the major chord, and the major key. This polysemy allows the participants to solve problems such as figuring out the root of a C-major chord, or figuring out the tonic of the key C-major, without having to engage much with what the concepts “root” or “tonic” mean. Both problems can be solved simply by remembering one can apply the same signifier to both a chord and its root, or to both a key and its tonic. While this approach works, and might implicitly convey some of the conceptual content, it is important to remember that the regularities in the form of the signifiers map onto only one aspect of the relations of generality in the conceptual system. In particular, the former do not preserve the hierarchical structure of the latter. For example, the fact that we can refer to both the chord C and the pitch-class c by making the sound [sē], does not convey that we call the chord C because its root is called c, rather than the other way around.

In other cases, it is less obvious how surface features relate to conceptual relations of generality. This becomes especially clear when special techniques need to be applied in order to compensate for how surface features of representations and signs do not capture relevant relations of generality for the task at hand. The clearest examples of this in my material are techniques that involve jumping up from G-flat or F-sharp to C in the circle of fifths in order to avoid that more basic techniques, which would cross the border between the sharp- and flat-side of the diagram, result in enharmonic equivalents. This approach is used both in the generation of the diagram (Martin’s extended technique, cf. Figure 12) and when transposing to G-flat or F-sharp major (see Excerpt 16 and analysis thereof).

These techniques compensate for a failing of the diagram in the form it is used in this educational practice, namely that it only marks out enharmonic equivalents for the keys/chords at the bottommost position. That is, the surface features of the diagram do not capture this particular relation of generality (enharmonic equivalence) to the extent required to solve these particular problems. But it would not be necessary for the diagram to do so if its use was mediated by conceptual relations of generality rather than rules operating on



surface features of the circle of fifths inscription. It is possible to imagine a situation where the whole jumping-up operation would be unnecessary, because the students would know to read, for example, B as C<sup>b</sup> when they were transposing to G-flat major. In fact, this is precisely what they are expected to do when problem-solving techniques for similar problems are mediated by the inscription of a piano keyboard, where black keys are read as flat or sharp pitches depending on tonal context.

### 8.3 HOW DOES THIS FACILITATE LEARNING PROCESSES?

The second research question asked how the specific ways in which the circle of fifths is introduced, reproduced and used in the lessons facilitate learning-processes. I have argued above that the educational practice contains tensions between problem-solving strategies based on surface features of the signs involved, and the ways in which these strategies are sometimes couched in terms of tonality-related concepts. The gaps between the tonal-conceptual interface and the tonality-agnostic core of the strategy start to show when students attempt to make sense of the concepts and the circle of fifths by reasoning from these premises and applying this problem-solving strategy outside the bounds of the particular kind of problem that it is demonstrated on.

Joel's attempt at transposing in a minor key demonstrates that it is possible to get a correct answer while simultaneously misapplying the conceptual apparatus of tonality (Joel's solution is almost correct, but the incorrectly transposed chords were not incorrect due to his application of concepts). Janna's question about how to decide whether the chord sequence is in major or minor reveals that the BOX-concept, which forms the bridge between visualizing spatial relations between chords in the circle of fifths and the KEY-concept, cannot support that distinction. Lena's use of the boxing-operation in her first interview highlights that this is because unlike the KEY-concept, the BOX-concept is exclusively concerned with chords. Janna's question in particular also highlights the circularity of the system as a whole. While tonal concepts are used to make sense

of operations with the circle of fifths, operations with the circle of fifths are used define and illustrate those very concepts. It is really only TONIC that gets explicated in terms not directly related to the circle of fifths in the observed lessons.

This kind of circularity may be inevitable given the spectrum of previous knowledge in the class. The teacher is faced with bootstrapping a music-theoretical conceptual and symbolic system from a disparate set of antecedents, very few of which are shared by the full group. He needs a way to represent tonality and harmony that can accommodate students with different levels of previous understanding, and the circle of fifths is probably as good a choice as any. The circularity that becomes evident in the study could be understood simply as a result of this attempt to bootstrap the whole conceptual system from a foundation of very little shared language. This makes hierarchical integration of concepts difficult to achieve, since all definitions will, necessarily, be fragmentary and mutually interdependent.

What remains to do in that case is to make sense of the concepts by application rather than definition or explanation. This is, as demonstrated in the previous chapter, exactly what was done in this educational practice. The circle of fifths and a conceptual apparatus of tonality was deployed in problem solving, again and again. The materials on which these problem-solving techniques operated, however, were not musical materials but strings of symbols representing musical phenomena. Throughout the observed lessons, this absence of sounding music was particular to the lessons involving harmony, transposing and the circle of fifths.

Unsurprisingly, avoiding musical examples in the classroom limits the teacher's opportunities to guide the students' use of everyday language to generalize over musical experiences. In other words, the absence of music in the classroom skirts one of the main strengths of everyday conceptualization, which could be especially problematic when many of the central concepts of tonality, including the relations represented in the circle of fifths, ultimately refer to concrete, situated experiences. This is a second reason for the apparent circularity in this educational practice. Although there

are everyday conceptualization processes going on, their content is symbol manipulation rather than the phenomena the symbols (ideally would) refer to. It is everyday conceptualization once removed. That makes it difficult to break out of circular networks of meaning, since there is no easy way to stop and say *but listen to what it sounds like!*

Since there are almost no examples of sounding music in the lessons on the circle of fifths, I have to turn to the interviews to gain an understanding of if and how the students relate the circle of fifths with concrete musical experiences. As I have argued above, in the lessons the circle of fifths is primarily made sense of as a transposing tool by deploying it in solving transposing problems. The problem-context, as well as the process and outcome of the problem-solving strategy are in turn made sense of in terms of concepts of tonality, most notably KEY, TONIC, and other FUNCTION-concepts (and also the BOX-concept, which may be a local concept). Hence, it is of interest to consider not only students' use of the circle of fifths in the interviews, but also their use of these related tonality-concepts.

In the analysis, Lena's case emerged as a focal point for attempting to answer Research Question 2. I view Lena as the participant who is most in the midst of appropriating the circle of fifths. Of the students who participated in both interview rounds, Cecilia and Joel appear to have come further toward making the circle of fifths their own. Joakim tends to rely on other semiotic means in talking about and solving musical problems, as does Monica, who finds the circle of fifths mostly unnecessary. Tobias positions himself as someone who is bad at the circle of fifths, and although he is mostly just unable to reproduce it from memory, this positioning means that he does not turn to it as his preferred means of explanation in the way that Lena does. The circle of fifths appears to be wholly unfamiliar to Fredrik, except as something that he has seen during lessons. Lena, on the other hand, frequently turns to the circle of fifths in order to explain music-theoretical concepts or musical phenomena, she can reproduce it and use it, but still relies on overt semiotic means introduced in the lessons to do so. This all means

that in Lena's case, it is possible to observe what happens when the use-case for the circle of fifths, as demonstrated during the lessons, is faced with a slightly extended problem-context.

What I wish to highlight about Lena's case here is how the circularity and disconnect from aural judgement discussed above carries over to the interview context, and how this is related to her reliance on the techniques used in the lessons. Although Lena's composition and composing process demonstrates that she can co-construct tonality in conventional ways in musical practice, her account of her harmonizing process is quite divorced from aural considerations. In her verbal account she picks a tonic (the choice standing between C and G) based on the boxing-operation and the circle of fifths. Importantly, this selection of a tonic is presented as taking place when she is harmonizing the melody. In other words, TONIC is understood as an exclusively harmonic concept, with no connection to the KEY-concept. The tonic is simply the chord that ends up in the middle when one circumscribes a group of chords (making a BOX) in the circle of fifths. In this conceptual system, there is no way of conceptualizing the idea that we already "picked" the tonic when we composed the melody—or perhaps that I made the decision when I prepared the beginning beforehand—because TONIC is a function of BOX, not of KEY.

The disconnect between the TONIC- and KEY-concepts insulates the circle of fifths, and the understanding of harmonic relations and tonality that is enacted with it during the lessons, from musical experience. Precisely *because* Lena is so good at deploying the circle of fifths, its associated concepts, rules and algorithms as used in the lessons, their fundamental circularity is preserved.

#### 8.4 STUDENTS' PROCESSES OF LEARNING MUSIC-THEORETICAL CONCEPTS AND MODELS IN SPECIFIC EDUCATIONAL PRACTICES

In my development of my research problem and research questions, I have stressed an understanding of the study as grounded in cases on different levels. The lessons at the particular school where the

study was conducted are understood as a case of aural skills and music theory education at the upper secondary level. Aural skills and music theory education at the secondary level is understood as a case of secondary music education focusing on models and concepts of music. The circle of fifths and the concepts associated with it are understood as cases of music-theoretical models and concepts. The particular students interviewed are understood as cases of students learning such content in such educational practices and contexts.

While there is an aspect of theoretical generalization in any analysis that applies theoretical concepts to specific cases (as Vygotsky, 2012, points out, every concept is a generalization), theoretical generalization comes to the fore in considering how the particulars of the cases studied in this thesis relate to conclusions about that which they are taken to be cases of. In this section, I will attempt to consider what my results about this particular educational context, these particular participants, and the circle of fifths say about students' learning of, about, and with music theoretical models and concepts in relation to educational practices.

#### 8.4.1 What Happens When Both Music and Definitions Are Scarce?

I have described the educational practice as one where mediated remembering and application in abstract problem-solving are prioritized, and where definitions, explanations, and musical examples are rare. In a sense, these lessons provide an extreme example of the kind of mediated conceptualization processes which distinguish scientific concepts, in that they display the verbalism Vygotsky (2012) saw as distinguishing characteristics of the beginning of a scientific concept's developmental trajectory. The circle of fifths is made sense of as an inscription used in transposing. In the process of demonstrating transposing exercises, signs in the circle of fifths—including both chord/key-symbols and meaningful spatial relations—are adequated with function symbols, which are adequated with chord symbols. These chord symbols, set up in different sequences, are taken to represent sounding music, which is itself

almost completely absent from the lessons. That is a long chain of mediation between the circle of fifths and the musical phenomena it supposedly represents. And there is no guarantee that all students can make musical sense of the chord sequences.

On the other hand, there is also an absence of concepts being explicated or defined in the way that Vygotsky (2012) saw as central to scientific conceptualization. Most of the definition-like statements can be reduced to algorithms for denoting something as a case of a particular concept—rules for deductive classifications—couched as subtasks in a problem-solving strategy. These statements rarely touch on *why* they work, but rather rely on the surface level of the signs and representations they deal with. The problems students face when trying to apply these techniques and concepts outside the narrow problem-context in which they are taught (transposing short chord sequences in major keys) indicate that these surface level relations of generality make the concepts less transferrable.

Taking a step back and looking at the treatment of the circle of fifths, and the central concepts KEY, TONIC (note/chord), SUBDOMINANT, DOMINANT, and RELATIVE in the relevant observed lessons, a picture emerges where:

- The concepts are largely elaborated based on the circle of fifths, either in explicit definition-like statements referring directly to diagram, based on other concepts which are defined based on the diagram, or implicitly in being used to mediate different problem-solving techniques using the diagram.
- When the circle of fifths is elaborated explicitly, it is often in terms of itself, that is, by generating the diagram based on partial versions of the diagram, or by using terms that are ultimately defined based on the circle of fifths. It is also elaborated implicitly by being used in problem-solving with these terms as mediators.

Hence, the picture that emerges is largely one of a self-contained conceptual system where the different parts define each other, a result similar to Zimmerman Nilsson's (2009).

The self-containedness of this system is partly the result of the lack of semiotically mediated connections to musical experiences.

Without musical examples to ground the lower-level concepts with, the only option is to bootstrap the conceptualization-process by creating local conceptual hierarchies which are globally circular. If Vygotsky is right in that the conscious and volitional application of concepts depends on there being super-, co-, and subordinate concepts, the analyses above imply that concepts do not need to be part of a full hierarchical structure to work in this manner.

A hermeneutic circle provides a local hierarchy of concepts, which appears to be largely sufficient even though there is no actual hierarchy if one looks at the circle as a whole. In other words, circularity might seem to abound in this material *because* the interdependency of meaning in a hermeneutic circle is a way of bootstrapping awareness of concepts without structural hierarchies already in place. It is possible that Falthin (2014) is getting at something similar in his study of upper secondary students conceptualization processes when composing electro-acoustic music (more thoroughly discussed in Section 2.4). He writes that students eventually developed conceptual understanding by “recursive application” of the concept as an “assembly of information” (p. 155) and connects this to scientific concepts. *Recursive application* implies a similar kind of circular development, and *assembly of information* relates to the relative meaninglessness of the concept at points in development before its hierarchical integration.

However, the meaning-making potential of the repeated application of the circle of fifths in solving transposing tasks should not be underestimated. There is an implicit message about the sameness of the tonal system from every angle in that application, which ties back to the very origin of the diagram. But that way of making sense of the circle of fifths has little to do with mediated conceptualization. It looks more like situated conceptualization processes, where the meaning of the concept is implicit in how it is used in concrete, situated instances.

There are indications in my material that the students who have most successfully made the circle of fifths their own have done so by engaging with it in musical practice. On the other hand, there are also indications that simply thinking about the

circle of fifths while working with music is not enough on its own. Rather, the ability to make sense of musical practice with the circle of fifths, and conversely, to make sense of the circle of fifths through musical practice, is dependent on the set of concepts that mediate between the relatively abstract diagram and the musical problem context. It seems likely, therefore, that the teachers have an important function to fill in providing and such concepts and relating them to each other.

When such conceptual relations are not provided by the teacher, it becomes up to each student to recreate them from the kind of repeated successful application that is prevalent in the lessons. Similarly, this study shows that being able to use mnemonic and problem-solving techniques related to the circle of fifths as demonstrated in the lessons, does not necessarily mean that the diagram is well understood. However, I also show that this can be remedied if a learner has access to the requisite conceptual apparatus, and in collaboration with a more experienced person can be made to ask the right questions. Again, the role of the teacher is shown to be important, if the sorts of insights are not to be left to chance, differences in previous knowledge, or support outside of school.

#### 8.4.2 Open and Closed Meaningful Structures

A key idea in Vygotsky's work (1997a, 2012; Vygotsky & Luria, 1994) is an understanding of cultural development as a process of mastering one's own mental functioning by means of signs. Several of Vygotsky's examples illustrate that a central aspect of this is making the signifiers meaningful, as part of a meaningful structure. Tying a knot in one's handkerchief to aid memory does nothing to convey what is to be remembered, instead, whoever uses this technique needs to create that meaningful connection themselves. Similarly, a child who, in one of Vygotsky's experiments, selects a picture of a crab to help him remember the word "theater" achieves this by creating a meaningful structure within which the connection makes sense: "The crab is looking at the stones on the bottom, it is beautiful, for him it is a theater" (Vygotsky, 1997a, p. 181; cf. discussion in Wagoner, 2009).



Although this is a powerful explanation of how semiotically mediated functioning develops, there are other factors to consider from an educational perspective. Not all meaningful structures carry the same kinds of potential for further development. They can all, by virtue of being meaningful structures, work as semiotic mediators in regulating different activities such as remembering, classifying, and problem-solving. In relation to a particular educational content, however, they differ on a spectrum from closed, or self-contained, to open.

The mnemonic sentences used to reproduce the circle of fifths in this study are the clearest examples of what I mean by *closed meaningful structures*. Similar mnemonics abound in music-educational practice, often for the purposes of reproducing or orienting oneself in a certain representation—mnemonics for lines and spaces in staff notation, for the placement of sharps and flats, for strings on a guitar (can be viewed as a way of orienting oneself in the inscriptional aspect of the guitar), etc. Especially in their function of helping to orient oneself in a certain inscription, such mnemonics can be viewed as ways of generating something akin to the kinds of secondary or adapted notations documented by Blix (2015) and Backman Bister (2014).

These mnemonic sentences create small, meaningful wholes that aid memory, but the semiotic means by which they do so often have no substantive connection to the conceptual system the thing to be remembered is part of. It is in this sense that they are self-contained, or closed. They offer nothing that opens up for interaction with other concepts. A similar, but not as extreme, closedness can be observed when the circle of fifths is elaborated and operated upon almost exclusively in terms of itself and its surface features. This does not achieve the same degree of closedness, because of how surface features of the circle of fifths inscription are similar or identical to surface features of other symbols in the system of signs.

Next, consider *rules*. By rules, I am not primarily referring to rules like *consecutive fifths between two voices are not allowed in four-part harmony*, although such rules are a common feature

of music theory pedagogy, and interesting phenomena in their own right. Instead, I am talking about a particular kind of rule which I have highlighted in this thesis, a rule that mediates a deductive classification, and thereby often a transition between different representations: *The tonic is always what the key is called; the subdominant is always to the left of the tonic in the circle of fifths.* Often, such rules can be understood as a special kind of mnemonic device. One does not need to automate the recollection of the subdominant of each key if one can just remember the rule, and has access to a circle of fifths.

Unlike the mnemonic sentences, however, these rules create a connection between two or more subject-relevant concepts (e.g. TONIC and KEY, or SUBDOMINANT, TONIC, and CIRCLE OF FIFTHS). In this sense, the rules are more open, less self-contained, than the pure mnemonics. They open up the option to proceed from one concept to the next, from one inscription or representation to another. On the other hand, these rules are more closed than what I will call definitions and explanations, since they rely on the surface level of the signs and representations they operate with. In fact, this is part of what is characteristic of rules in comparison to definitions: They are semiotically mediated ways of orienting oneself in a particular form of representation, or of adequating different representations with each other. Rules are thus the clearest expression of how the logic of the representation supersedes the logic being represented in this study.

The difference between a rule like those above and a definition can be hard to spot, since they share a similar form: *X is Y*. In this thesis, I have held to a distinction between a rule and a definition based on the latter establishing a hierarchical relationship. A definition frames X as a certain kind of thing, *genera*, as well as supplying ways to pick out this particular thing from its kind, *differentiae*. Some of the rules above can be understood as definitions with their genera omitted, they are all *differentiae*, and could be developed into definitions by adding a genus: *The subdominant is* [a chord that is] *to the left of the tonic in the circle of fifths* frames SUBDOMINANT as a kind of CHORD. This is a hierarchical relationship:

A subdominant is a kind of chord, but a chord is not necessarily a subdominant, which would ideally (but less often in the real world) mean that I can apply what I know about chords to subdominants, but not necessarily what I know about subdominants to chords in general. In other words, rules are reversible, definitions are not. It is this hierarchical aspect that makes a definition more open than a rule. When a definition connects concepts together hierarchically, it becomes possible to learn something more about the *definiendum* than just how to classify an instance of the concept in question given certain known information.

Explicit definitions of this kind are very rare in my material, although one could argue that in context, the genera might be left implicit. Talking about the subdominant being to the left of the tonic in the circle of fifths in the context of classifying chords according to function may make it unnecessary to specify that one is talking about a kind of chord. Nevertheless, this is one of the parts of my result that is most compatible with Zimmerman Nilsson's (2009) study on the same subject (under a previous curriculum). She demonstrates how content is presented as self-contained units in the aural skills and music theory subject. Giving the example of the chromatic scale, she points out that this piece of content is introduced based on its internal structure, but not compared and contrasted with other scales. While framed in different terminology due to different theoretical frameworks, this is equivalent to the difference between rules and definitions. By not comparing chromatic scales with other scales, the CHROMATIC SCALE is not constructed as a kind of SCALE, in the same way as just saying that the root of a chord is what the chord is called does not construct ROOT as a kind of PITCH, component of a chord, or whatever might be pedagogically relevant.

While explicit definitions are rare, I have found it relevant to distinguish between definitions and rules on theoretical grounds. The hierarchical element that a definition entails is at the heart of Vygotsky's (2012) understanding of scientific concepts, and they fill the function they do in the theory by virtue of this hierarchical element. The fact that explicit definitions are rare in the educational

practice I have investigated is therefore an interesting result in itself. It highlights that Vygotsky's assumptions about how concepts are taught in schooling may not be valid in an early 21st century music theory classroom in Sweden.

When the meaning of a concept is being elaborated upon, but that elaboration cannot easily be reformulated as a definition or reduced to a deductive rule for classification, I have chosen to call it an *explanation*. Like rules, explanations do not provide a hierarchical structure unless they are woven into a definition as its *differentiae*. They do, however, represent the most obvious way in which semiotic means are used to relate music-theoretical concepts—which are otherwise mostly made meaningful through mnemonics, rules, the occasional definition, and application through abstract problem-solving—to everyday conceptions of musical experiences. In my material, this is mostly achieved by means of metaphor, connotation, ad hoc (cf. Wallerstedt, Pramling, et al., 2014) descriptions of musical experience, and ad hoc generalizations over musical practice. I have classified explanations as the most open since they break out of the formal conceptual system that both rules and (most) definitions operate within. If, compared to mnemonics, rules and definitions open up the routes into this formal system, explanations mediate the expansion of the formal system into musical experience and vice versa. It is here that everyday- and scientific concepts start to interact.

Creating a spectrum as the one I have outlined above always carries the risk of aligning a normative dimension with the descriptive one. In this case, it is easy to read closed as bad and open as good. This is not the point. Of course, a curriculum focusing only on mnemonics would be hopelessly superficial, but a curriculum focusing only on explanations would instead risk veering into the overly subjective. A curriculum only teaching rules might educate well equipped problem solvers, but the problems themselves would be quite meaningless. A curriculum based wholly on definitions would never even get off the ground, because each definition presupposes several others (a NOTE is a sound with PITCH and DURATION; PITCH is a PERCEPTUAL QUALITY of SOUND organized by

FREQUENCY; DURATION is an INTERVAL of TIME; a PERCEPTUAL QUALITY is...) In reality, any teacher will need to utilize a combination of mnemonics, rules, definitions, and explanations.

My point is that music educators should be aware of the different learning potentials of these different ways of creating meaningful structures, and thus be able to make informed choices regarding how to combine them in order to convey a certain content and facilitate a certain progression. It is possible that the dominance of dichotomies such as *formal–informal* and *theoretical–practical* in music-educational discourse blinds us to the variation within forms of knowledge and forms of teaching within these poles. It becomes all too easy to generalize anything involving visual and verbal symbols as being theory or formal, without considering the differences contained within symbolic approaches to music, or problematizing the dichotomy itself.

#### 8.4.3 Abstraction and Generalization in Application

Mnemonics, rules, definitions, and explanations can be understood as meaningful structures. As such, they can be used to regulate semiotically mediated remembering, classifying, accounting, reasoning, and other activities, in the pursuit of solving some problem. These problem-solving activities can, in turn, be understood as ways of making sense of the concepts and models involved in the mnemonics, rules, definitions, and explanations, by situating them in concrete problem-contexts.

Some regularities in how both teacher and students go about doing this can be observed in this thesis. Firstly, in order to be able to deploy semiotically mediated problem-solving strategies that are framed in general terms, participants first need to classify some object as being an instance of a concept. For example, classifying the symbol “A” as an instance of TONIC allows the participants to deploy the rule *the subdominant is always to the left of the tonic in the circle of fifths* as a means of regulating their classification of the symbol “D” as an instance of SUBDOMINANT (see e.g. Excerpt 15). The generalization inherent in the act of classification allows

for a different set of semiotic means to be deployed than if they had kept talking in terms of chord-symbols.

Classification also plays a vital part in more open-ended activities that are not primarily concerned with the application of rules in particular problem-solving strategies, such as accounting for and reasoning about musical practice and experience. When Lena first plays the tonic note at the end of her piece, resolving the tonal ambiguity that had persisted throughout the composing process, she starts laughing. This indicates that she has abstracted some property from the holistic musical experience, which was made salient by the specific circumstances of our creative process, what Vygotsky (2012) called a potential concept. Perhaps this property is a particular way of doing tonality—creating a tonic-experience—by proceeding stepwise from the third to the tonic. But without a sign-component, potential concepts are locked into the situated, goal-directed activities in which they originate. They only allow for “generalization in action” (Miller, 2017, p. 32).

Incidentally, this analysis in terms of potential concepts addresses a critique Falthin (2011b) raises against Kaladjev’s (2009) concept of musical generalizations. Falthin argues that Kaladjev is wrong in taking auditory musical generalizations to be unconscious and not conceptual in the sense Falthin is using the word. The counterargument Falthin offers is research showing children’s ability to apply structural features they could not report verbally in their own compositions. Falthin concludes that “[i]t appears [the children] managed to abstract musical structure from pieces they had heard or learned, and re-synthesize it to accommodate their own compositions” (2011b, p. 127). Note that this abstraction without verbalization, but with the ability to generalize (i.e. re-synthesize) in a goal-directed practice, is exactly what one would expect of potential concepts. Viewed this way, auditory musical generalizations are not so much unconscious as action-bound.

This is about the distinction between directing consciousness to the *what* rather than the *how* of (musical) action (cf. Vygotsky, 2012), making musical sense in musical terms. Within this theoretical framework, Bamberger’s (2006) organizational constraints can

be understood as potential concepts which exist as generalization in musical action (including listening), abstracting and generalizing features of musical objects that are functionally equivalent to the task at hand. When that happens, conscious awareness can be directed towards those abstracted features in semiotically mediated listening, drawing potential concepts into the conceptualization process. In this sense, one might argue that potential concepts of music are what we talk about when we talk about music.

When Lena accounts for what was funny, she verbalizes a classification of the particular pitch that prompted her reaction (as “c”) and classifies the sound of the ending as a “typical little song.” These two classifications generalize in different directions. Classifying the sound of the ending as that of a typical little song generalizes over previous musical experiences. By creating an ad hoc verbal label for this kind of ending, Lena opens up the possibility to integrate the experience thus named into a semiotically mediated conceptualization process. Classifying the final note as c is more akin to the previous example, classifying the chord-symbol “A” as an instance of TONIC. But in this case, what is being classified is not another symbol but an actual musical sound (probably mediated by identifying the pressed key on the piano, using the inscriptional aspect of the keyboard). By classifying this sound as a particular pitch(-class), the set of meaningful structures connected to the pitch-naming system (including the productive polysemy illustrated in the analyses) can be brought to bear on the problem of accounting for what, in this particular, situated instance, was funny and why. Together, these two classifications allow us to co-construct a relation from this experience to the TONIC-concept. This, in turn, lets Lena apply meaningful structures related to that concept, such as the notion that you always want to go back to the tonic, or the operation of circling a group of chords in the circle of fifths to represent a key, to account for our musical practice.

It is easy to see this as a unidirectional process, either as semiotic tools structuring musical experience and practice, or as musical experience and practice grounding semiotic tools. Debates on the relationship between music, representation, and conceptualiza-

tion in music education often end up reproducing a paradoxical opposition between *sign before sound* versus *sound before sign*. The phrase “conceptualizing and representing music” will then be taken to mean either (1) concepts form (musical) experiences, or (2) (musical) experiences form concepts. While (almost) no one would explicitly defend one of these extremes to the exclusion of the other when they are spelled out this bluntly, one or the other is usually implicitly constructed to be of primary explanatory or normative value.

Today, it is rare to find examples of normative priority being given to the first option—concepts form (musical) experience. Nevertheless, it is often the implicit position against which many modern music-educational arguments are made, since it used to be more prevalent in music-educational discourse, for example in initiatives to educate the masses into a better appreciation of high culture. A consequence of giving normative priority to the first option is discounting unschooled or informal musical experience and practice as somehow lesser, not as rich, or less authentic.

A good example of this position being given explanatory *but not normative* primacy is when Wallerstedt, Pramling, and Säljö (2014) state that “for higher forms of psychological functioning, such as listening in our sense, there is no point in distinguishing between what someone is able to discern and what he/she is able to account for” (p. 382). This statement does not discount that musical experiences can be rich and authentic in the absence of the ability to account for them, but rather makes a theoretical-methodological point that discounts those experiences as objects of study and thereby descriptions of them as means of explanation. Giving explanatory priority to the first option in this manner makes it more difficult to consider explanations of the development of listening (conceived of as a higher mental function and therefore mediated by signs) that do not assume that *concepts form (musical) experiences* and *(musical) experiences form concepts* are competing explanatory models.

When primacy is given to the second option—(musical) experience forms concepts—it becomes possible to view teaching



and learning musical terminology and symbol systems as a matter of simply attaching symbolic labels to extant musical distinctions. This in turn allows one to ask whether there could be a mismatch between, on the one hand, the distinctions inherent in the culturally and historically developed system of labels to be learned, and, on the other hand, the already extant distinctions formed by the learner through musical experience.

When this view is granted primary *explanatory* value, it can lead to formulating productive didactic problems, for example when Bamberger (1996) distinguishes between units of description and units of perception:

We are asking students to begin with what we believe are the simplest kinds of elements, but which for them may be the most difficult. In doing so, I think we are confusing smallest elements – in music, isolated, de-contextualized pitch and duration values – with what we assume are also the simplest elements. [...] But in doing so, we are not distinguishing between our own most familiar units of description, the notes shown in a score, and the intuitive, contextual units of perception – those which young children and most adults, too, are attending to in making sense of the music all around them. (Bamberger, 1996, p. 34)

Bamberger's contribution is important, since it invites us to consider that units of description only capture some aspects of what they describe, that schooling may blind us to these discrepancies, and that there is a logic also to unschooled units of perception that should not be discounted as wrong.

When taken too far, however, ascribing too much explanatory value to sound-before-sign also invites the view that (musical) conceptualization processes can be considered wholly divorced from the use of signs, or at least from the use of signs in formal educational contexts. For example, Gruhn (2006) argues that music must be understood praxially, as action, and therefore “music learning is best achieved by music making” (p. 6). Since music-making (according to Gruhn) can be done without technical terminology, music theory and terminology “are no longer necessary to music learning” (p. 6). Truly musical learning, to Gruhn, is concerned with forming musical representations, which can only be formed through musical action

and experience.<sup>36</sup> While I see some truth in this view—after all, I have pointed to the distance between operations with signs and the musical phenomena these signs ultimately concern as potentially problematic in this thesis—Gruhn sets up a dichotomy between, on the one hand, the use of signs, terminology and narrative, and on the other hand, the use of music:

If music teaching and learning starts with using words, symbols, notations, stories, and the like, without musical intentions and meanings, then it falls short of teaching and learning music, which, instead, is comprised of intrinsic musical meaning. As a consequence of this way of understanding music, a very basic change in our pedagogical approaches to music learning is required. We must consider that musical interaction and musical understanding happens only within music, but without verbal or symbolic transformations. (Gruhn, 2006, p. 7)

By setting up this dichotomy, Gruhn seems to blind himself to the option that signs and music might *interact* in development, and thereby the only question that remains to him is whether sound or sign should be introduced first. Were that indeed the question, I would undoubtedly agree with Gruhn that musical action and experience should be prioritized. Due to Gruhn's false dichotomy, however, the question is the wrong one. It only leads to an oddly linear view of musical learning and development, where music theory, notation, and terminology are simply a question of attaching labels to fully formed musical representations. This demonstrates a problem that both sign-before-sound and sound-before-sign have in common: The very question they implicitly answer is based on

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36 This view also leads Gruhn into an infinite regress, since he considers musical learning to be the development of musical representations, which he considers to be dependent on a stimulus being experienced *as* music, which in turn is dependent on previous musical representations being activated (see especially Gruhn, 2006, p. 25ff.). If we follow this train of thought a bit longer than Gruhn does, we might conclude that having a musical experience is impossible, since its status as a musical experience depends on musical representations, which are developed only through musical experiences, which are dependent on previous musical representations having been developed...

the assumption that development is an essentially linear process. Gruhn also shows how the strong explanatory value ascribed to this linear model quickly results in ascribing normative value to it as well—who would want to deprive music education of its musical content? When this view is granted primary *normative* value, it also becomes possible to question whether such culturally and historically developed systems of labels should be taught at all (especially in combination with assumptions about children’s inherent artistic competence, as discussed in Section 1.1). If the students happen to have developed distinctions that do match the ones inherent in the system of labels, there is no need to teach that system of labels, and if there is a mismatch between the two, the one developed by the students based in their own musical experience is viewed as inherently better, truer, or more authentic.

This assumption lets Stewart Rose and Countryman (2013) argue that while the terminology associated with “elements of music” is useful to those who know it, it should not be taught to people who do not know it. Instead, teachers should affirm “how students talk about music using *their* elements” (p. 54, original emphasis). Of course, there is nothing wrong with affirming and utilizing what students already know about music. What is problematic about Stewart Rose and Countryman’s position is that teaching something that students do not already know is constructed as standing in *opposition* to respecting and utilizing what they already know.

While and Bamberger (2006), Gruhn (2006), and Stewart Rose and Countryman (2013) all stress the importance of students’ extant ways of making sense of music, only Bamberger’s position avoids giving a linear understanding of musical development normative priority. Therefore, Bamberger (2006) can present a view of musical development as an increased repertoire of musical sense-making strategies, where the goal of teaching is not to correct previous understanding, but to provide alternative ways of understanding as well as the competence to switch between them.

I do not wish to imply that I have solved the sound-before-sign vs. sign-before-sound problem with this thesis. I have treated it quite extensively here, however, because I am aware that some of

my results may be read as an argument for sound-before-sign, and I wish to clarify that I do not think they are an argument for either of these positions. Rather, I believe both positions are responses to the wrong question. This is especially true when the question is put in the context of educational research. While it is conceivable that a psychologist or a philosopher may ask the question of what comes first and be able to come up with an interesting answer, the question in the field of education should not be “what comes first?” or even the normative question of what *should* come first.

Rather, we need to concede that music as an educational endeavor contains both an artistic or craft-dimension and a symbolic, conceptual and discursive dimension (or an *ars* dimension and a *scientia* dimension, Nielsen, 1998). The interesting question from an educational perspective, then, is not whether one of these *should* come before the other, nor whether one *does* come before the other in some hypothetical state of nature where we do not engage in discourse while engaging in music. It will be quite rare to encounter a student with no previous experience of music, and equally rare to encounter a student with no experience of talk about, and representations of music. Therefore, we need to ask how we connect the *ars* and *scientia* dimensions of music education so that the subject contains its integrity as a whole.

This thesis has admittedly focused on the sign-mediated and *scientia* aspects of music education. But I would argue that in doing so, it has highlighted the importance of considering the choice of such content, the way such content is presented, and how it is applied, from the perspective of how it integrates with musical experience and practice.

### 8.5 DEVELOPMENT OF PRACTICE

This thesis has not engaged in development of practice in the sense of conducting a pedagogical intervention, testing teaching methods, etc. Therefore, I want to be quite careful about offering recommendations about how teachers should teach. Nevertheless, I argued in Section 2.7 and Chapter 3 that teachers at the secondary level who

want to develop their practice based on a theoretical and empirical understanding of how upper secondary students learn music-theoretical concepts and models, and how those learning processes relate to educational practices, will face a lack of relevant research. How has this thesis addressed this problem, if I am unwilling to recommend specific teaching practices?

I can offer some general, empirically grounded recommendations concerning teaching methods—for example, I would recommend using musical examples, varying examples to avoid incorrect overgeneralizations, and making important conceptual relationships explicit. I believe, however, that a more worthwhile contribution to teaching practice would be providing a set of theoretically and empirically grounded concepts and distinctions, which could be of use in planning and evaluating lessons. I would argue that some of the more concrete recommendations above follow from the application of those concepts and distinctions. Note that this means I will sometimes have to go beyond what I have concrete examples of in my data in order to exemplify how these concepts and distinctions could be applied.

One such distinction I cannot take credit for myself is Vygotsky's (2012) distinction between scientific and everyday concepts, or conceptualization processes. Nor can I take credit for his account of the role of potential concepts in concept development. But after having run these concepts-about-concepts through the empirical meat grinder I believe I can say something more specific about how they apply to music education, and particularly aural skills and music theory education.

Thinking about aural skills and music theory education in these terms, a central concern for teachers becomes how to facilitate the dialectic between scientific and everyday conceptualization processes. In order to do that, we cannot reduce everyday concepts to concepts developed in informal or practical settings, nor scientific concepts to concepts introduced in formal institutions of schooling. Rather, these forms of conceptualization differ, and complement each other, in what aspects of a concept are made explicit. For example, this thesis shows that quite abstract problem-solving ac-

tivity, as part of formal schooling in music *theory*, can still behave much like everyday conceptualization, in the sense that the relations of generality between the concepts used are largely left implicit.

The strength of everyday conceptualization processes lies in their ability to direct attention to or pick up on potential concepts (the latter perhaps in an ad hoc manner), abstracted features of objects, and give that situated generalization in action a sign component. Recruiting this strength by creating conditions for this to happen with musical experiences is important in a subject such as aural skills and music theory. Wallerstedt (2010, 2011) has argued that a central pedagogical challenge for music education is to point out, represent, and help students attend to musical features. Here, the tools of variation theory (in addition to the two texts by Wallerstedt cited above, see Ling & Marton, 2012; cf. Driver, Elliott, & Wilson, 2015) might be helpful guides for teachers in planning (and for researchers in analyzing) lessons. Another useful approach, which I have discussed briefly in this thesis, is to deliberately create situations where students' normal means of solving a problem will not work, in order to help them break out musical features from holistic, naturalized activities.

The problem of how to introduce scientific concepts (or perhaps, rather, how to model scientific conceptualization processes) may at first glance seem less difficult. If the strength of scientific conceptualization processes lies in making relations between concepts explicit, we just need to make sure to define our terms in a thought-through way. This *is* probably important, but we face two problems. Firstly, it is difficult to define one's terms correctly and succinctly, while at the same time using terminology that is understandable to students with little or no previous exposure to music theory. We face the same problem as the teacher in this study, to bootstrap a whole conceptual system from scratch. This means we will probably have to accept some degree of oversimplification, and that many of our starting definitions will end up being circular.

Secondly, at the start of their developmental trajectory, scientific concepts mainly lend themselves to empty verbalism (Vygotsky, 2012). In practice, this means that students may be able to solve

problems through inference, but will have difficulties judging if their solution is reasonable, or feels right. I have talked about this as a “gap” between the conceptually mediated reasoning and musical knowledge as it presents itself in practice. I believe a way of addressing these two issues with scientific conceptualizations is attending to how their connection to concrete, situated musical experiences is mediated by everyday concepts. That is, we need to help students establish common everyday conceptualizations of music and draw them into our work with music-theoretical concepts and abstract representations of music.

Another distinction I believe could be useful is the one between open and closed meaningful structures, discussed above. As I stressed there, I do not wish to imply that closed is bad and open is good (or the other way around), but I believe the distinction is useful because it helps us think about what we are hoping to achieve when introducing a meaningful structure as a mediational means. Closed structures, especially mnemonics that do not rely on subject-relevant terminology, carry limitations regarding how they can integrate with the wider conceptual system. Rules, while relying on subject-relevant terminology, are mainly concerned with the surface features of signs and representations. The main benefit of both is that they mediate *performance without competence*. Performance without competence is not necessarily negative. In fact, one could argue, with Miller (2011), that performance without competence is the main mechanism of instruction-based learning.

I should stress here that the distinction between closed and open meaningful structures does not imply that only closed meaningful structures mediate performance without competence. Open meaningful structures may do so as well (as in verbalism early in the development of scientific concepts). Rather, the difference is that it may be easier to get performance without competence off the ground with closed meaningful structures, since they rely less on (subject specific) prior knowledge and understanding. Thus, when choosing between introducing a closed meaningful structure, or spending more time on an open meaningful structure, we should consider whether the performance without competence

that the closed meaningful structure mediates would in turn be something that the student can learn from. This will depend on both the structure of the problem to be solved and the student's available means to make sense of the solution.

#### 8.6 FURTHER RESEARCH

As I stressed in Section 8.1, I have tried to make strong statements and not overly hedge my bets in this chapter. As a corollary to this position, I would encourage any further research that seeks to extend upon my analysis, apply it in different contexts, or—most importantly—show that it is erroneous. To someone who wishes to do any of these, and perhaps especially the last, I would suggest focusing on two aspects of my results which largely rest on a *lack* of use in the context where the study was conducted: The roles of music and definitions in the music theory classroom. Both these topics would lend themselves well to studies conducted in collaboration with teachers. For example, the Learning Study framework combined with Variation Theory (see e.g. Ling & Marton, 2012) appears to me to offer tools for conceptualizing the use of musical examples in the classroom, as well as for studying the outcomes of different use-cases. Similarly, the role of definitions in learning music-theoretical concepts could be studied by planning and evaluating lessons together with a teacher, perhaps using the spectrum from closed to open meaningful structures as a starting point. For this type of question, comparisons between different subjects may be valuable as well.

In terms of further research, the scarcity of definitions presents a methodological problem for qualitative studies of microgenetic processes, with a focus on how meaning is made in specific, situated practices. Studies drawing on such methodological assumptions may, because on their focus on detailed analysis of local processes, be ill equipped to capture how definitions could be dispersed over longer stretches of time in educational settings, while never being fully elaborated in any one situation. It also raises the question whether other contemporary studies using this theoretical construct (or versions under different names, e.g. academic concepts, institutional



concepts, etc.) have considered the hierarchical aspect as part of their classification scheme. If Vygotsky's theory is still more correct than not about the mechanisms of conceptual development, this in turn raises the question of if and how students today develop hierarchically integrated conceptual structures in educational contexts with a near absence of explicit definitions.

Regarding the role of music, I would also suggest further research on the interface between musical and sign-mediated thought in the development of musical expertise. Here, purely classroom-based studies may not be sufficient, but a more interventionist approach, through interviews and qualitative experiments may be necessary. Bamberger's work (e.g. Bamberger, 1995, 1996, 2006) addresses some of these issues, as well as the body of work on children's invented notations (e.g. M. Barrett, 2000; M. S. Barrett, 2004; Davidson & Scripp, 2001; Davidson et al., 1988). But these studies do not tend to engage specifically with symbol-systems and concepts as they are taught in music schooling, rather, they rely on participants developing other ways of representing and conceptualizing music. I see a potential for interviews *in* music, coordinated with studies of or interventions in educational practices, to be extended further to address these types of questions. Through such studies, the role of the instrument and its inscriptional aspect as central mediating devices between knowledge expressed in musical practice and semiotically mediated knowledge could be explored further.

There are also aspects of how music-theoretical knowledge, and aural skills and music theory as a subject, are constructed in educational practices, which would merit further investigation. For example, in one of my analyses in the preceding chapter (see Excerpt 15 and analysis thereof), I have noted how the teacher's attempt to make the subject appear less intimidating relates to a construction of music-theoretical knowledge as something arbitrary to be remembered. What is less visible in this thesis is that such attempts to manage students' perception of the subject are a common occurrence in the material. It would be interesting to learn more about how common this phenomenon is, if there are other ways in which it relates to the construction of what music-theoretical knowledge

and the aural skills and music theory subject are, and how such constructions relate to discourses around music and music education.

There are now two qualitative studies of aural skills and music theory education in Swedish upper secondary schools (the present thesis and Zimmerman Nilsson, 2009). Both find that the content is treated as a toolbox that students are supposed to learn to use to solve specific kinds of problems, and that content is treated as self-contained units. Zimmerman-Nilsson (2009) also found that in ensemble lessons the form of the lesson tended to decide the content, while in music theory lessons, the content appeared to decide the form. This study has not had these comparative intentions, and has focused on a particular content in music theory lessons. But while there are indeed significant differences in the form of the lessons depending on the nature of the content (e.g. sounding music in lessons on rhythm, but no sounding music in lessons on harmony and the circle of fifths), most of the observed lessons share an almost improvisational style (present something and then deal with problems as they appear) that seems more typical of ensemble- and one-to-one instrumental lessons.

While the similarities are mostly striking, two qualitative studies remain a tenuous ground for generalization. It would therefore be of interest to follow up with a broader approach, either through a larger scale observational study (of similar scope as Ericsson & Lindgren, 2010), through some kind of survey (as Buonviri and Paney have started to do in an American context, see Buonviri & Paney, 2015, 2020; Paney & Buonviri, 2014), or some combination of the two. In a survey, one might also ask about the educational background of aural skills and music theory teachers in upper secondary schools. How many have specialized training in the *didaktik* of these disciplines? How does this influence their pedagogy?

### 8.7 CODA

If you, dear reader, only take one thing from this book, I would like it to be this: There is very little about how students learn to conceptualize and represent music, and very little about how we

should teach historically developed ways of conceptualizing and representing music, that is obvious. I hope that this awakens in you a curiosity, maybe even a frustration, that makes you want to learn more. If you take two things from this book, I would like it to be that frustrated curiosity, and the idea that what we call music theory is a multifaceted thing, and that therefore we are ill-served by simple dichotomies such as language–music, theory–practice or formal–informal when trying to understand how to teach it. If you take three things from this book, I would like it to be the above, and the imperative to use musical examples when teaching theoretical concepts and models.

You are, of course, welcome to take more from this book, if you can find something that may be of use.



## 9. Svenskspråkig sammanfattning

Den här avhandlingen handlar om hur elever lär sig kvintcirkeln, samt hur de lär sig om och med kvintcirkeln, i kontexten Gehörs- och musikleäraundervisning på gymnasiet. Kvintcirkeln har, så vitt jag vet, inte utgjort fokus för musikpedagogisk forskning tidigare, även om den ibland har tagits upp i studier med annat forskningsfokus. Detta är en aning förvånande, då diagrammet är vanligt förekommande i musikklassrum, i läroböcker och, inte minst, på nätet. Men inte heller den här studien uppstod ur ett intresse specifikt för kvintcirkeln, utan ur ett intresse för gehör och gehörslära.

Med *gehör* menar jag här inte enbart förmågan att spela på gehör. Snarare är jag intresserad av gehör som utbildningsämne, en uppsättning kunskaper och förmågor som vi kan undervisa om och i. Målet för sådan utbildning kan bland annat vara att utveckla förmågan att spela på gehör, men i ett vidare perspektiv handlar det om att utveckla ett tränat, eller professionellt lyssnande. I detta ingår förmågan att höra något *som* något, till exempel att höra ett durackord *som* ett durackord. Med andra ord finns en begreppslig aspekt av gehör i denna mening. Detta återspeglas även i den svenska gymnasieskolans kursplan för ämnet Gehörs- och musikleära 1 (Skolverket, 2011), dels i att kursen tar upp både gehörslära och musikleära, dels i formuleringen av kursmålen, exempelvis: ”Eleven värderar

med enkla omdömen sitt musicerande med hjälp av musikteoretiska begrepp” (kunskapskrav för betyget E, s. 8, fetstil borttagen). Avhandlingens frågeställningar växte inledningsvis fram ur min egen musiklärarpraktik, och särskilt ur min undervisning i kursen Gehörs- och musiklära, där jag som lärare ställdes inför frågan hur jag kunde stötta utvecklingen av begreppsligt lyssnande hos mina elever.

Den här avhandlingens inriktning mot kvintcirkeln, och de musikteoretiska begrepp som är kopplade till den, utgår alltså från antagandet att undervisning i musikteoretiska begrepp, modeller och representationsformer inte har ett egenvärde, utan i slutändan syftar till att utveckla elevernas repertoar av sätt att relatera till och lyssna på musik. Med andra ord motiveras studien av en vilja att bättre förstå *förutsättningarna* för att utveckla gehör, förstätt som professionellt lyssnande. Baserat på min egen lärarerfarenhet tror jag att ett sådant projekt kan vara av värde både för musiklärare och musiklärarstudenter som vill utveckla sin praktik. Jag kommer även att visa på hur ett sådant projekt kan bidra till det musikpedagogiska forskningsfältet.

Det musikpedagogiska fältet har länge präglats av olika dikotomier, t.ex. formellt–informellt, teori–praktik, implicit–explicit eller inautentisk–autentisk. Deras popularitet beror säkerligen delvis på att de fångar verkliga spänningar inom fältet, men den beror även på att de är inblandade i olika sätt att legitimera musikämnet. En sådan legitimeringsstrategi är att framhålla musik som en unik och lite mystisk kunskapsform, omöjlig att språkliggöra och endast tillgänglig genom specifikt musikaliska verksamheter. När den här typen av legitimeringsarbete kombineras med en syn på barn och ungdomars konstnärliga kompetens som något som måste få växa fram autentiskt och ostört, skapas en (i min mening) motsägelsefull syn på musikundervisning och lärarens roll. Musikundervisning blir då en fråga om att släppa fram latent kreativ förmågor och att bekräfta elevers spontana förståelser och tolkningar. Detta leder till att det betraktas som negativt när lärare lär ut historiskt och kulturellt utvecklade begrepp och symbolsystem, det hotar elevens autentiska relation till musik. I en sådan syn på musikundervisning blir det svårt att få plats med en syn på gehör som den jag skissat ovan.

I praktiken verkar dock denna syn på musikundervisning och musiklärarens roll ofta vara baserad på en sammanblandning av innehåll och didaktiska strategier. Det ligger sannolikt något i att vi som lärare bör ta hänsyn till, och ta vara på, elevers tidigare musikupplevelser och -förståelser. Men att göra det innebär inte att vi bör stanna där. Det är ävenledes viktigt att uppmärksamma att många av de begrepp och teorier som lärs ut är illa anpassade till musik som eleverna möter i sin vardag. Det innebär inte att vi bör undvika att undervisa om dem, men däremot att vi bör behandla dem på ett mer nyanserat vis i undervisningen. Jag tror därför att en studie som denna kan bidra till att nyansera den här debatten, genom att undersöka begrepp och visuella representationers roll i musikaliskt lärande, och genom att undersöka hur dessa lärs och undervisas om.

#### 9.1 TIDIGARE FORSKNING

Forskningsöversikten i den här avhandlingen gör tre huvudpoänger: För det första finns ett behov av att bättre förstå hur undervisning om begrepp och lärande av begrepp går till i musikklassrum, särskilt i ungdomsskolan. Det finns också indikationer på att detta är ett område där den svenska musiklärarkåren är i behov av professionsutveckling (Skolinspektionen, 2019; Skolverket, 2015; Wallerstedt & Pramling, 2016). Forskningsintresset för begrepp i musikundervisning har sjunkit sedan en topp på 1970-talet (Tan, 2017). På senare tid har forskning som tar upp begrepp och terminologi framför allt kommit ur teoretiska traditioner som fokuserar på verktyg och mediering (t.ex. sociokulturell teori, se exempelvis Mars, 2016a; se även Wallerstedt, Lagerlöf, & Pramling, 2014, som sammanfattar ett flertal studier av författarna). Hur själva begreppen lärs har dock sällan varit i fokus, antingen för att kunskapsintresset snarare är riktad mot hur de används i olika medierade aktiviteter eller för att forskningen kommit fram till att de knappt verkar användas i den studerade kontexten. Med tanke på det senare kan även påpekas att trots att musikteoriundervisning är en relativt nischad musikpedagogisk verksamhet, så kan den vara värd att studera eftersom

den erbjuder en musikpedagogisk kontext där vi kan vara ganska säkra på att undervisning om begrepp kommer att förekomma, och därför kan studeras.

För det andra visar forskningsöversikten att forskning om undervisning och lärande i ämnena gehörslära, musiklära och musikteori är synnerligen utforskat. Detta gäller särskilt i ungdomsåren, medan det genomförts fler studier på högskolenivå eller med yngre barn som lär sig grundläggande begrepp (t.ex. ”musikaliska grundelement”). Min forskningsöversikt identifierar två svenska studier om dessa ämnen, Zimmerman Nilssons (2009) avhandling om musikleärares val av undervisningsinnehåll i Ensemble och Gehörs- och musiklära på gymnasienivå, och Falthins (2011b) licentiatuppsats. Den förra tar alltså framför allt ett lärarperspektiv, medan den senare är något av ett gränsfall, då den behandlar begreppsbildning, men i ämnet Arrangering och komposition. Falthin är också framför allt intresserad av begreppsbildning i en icke-verbal, musikalisk mening, vilket skiljer hans intresse från föreliggande avhandlings. Buonviri och Paney har i ett antal artiklar undersökt ämnet *Advanced Placement (AP) Music Theory*, i en amerikansk *high school*-kontext (Buonviri, 2018; Buonviri & Paney, 2015, 2020; Paney & Buonviri, 2014). Även dessa studier tar framför allt ett lärarperspektiv, genom enkäter och intervjuer med lärare. Endast en (Buonviri, 2018) är baserad på klassrumsobservationer.

För det tredje visar forskningsöversikten ett behov av detaljerade fallstudier av begreppsbildningsprocesser i musik och av hur elever, särskilt ungdomar, lär sig representera musik. Studier av symbolsystem och visuella representationer inom musikpedagogik har framför allt undersökt olika former av musiknotation (se Lehmann & Kopiez, 2016; McPherson & Gabrielsson, 2002 för översikter). Det finns forskning kring mer abstrakta visuella modeller i utbildningsvetenskaplig forskning riktad mot andra skolämnen (t.ex. grafer och diagram inom STEM), men det är oklart i vilken mån dessa resultat kan generaliseras till andra discipliner. Det finns en lång tradition av forskning kring lärande av musikterminologi, men denna forskningstradition har framför allt undersökt yngre barn och universitetsstudenter (se översikter hos Flowers, 2002;



Hair, 2000). Ofta har denna forskning varit kvantitativt inriktad, och fokuserat på utfall av begreppsriktad undervisning. Kvalitativ forskning, framför allt inriktad på yngre barn, har dock visat på hur fallstudier, ibland med kvasiexperimentella inslag, kan öppna upp begreppsbildningsprocesser och göra dem tillgängliga för analys.

De kunskapsbehov som identifieras ovan är i sin tur viktiga att uppfylla på grund av lyssnandets centrala roll i alla musikaliska aktiviteter. Även om avancerade former av musikalisk förståelse verkar uppstå även utan explicit skolning (se t.ex. Bigand & Poulin-Charronnat, 2006), så finns det mycket som pekar på att medvetet och viljestyrt lyssnande är beroende av att vi kategoriserar, begreppsliiggör och signifierar musikaliska fenomen (Bamberger, 2006, 2013b). I forskning som använder sociokulturell teori har den här typen av lyssnande teoretiserats som en högre mental funktion, en form av medierat lyssnande som beror av kulturella verktyg (se t.ex. Pramling & Wallerstedt, 2009; Wallerstedt, Pramling, et al., 2014; jfr. Vygotsky, 1997a). Men medan denna forskningstradition har fokuserat på hur lyssnandet, den medierade aktiviteten, utvecklas, har frågan om hur elever lär sig dessa verktyg (t.ex. begrepp, symbolsystem) fått mindre uppmärksamhet. Det finns alltså ett behov av forskning kring lärande av de verktyg som medierar lyssnande, sett som en högre mental funktion.

## 9.2 FORSKNINGSPROBLEM OCH FORSKNINGSPRÅG

Formulerat i breda termer är det forskningsproblem föreliggande studie försöker bidra till att lösa en brist på kunskap gällande de processer genom vilka elever, särskilt i ungdomsåren, lär sig musikteoretiska begrepp och modeller, och gällande hur dessa processer relaterar till specifika utbildningspraktiker. Ett så pass brett problemområde går dock svårigen att täcka in genom en enda avhandlingsstudie. Därför kommer jag att angripa detta breda forskningsproblem genom fallstudier. Jag kommer att fokusera på en specifik musikteoretisk modell, kvintcirkeln, i en specifik musikpedagogisk kontext, Gehörs- och musikläraundervisning på en svensk gymnasieskola, och inom den kontexten, på specifika elevers lärprocesser. Därmed kan

ett mer fokuserat forskningsproblem formuleras enligt följande: *Problemet den här avhandlingen syftar till att angripa är en brist på kunskap om de processer genom vilka musikelever på gymnasiet lär sig kvintcirkeln, och hur dessa processer relaterar till den Gehörs- och musikleureutbildningspraktik de deltar i.*

Två snabba klargöranden angående denna formulering: För det första, detta fokus på kvintcirkeln ska inte tolkas som ett uttryck för att jag anser att detta diagram bör (eller för den delen inte bör) vara en del av undervisning i Gehörs- och musikleure. Den är helt enkelt ett intressant fall av en musikteoretisk modell. För det andra är jag medveten om att ”lär sig kvintcirkeln” möjligtvis antyder ett fokus på memorisering snarare än förståelse. Vilken roll dessa spelar är förstas en empirisk fråga. Snarare bör ”lära” här även förstas som lära om, lära med, lära genom, osv.

Jag ställer utifrån denna problemformulering två forskningsfrågor:

- 1 Hur introduceras, reproduceras och använder deltagarna kvintcirkeln i utbildningspraktiken?
- 2 Hur stötts lärprocesser av de specifika vis på vilka kvintcirkeln introduceras, reproduceras och används?

### 9.3 TEORETISKT RAMVERK

Kvintcirkeln kan förstas på olika vis, exempelvis som en inskription, en representation, ett begrepp eller en modell. Å ena sidan kan jag syfta på specifika materiella objekt som har ett mönster av linjer och krumelurer (”det sitter en laminerad kvintcirkel på väggen i klassrummet”), å andra sidan kan jag syfta på kvintcirkeln som abstraktion, en sorts platonisk form, som alla dessa materiella kvintcirkelar endast är specifika fall av. Antagligen ligger de mer intressanta tolkningarna någonstans mellan dessa extremer. En kvintcirkel som materiellt objekt är inte vilken kombination av linjer och krumelurer som helst, men (för den som lärt sig att se den som sådan) en specifik, meningsfull kombination av linjer och krumelurer. Och kvintcirkeln som abstraktion har en specifik kulturell historia, i vilken det ingår att ha förts vidare som linjer och krumelurer i olika materiella media.

I den här avhandlingen använder jag begreppet *inskriftion* för att tala om kvintcirkeln som linjer och krumelurer inskrivna i materiella objekt. Från ett multimodalt socialemiotiskt perspektiv kan en inskription förstås som en materiell visuell representation, där en representation är en meningsfull enhet av tecken i olika modaliteter (jfr. Kress & van Leeuwen, 2008; Leijon & Lindstrand, 2012). I kvintcirkelns fall rör det sig av en kombination av konventionella symboler (t.ex. "C", "m", "#"), spatiala relationer och cirkeln som helhet, med dess konnotationer av ett slutet system. Men även för de konventionella symbolerna gäller att de har en mening som är specifik för den musikaliska kontexten: Symbolen "C" betyder inte samma sak i kvintcirkeln som när du läser en text. Därmed blir det även intressant att försöka förstå det begreppssystem som kvintcirkeln ingår i.

Är då kvintcirkeln ett begrepp? Som abstraktion kanske, och i den, i sig ganska ointressanta, meningen att vi kan använda ordet "kvintcirkel" för att referera till kvintcirkel. Här har jag dock valt att hellre tala om kvintcirkeln som en inskription, en representation, eller en modell, i meningen att den är en visualisering av vissa aspekter av ett begreppssystem.

### 9.3.1 Inskriptioner

Inskriptionsbegreppet har sitt ursprung i *Science and Technology Studies*, där Latour (1987) använde det för att referera till figurer och diagram i vetenskapliga artiklar, utskrifter från vetenskapliga instrument, etc. En artikel av Roth och McGinn (1998) verkar ha spelat en avgörande roll i att överföra begreppet till det utbildningsvetenskapliga fältet. De definierar inskriptioner som "tecken som är materialiserade i något medium, exempelvis på papper eller en datorskärm" (s. 37, min översättning), och ser inskriptioner som en underkategori till representationer, som gjorts nödvändig för att skilja inskriptions-representationer från *mentala representationer*. I förlängningen syftar detta till att åstadkomma ett skifte i synen på representationsarbete, från något som sker i folks huvuden, till en social process.

Därmed är det inte förvånande att inskriptionsbegreppet plockats upp i sociokulturella och CHAT-inspirerade teoritraditioner. Säljö (2013) tillämpar exempelvis inskriptionsbegreppet, men ger det en definition som framhåller inskriptionen som ett *fysiskt redskap* med ”diskursiva distinktioner inskrivna i sig” (Säljö, 2013, s. 51). På så vis integreras inskriptionsbegreppet i ett sociokulturellt perspektiv på mediering och redskap. För Säljö blir inskriptionsbegreppet ett argument som visar på orimligheten i att upprätthålla en distinktion mellan fysiska och psykologiska redskap—både inskriptioner och manuella redskap medierar mänsklig aktivitet genom att låta användaren dra nytta av andras externaliserade erfarenheter, inskriptioner råkar bara göra detta genom tecken. I den här avhandlingen vill jag inte gå lika långt som Säljö. Istället vill jag ta ett perspektiv på inskriptioner som framhäver att distinktionen mellan fysiska och psykologiska verktyg (Vygotsky, 1997a; Vygotsky & Luria, 1994) är nödvändig för att förklara hur inskriptioner fungerar som medierande redskap. Från ett sådant perspektiv kan vi exempelvis säga att ett piano, ett verktyg för att producera musikaliskt ljud, även har en inskriptionsaspekt i klaviaturens design, och att det sålunda kan användas som både ett fysiskt och ett psykologiskt redskap (men på olika sätt).

Den utbildningsvetenskapliga forskningstraditionen om inskriptioner understryker att de inte har en inneboende mening, utan görs meningsfulla i situerade praktiker (Medina & Suthers, 2013; Roth & McGinn, 1998; Säljö, 2013). Roth och McGinn (1998) spårar exempelvis hur elever skapar en hel kaskad av inskriptioner i sitt arbete med ett jordprov, och uppmärksammar hur dessa relateras till varandra genom en kedja av *adekvationer* (*adequations*), en term lånad från Latour (1987) som syftar på hur olika inskriptioner eller delar av inskriptioner konstrueras som representationer av samma sak. Säljös (2013) mer redskapsfokuserade förståelse av inskriptioner leder till att han i lägre grad fokuserar på hur inskriptioner relateras till observationer, och i högre grad framhäver inskriptioners generella strukturer och deras funktion i problemlösning (t.ex. cellstrukturen i en tabell). För denna avhandling är båda dessa perspektiv på inskriptioner värdefulla. Skapas en kedja av adekvationer

mellan kvintcirkeln, som en relativt abstrakt representation, till de musikaliska fenomen den (konventionellt) representerar? Vilka problemlösningstrategier medierar diagrammet, och på vilket sätt bidrar de till att göra det meningsfullt?

### 9.3.2 Begrepp

Begreppet *begrepp* är inte entydigt. Lingvisten Ray Jackendoff (1992) påpekar att begreppet används i åtminstone två olika meningar: som något som finns ute i världen, oberoende av vem som känner till det, och som ett psykologiskt fenomen, något som personer har begripit, vet, eller förstår. Filosofer arbetar ofta med begrepp i den första meningen, och det är någonting sådant jag menar när jag skriver om kvintcirkeln som platonisk form ovan. Psykologer arbetar ofta med begrepp i den andra meningen. Inom utbildningsvetenskap är det dock inte lika enkelt att undkomma spänningen mellan dessa olika tolkningar av begreppsbegreppet, eftersom båda betydelseerna är centrala för disciplinen: Det är i någon mening den ”filosofiska” förståelsen av begrepp vi rör oss med i exempelvis läroplansdokument, medan det är den ”psykologiska” förståelsen av begrepp vi tenderar att använda i analyser av lärande och kunskap.

Kognitiv psykologi har exempelvis gått vidare från en förståelse av begrepp (i psykologisk mening) som grundade i definitioner, till familjelikhets-, prototyp-, schema- och förklaringsbaserade teorier (Komatsu, 1992; Slaney & Racine, 2011). Från ett utbildningsvetenskapligt perspektiv, och från ett perspektiv som intresserar sig inte bara för hur begrepp fungerar psykologiskt, utan även för hur de lärs och utvecklas, är det inte lika lätt att släppa definitionismen, eftersom vi måste ta hänsyn till den didaktiska relationen mellan begrepp i filosofisk mening (ett innehåll), en lärares undervisning, och elevers förståelse av begrepp (begrepp i psykologisk mening). Här blir Vygotskijs (Vygotsky, 2012) teorier om begreppsutveckling relevanta, och särskilt hans distinktion mellan vardagliga och vetenskapliga begrepp, då dessa även erbjuder en teoretisering av relationen mellan undervisning, lärande och begreppsutveckling.

Distinktionen mellan vardagliga och vetenskapliga begrepp är grundad i deras ursprung, i hur begreppen lärs. Ett vardagligt begrepp<sup>37</sup> (*everyday concept*) lärs genom ett konkret, situerat möte med dess objekt, medan ett vetenskapligt begrepp (*scientific concept*) lärs genom andra begrepp, t.ex. genom en definition. Vetenskapliga begrepp står alltså i en medierad relation till sina objekt. Vygotskij menar att barn är omedvetna om sina vardagliga begrepp. De kan alltså inte rikta medveten uppmärksamhet mot hur begreppen används. Detta beror enligt Vygotskij på att begreppen inte är integrerade i ett hierarkiskt begreppssystem. Om ett begrepp i sin tur inte generaliserats som en specifik typ av begrepp (t.ex. SUBDOMINANTPARALELL som en sorts ACKORD) så saknas möjligheten att mediera medveten uppmärksamhet mot begreppet. För Vygotskij är medvetet och viljestyrt användande av begrepp kopplat till vetenskapliga begrepp. Till skillnad från vardagliga begrepp startar vetenskapliga begrepps utvecklingsbana med att de medieras via andra begrepp. De är alltså redan från början integrerade i ett rudimentärt begreppssystem (står i hierarkiska generalitetsrelationer med andra begrepp).

Men varken vardagliga eller vetenskapliga begrepp bör förstås som statiska slutpunkter i begreppsutveckling. Snarare menar Vygotskij att mogna begrepp bildas genom en dialektik mellan vardagliga och vetenskapliga begreppsbildningsprocesser. Ett vardagligt begrepp har sitt ursprung i konkreta, situerade möten med sitt objekt, och dess utveckling formas av implicita mönster i en språkgemenskap. Detta kan göra dem svåra att bryta ut ur de situationer och kontexter där de lärts. Ett vetenskapligt begrepp står i en medierad relation till sitt objekt, och kan därför lätt hamna i tom verbalism. Vardagliga begrepp kan brytas ut ur sina situerade kontexter när de dras in i hierarkiska relationer med andra begrepp genom vetenskaplig begreppsbyggnad, och vetenskapliga begrepp grundas i konkreta erfarenheter genom sina relationer med vardagliga begrepp.

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37 Vygotsky använder även termen *spontana begrepp* på ett vis som delvis överlappar med vardagliga begrepp. För en diskussion av dessa hänvisas läsaren till Avsnitt 4.5.

Många har påpekat att det är olyckligt att Vygotskij (och hans översättare) valde ordet *vetenskapliga* för att benämna vetenskapliga begrep. Men även *vardagliga* och *begrepp* är inte helt oproblematiske terminologi. För det första vore det bättre att tänka på vardagliga och vetenskapliga begrepp som olika typer av *begreppsbildningsprocesser* snarare än olika typer av begrepp. I den här avhandlingen ser jag inte heller vetenskaplighet eller vardagliga situationer som det utmärkande för vetenskapliga och vardagliga begrepp, utan huruvida de har sitt ursprung i en medierad (vetenskapliga begrepp) eller situerad (vardagliga begrepp) begreppsbildningsprocess. Märk att både vetenskapliga och vardagliga begrepp fortfarande kan fylla medierande funktioner, och att varje situation där någon lär sig ett begrepp självklart är situerad i en viss fysisk, kulturell och historisk kontext. Skillnaden ligger snarare i att medierade begreppsbildningsprocesser så att säga re-situerar begreppet i ett (kulturellt och historiskt utvecklat) begreppsligt system, som inte är lika beroende av den enskilda situationens logik. Situerad begrepps-bildning är i högre grad beroende på den enskilda situationens logik, och det är deras styrka. Med detta sagt så kommer jag att fortsätta använda terminologin vardagliga och vetenskapliga begrepp, eftersom den är så pass väletablerad, men i den betydelse som skisserats ovan.

I *Thought and Language* (Vygotsky, 2012) lägger Vygotskij fram två modeller för begreppsutveckling. En som tar upp dialektiken mellan vardagliga och vetenskapliga begrepp, och en som mer liknar en stadieteori. I den senare av dessa spelar *potentiella begrepp* (*potential concepts*) en viktig roll. För Vygotskij är alla begrepp generaliseringar. Vad som särskiljer förbegreppsliga *komplex*-stadier i begreppsutvecklingen är att de generaliserade element hos referenterna inte är stabila. Effektiv generalisering kräver väldifferentierade och stabila element. Potentiella begrepp är Vygotskijs svar på frågan om hur dessa uppstår. De uppstår inom perceptuellt och handlingsdrivet tänkande, baserat på likheter i form eller funktion. Exempelvis skulle detta kunna vara egenskapen *långsmal* hos en penna och en banan, eller att vi kan använda båda för att peta till något som ligger strax utom räckhåll.

Miller (2017) beskriver detta som generalisering i handling: Relevanta egenskaper (t.ex. långsmalhet, petanvändbarhet) abstraheras och kan sedan generaliseras till andra objekt i liknande problemkontexter, medan andra egenskaper (t.ex. ätbarhet) ignoreras. Inom ett ramverk av instrumentellt handlande har alltså potentiella begrepp några av de egenskaper som Vygotskij (Vygotsky, 2012) såg som centrala för mogna begrepp – abstraktion och generalisering – men de saknar en teckenkomponent. Först när potentiella begrepp växer ihop med förbegreppsliga strukturer med en teckenkomponent kan denna potential realiseras fullt ut.

Trots denna centrala teoretiska funktion har potentiella begrepp fått relativt liten uppmärksamhet i senare forskning. Detta gäller även i ett fält som musikpedagogik, där det borde finnas ett särskilt intresse för att teoretisera icke-verbala aspekter av begreppsutveckling. Musikaliska strukturer är holistiska, flerdimensionella och öppna för tolkning. Begreppet *potentiella begrepp* kan användas för att teoretisera hur relevanta strukturella egenskaper hos ett musikaliskt objekt abstraheras och generaliseras i målinriktad, instrumentell musikalisk handling.

### 9.3.3 Verktyg, tecken och mediering

Tidigare forskning, i ett sociokulturellt perspektiv, har teoretiserat lyssnande som en högre mental funktion (t.ex. Wallerstedt, Pramling, et al., 2014), ett begrepp som hämtats från Vygotskij (t.ex. Vygotsky, 1997a). Högre mentala funktioner i denna mening utmärks av att de är medvetna och viljestyrda. Medvetenhet ska här förstås som självreflexiv, medvetenhet om den egna mentala aktiviteten. Detta åstadkoms genom att lägre mentala funktioner medieras av psykologiska verktyg (tecken), i analogi med hur mekaniska verktyg medierar människans interaktion med världen, och på så vis förändrar arbetets natur och förutsättningar. Liksom mekaniska verktyg har psykologiska verktyg ett kulturellt och historiskt ursprung. De utvecklas för att mediera kommunikation mellan människor (alltså påverka andra människors tänkande), men kan även vändas inåt, och användas för att ta kontroll över det egna tänkandet. Vygotskij (Vygotsky, 2012)



menar att detta, liksom medveten begreppsanvändning, förutsätter en hierarkisk struktur. För att vi ska kunna ta kontroll över en mental funktion, t.ex. minnande, behöver den klassificeras som en särskild typ av funktion och på så vis differentieras från den holistiska upplevelsen av mental aktivitet.

Medan Vygotskij (Vygotsky, 1997a; Vygotsky & Luria, 1994) framhäver att analogin mellan mekaniska verktyg och tecken (psykologiska verktyg) är just en analogi, så har senare teoretiker som bygger vidare på Vygotskijs arbeten (t.ex. Wertsch, 1994, 1998) ofta föredragit att sammanföra båda i en kategori. Detta riskerar dock att leda till ett fokus på observerbara, färdigformerade redskapsmedierade aktiviteter, och att exempelvis begreppsutveckling hamnar i skymundan. Jag har därför försökt upprätthålla distinktionen mellan fysiska och psykologiska redskap i den här avhandlingen, vilket jag menar hjälper till att klargöra hur gränfall så som exempelvis inskriptioner bidrar till begreppsbyggnad och vice versa.

#### 9.3.4 Lärande, appropriering, internalisering, undervisning och utveckling

*Lärande* tenderar idag att vara ett centralt begrepp i både utbildningsvetenskap och i formuleringen av utbildningspolitiska mål (Biesta, 2005). Lärande är dock ett notoriskt svårdefinierat begrepp, som ofta leder till paradoxer (Marton & Booth, 1997; Miller, 2011; Sfard, 1998). Ett av den sociokulturella eller situativa teoritraditionens mest effektiva retoriska grepp var att omdefiniera lärande från en tillägnande- eller konstruktionsmodell till en deltagandemodell. På så vis kunde man kringgå några av de paradoxer som präglade tidigare forskningsinriktningar (Sfard, 1998). Inom vissa sociokulturella traditioner uttrycks detta ställningstagande bland annat genom att termen *appropriering* föredras framför *internalisering*. Enligt Valsiner (1997) är internaliseringsterminologin kopplad till en ontologisk position som förnekar en separation mellan person och (materiell/social) värld.

Utan en sådan dualism finns inte heller någon meningsfull distinktion mellan intern och extern medierad aktivitet, och den-

na position är sålunda sammankopplad med sociokulturell teori om vilja att skilja på fysiska och psykologiska redskap. Givet den här avhandlingens kunskapsintresse menar jag dock att det är viktigt att problemet att direkt kunskapsöverföring är omöjlig måste tas på allvar, vilket är svårt att göra om det kringgås genom en deltagandemodell för lärande. Detta innebär att jag inte nödvändigtvis ser internaliseringsbegreppet som problematiskt, när det används för att beskriva den process genom vilken tecken vänds inåt, och på så vis gör sociala, inter-mentala operationer till personliga, intra-mentala operationer.

Vygotskijs psykologi, liksom många andra psykologiska traditioner under mellankrigstiden, tenderar att fokusera på *utveckling* snarare än lärande. I Vygotskijs fall är det inte bara så att frågorna tenderar att handla om utveckling (t.ex. *utvecklingen* av vetenskapliga begrepp eller högre mentala funktioner, snarare än *lärande* av vetenskapliga begrepp eller högre mentala funktioner), utan även så att hans arbete genomsyras av ett både teoretiskt och metodologiskt utvecklingsperspektiv. Vad är då relationen mellan utveckling och lärande?

Innan jag besvarar den frågan är det viktigt att framhålla att Vygotskij inte producerade en enhetlig teori, och att det inte verkar gå att dra en skarp gräns mellan utveckling och lärande utifrån hans verk. Däremot verkar det möjligt att förstå lärande som ett vidare begrepp än utveckling. Utveckling verkar för Vygotskij betyda kvalitativ förändring, ofta med domänöverskridande resultat, medan lärande även kan betyda kvantitativ förändring (lära sig mer av något), betingning, memorisering och imitation. Även om detta är en överförenkling så hjälper en sådan distinktion till att utreda vad Vygotskij (Vygotsky, 2012) menar med att användbar undervisning föregår och leder utveckling. Enligt Miller (2011, 2017) är källan till utveckling i den närmaste utvecklingszonen inte är läraren, eller det innehåll läraren undervisar om, utan de handlingar den lärande kan utföra och rikta medveten uppmärksamhet mot genom lärarens ingripande. Den närmaste utvecklingszonen går då att se som konstituerad av undervisning och lärande, och som en arena för utveckling av kvalitativt nya sätt att relatera till undervisningsinnehåll.

## 9.3.5 Samkonstruktion och inkluderande separation

Jag har hävdat ovan att jag vill försöka undvika en renodlad deltagandemodell för lärande, men även att tillägnande- och konstruktionsmodellerna leder till problem. Hur går det att ta problemet med att direkt kunskapsöverföring är omöjligt på allvar och samtidigt inte hamna i en överförenklad överföringsmodell eller individualkonstruktivistisk solipsism? I den här studien har jag försökt tillämpa ett samkonstruktionsperspektiv (*co-constructionist perspective*, Valsiner, 1996), som försöker balansera mellan individualkonstruktivistiska och sociogenetiska teorier. Genom en dubbelriktad modell för kulturell överföring och utveckling erkänner samkonstruktionsperspektivet både den enskilda individens utveckling som central och att samhället historiskt föregår varje individ. Detta innebär att de sociala situationer inom vilka lärande sker varken kan förstås uteslutande som kulturella produkter eller som produkter av individuella konstruktionsprocesser. Individer är med och konstruerar den sociala verkligheten genom interaktion och tolkning av andra individers konstruktion av den sociala verkligheten.

Detta innebär att ett samkonstruktionsperspektiv inte kan utgå från delad mening när lärande ska förklaras. Snarare syftar perspektivet till en analys av hur delad mening uppstår i interaktiva och tolkande processer. För att undvika den solipsism som riskerar att följa ur en individualkonstruktivistisk syn på mening argumenterar Valsiner (2014) för en position han kallar för inkluderande separation (*inclusive separation*). Grundidén här är att om vi differentierar två enheter A och B i ett holistiskt system AB så har vi även skapat en metaforisk gräns mellan dem. Men denna gräns är inte bara vad som skiljer dem åt utan även vad som binder dem samman. Metodologiskt innebär detta ett fokus på vad som händer på gränsen.

## 9.4 METODOLOGI

Metodologiskt tar avhandlingen avstamp i ett utvecklingsperspektiv, där forskningsobjektet blir tillgängligt för analys genom att det befinner sig i utveckling. Jag angriper även forskningsproblemet genom

att inrikta mig på specifika fall. Tillsammans innebär detta ett val av kvintcirkeln och ett antal näraliggande begrepp som studiens fokus, och ett urval av kontext och deltagare där dessa kan antas befinna sig i utveckling. Studiens val av analysenheter är inspirerat av Vygotskijs (Vygotsky, 2012) argument för ord-mening som analysenhet, men eftersom jag studerar ett diagram som innehåller både konventionella symboler och visuospiala tecken är en bättre benämning tecken-mening.

Matusov (2007) påpekar att Vygotskijs argumentation för ord-mening som analysenhet innehåller två olika betydelser av *enhet*: En deskriptiv analysenhet, som är den minsta beståndsdel som analyseras, och en fenomen-enhet, som är ett resultat av teoretisk analys av forskningsobjektet. Vygotskijs position är att fenomen-enheten bör vara sådan att den bevarar egenskaperna hos det holistiska fenomen som enheten är del av, och att detta bör återspeglas även i valet av deskriptiv analysenhet. Exempelvis bevarar ord-mening egenskaperna hos fenomenet verbalt tänkande, eftersom både tecken- (ord) och tänkande-komponenten (mening) finns kvar på denna analysnivå. Ord- eller tecken-mening är därmed även den typ av gränsfenomen jag pekat på ovan. Men eftersom jag inte kan studera tecken-mening direkt krävs även att denna fenomen-enhet operationaliseras i deskriptiva analysenheter. För den här avhandlingen är dessa de observerbara praktiker genom vilka tecken-mening kan utvecklas, och de individuella fall för vilka tecken-mening utvecklas.

För att klargöra vad som händer i de praktiker som studeras använder jag mig av verktyg från det Interaktionsanalytiska fältet (Jordan & Henderson, 1995). Jag vill dock understryka att detta inte är att förstå som en interaktionsanalytisk studie. Interaktionsanalys bär på vissa antaganden om vad lärande är, samt hur lärande kan studeras och beskrivas, som innevarande studie har ambitioner att bryta mot. Snarare bör interaktionsanalysen förstås som ett första lager av analys som särskilt riktar sig mot Forskningsfråga 1, och vars främsta styrka är att klargöra vad som faktiskt går att peka på i datamaterialet, och därmed även vad som måste härledas av forskaren.

Detaljerade studier av utvecklingsprocesser medan de sker kallas ibland mikrogenetiska (mikroutveckling). Wagoner (2009) utgår från en definition av mikrogenetisk metod som en empirisk strategi som sätter igång, dokumenterar och analyserar framväxten av nya fenomen, och utvecklar detta i en experimentell riktning. För Wagoner är ett experiment inte nödvändigtvis hypotestestande, utan utmärks snarare av att det utgör ett systematiskt ingrepp i tingens vanliga ordning i syfte att göra någon aspekt av verkligheten tillgänglig för analys. Mikrogenetiska experiment beror på variation i klarheten hos ett stimuli, och/eller i vilka medierande redskap som görs tillgängliga. I den här avhandlingen har jag försökt utforma mina intervjuer med detta i åtanke, som en sorts kvalitativa, mikrogenetiska experiment.

En sådan metodologisk position ställer även krav på analys och tolkning. Studiens utvecklingsperspektiv i allmänhet, och mikrogenetiska analyser i synnerhet, kräver en analys som inte endast beskriver en utvecklingssekvens, utan läser *mellan* observationer. Detta kräver även en abduktiv, snarare än induktiv eller deduktiv, förståelse av generalisering (Alvesson & Skoldberg, 2017; Tavory & Timmermans, 2014; Wagoner, 2009), där generaliseringsriktningen går från fall till hypotes, till ytterligare fall.

Det finns både teoretiska skäl (t.ex. potentiella begrepp) och skäl grundade i tidigare forskning (t.ex. Pramling & Wallerstedt, 2009) att anta att musikaliska handlingar och erfarenheter utgör en viktig aspekt av musikalisk begreppsbyggnad. Jag har därför försökt att utveckla intervjutekniker där deltagarna kan uttrycka musikaliskt kunnande *i* musik, och inte endast i samtal *om* musik. I samspel med den förståelse av intervjun som mikrogenetiskt experiment som diskuterades ovan har jag landat i att intervjuer *i* musik är möjliga, men behöver designas i termer av problemkontexter där de musikaliska aspekter som är av intresse lämnas öppna så att deltagare kan utforska dem i samspel med en intervjuare.

## 9.5 ETIK

Det här forskningsprojektet följer Vetenskapsrådets (Vetenskapsrådets expertgrupp för etik, 2011, 2017) riktlinjer för god forskningssed. Alla deltagare har informerats om studiens syfte och om sina rättigheter i muntlig och skriftlig form, och har samtyckt till deltagande. Alla namn på deltagare som förekommer i avhandlingen är pseudonymer. Datamaterialet förvaras på krypterade hårddiskar. Det är dock viktigt att påpeka att forskningsetik handlar om mer än att följa regler och riktlinjer. Som forskare på fältet ställs vi inför etiska dilemman som vi måste ta ställning till i stunden, vi måste även kontinuerligt göra etiska bedömningar under hela forskningsprocessen (Pring, 2001). För exempel på sådana etiska överväganden, se Avsnitt 5.2.1.

## 9.6 METOD

Det empiriska arbetet för den här avhandlingen genomfördes på ett estetiskt program med musikinriktning, på en gymnasieskola i en svensk småstad. Jag observerade och videodokumenterade en lärares lektioner i kursen Gehörs och musicklära 1 med två olika elevgrupper i åk. 1 under sex veckor. Jag genomförde även enskilda kvalitativa intervjuer med elever före och efter perioden med lektionsobservationer. Tio elever intervjuades i den första intervjuomgången, och sju av dessa intervjuades igen i den andra intervjuomgången (en av de ursprungliga tio bytte skola, två ville inte delta i ytterligare intervjuer). Även intervjuerna videofilmades.

Eftersom detta inte är en hypotestestande studie, och eftersom den har explorativa inslag, så har dess fokus på just kvintcirkeln växt fram under studiens gång. Inledningsvis inriktades studien mot tre musikteoretiska begrepp (TONIKA, TONART, GRUNDTON), som valdes ut på grund av teori, tidigare forskning, och samtal med läraren som deltog i studien. Den första intervjuomgången var alltså inte inriktad mot kvintcirkeln. Redan efter den första intervjuomgången, och ännu mer efter lektionsobservationerna, blev det tydligt att kvintcirkeln var central för att förstå hur dessa begrepp användes i den här utbildningspraktiken. Detta påverkade i sin tur designen av den andra intervjuomgången.

Intervjuomgång 1 organiserades kring en musikalisk aktivitet där deltagarna tillsammans med mig komponerade en kort melodi och satte ackord till den. Deltagarna fick välja mellan att komponera helt från grunden eller utgå från ett urval av förberedda inledningar jag hade med mig. Dessa var utformade så att tonartens grundton inte fanns med i melodin, och vissa införde tvetydigheter genom sekundärtonikor eller en eller flera tonartsfrämmande toner. Efter att vi färdigställt kompositionen förde vi ett samtal kring deltagarens musikaliska val. Intervjuomgång 1 innehöll även ett antal bakgrundsfrågor, bland annat kring vilka instrument deltagaren spelade, hens fritidsmusicerande och musikutbildningsbakgrund.

Perioden med lektionsobservationer varade i sex veckor. Två elevgrupper följdes, en (Grupp 1) med tolv elever och en (Grupp 2) med sex elever. En vanlig vecka hade varje elevgrupp två 40-minuterslektioner i Gehörs- och musiklära. På grund av helgdagar och schemabrytande aktiviteter dokumenterades totalt sju lektioner per grupp (alltså totalt 14 lektioner). En komplikation var att flera av lektionerna bestod i att eleverna fick tillfälle till egen gehörsövning (med hjälp av webbplatser som [musictheory.com](http://musictheory.com)), eller att de fick välja mellan en föreläsning och egen övning. Det blev svårt att videodokumentera denna egna övning på grund av att elevernas datorskärmar var svåra att videofilma, för att de ofta använde hörlurar, och för att den ofta skedde i korridorer där även elever som inte godkänt deltagande i studien uppehöll sig. De lektioner som hade ett tydligare tema behandlade olika områden, bl.a. rytm och rytmnotation, dur- och molltreklanger, samt kvintcirkeln, harmonilära och transponering. För den här studien valdes därför sex lektioner ut för närmare analys (de som behandlade kvintcirkeln och näraliggande begrepp).

Den andra intervjuomgången, där sju elever deltog, byggde i hög grad på vad som observerats under lektionerna. Där hade förmågan att reproducera kvintcirkeln och använda den för att transponera korta ackordföljder framträtt som högt värderat. Deltagarna ombads därför att först rita upp en kvintcirkel efter bästa förmåga (med stöd från mig vid behov), därefter ombads de använda den för att transponera ackordföljder på ett liknande vis som under lektionerna.

En viktig skillnad var dock att deltagarna inte fick ackordföljdens tonart av mig. Därefter bad jag deltagarna att utföra samma typ av transponeringar utan att ha kvintcirkelinskriftionen framför sig, och stöttade vid behov i att tillämpa den funktionsterminologi som användes under lektionerna. Detta bör inte förstås som att deltagarna skulle genomföra uppgiften utan tillgång till kulturella verktyg, utan snarare som en förändring i villkoren för verktygsanvändningen. Under alla dessa moment uppmanades deltagarna att förklara hur de grep sig an uppgifterna. Intervjuomgång 2 innehöll även en lyssningsuppgift som inte har använts i avhandlingens resultatdel.

Både intervjuer och lektioner dokumenterades med hjälp av videoinspelning och fältanteckningar. Inskriptioner som deltagarna producerade samlades in eller dokumenterades. För majoriteten av de lektioner som analyseras i den här avhandlingen, och för samtliga intervjuer, användes en stationär kamera. En lektion blev endast dokumenterad med fältanteckningar p.g.a. tekniska problem. En intervju blev endast ljudinspelad, även då p.g.a. problem med kameran.

Intervjuerna transkriberades med verktyget ELAN, som gör det möjligt att transkribera olika modaliteter (t.ex. musik, gestik och tal) på olika rader (som i en DAW eller ett partitur), och på så vis visualisera samtidighet mellan olika modaliteter. ELAN kan inte hantera musiknotation, så melodispel transkriberades (i den mån det var nödvändigt för närmare analys) separat för hand. Eftersom de lektioner som valts ut för närmare analys hade ett format där läraren föreläste och ritade/skrev på tavlan, tog jag beslutet att den extra tid som hade krävts för en transkription i ELAN inte var motiverad. Istället har en ordbehandlare använts för dessa transkriptioner.

I resultatkapitlet presenteras excerpt av främst musikalisk interaktion som partitur med en anpassad notation (se Figure 7) och excerpt av främst talspråklig interaktion i ett mer traditionellt "manus"-format, men med tal i en kolumn och andra handlingar (t.ex. gestik, rita på tavlan) i en annan kolumn (se Table 5). Eftersom avhandlingen är skriven på engelska har de utdrag ur datamaterialet som presenteras översatts från svenska. Det är dock viktigt att påpeka att analysen genomförts på transkriptionerna i originalspråk.



Analys påbörjas i någon mening redan på fältet, och det finns en analytisk aspekt även av transkriptionsarbetet. Analysen av det transkriberade materialet, tillsammans med fältanteckningar och insamlade/dokumenterade inskriptioner, skedde främst genom ELAN, där video kan visas medan transkript uppdelat på olika modaliteter rullar förbi nedanför, och med hjälp av det kvalitativa analysverktyget NVivo. NVivo användes särskilt för lektionerna, där olika användningar av begrepp och av kvintcirkeln kodades i teoretiskt och empiriskt grundade kategorier. I analysarbetet framträdde framför allt ett fall, eleven Lena, som särskilt givande. Ofta har de abduktivt genererade hypoteser som hjälpt till att göra mer obskyra episoder begripliga sitt ursprung i analysen av Lenas intervjuer. Jag har valt att låta detta återspeglas i framställningen, på så vis att excerpt från Lenas intervjuer dominerar bland de elevfall som presenteras, medan andra elevfall mest används för att underbygga, nyansera, kontextualisera, eller problematisera dessa tolkningar.

### 9.7 RESULTAT

Den empiriska studien visar på en utbildningspraktik där aktiviteterna kan delas in i tre huvudsakliga kategorier:

- 1 Självständig övning, framför allt i arbete med intervall, notläsning, och melodidiktat.
- 2 Grupparbete, framför allt i arbete med takt, rytm och rytmnotation.
- 3 Lärarledda föreläsningar och demonstrationer, framför allt i arbete med harmonilära, kvintcirkeln, tonarter och transponering.

I den här avhandlingen analyseras lektioner i kategori tre. Kvintcirkeln var central i nästan all undervisning som tog upp tonalitetsrelaterade begrepp, t.ex. TONIKA eller TONART. Användningen av sådana begrepp var nästan uteslutande integrerade i olika problemlösningstrategier, vilket ledde till att information om vad begreppen betyder förblev implicit. Här kommer jag till att börja med granska strategier för att orientera sig i och reproducera kvintcirkeln.

## 9.7.1 Introducera, minnas och reproducera kvintcirkeln

Det finns endast ett fåtal exempel på sådant som skulle kunna anses vara en definition eller förklaring av kvintcirkeln. I dessa episoder konstrueras diagrammet som en modell som visar alla tonarter, och läraren erbjuder två principer för hur dessa är organiserade: (1) Ordningen bestäms av antal förtecken (fler korsförtecken medurs från C, och fler b-förtecken moturs från C) och (2) att det är en kvint mellan varje tonart. I samband med (1) introduceras även en indelning av cirkeln i en korssida och en b-sida, som fortsätter att spela en viktig roll.

En betydligt större del av lektionstiden ägnas åt olika minnestekniker som används för att generera kvintcirkeldiagrammet. Dessa utgår från minnesramsor som genererar tonarterna medurs från G (ibland C) till Fiss (t.ex. *Gå du Axel efter Bertils fiskar*) och moturs från F till Gess (t.ex. *Frosten bestal Esters aster dess gestalt*). Flera elever lägger stor vikt vid att förstå vad ramsorna betyder, vilket indikerar att en förståelse av ramsornas mening är viktig för deras funktion som minnestekniker. Dessa ramsor är närmast paradigmatiska exempel på semiotiskt medierat minnande (Vygotsky, 1997a; Vygotsky & Luria, 1994), alltså användandet av tecken för att utöka kapaciteten hos minnet. När durtonarterna längs kvintcirkelns periferi genererats ställs deltagarna inför utmaningen att minnas de motsvarande mollparallelltonarterna på cirkelns insida. Läraren demonstrerar två olika problemlösningstrategier för detta. Båda strategierna utgår från de redan genererade durtonarterna.

Den ena strategin går ut på att hitta den tangent på en pianoklaviatur som har samma namn som en symbol i kvintcirkeln, och sedan räkna tre halvtonsteg ned (åt vänster) från denna. Den tangent man landar på efter denna operation avläses som ett tonnamn (och om den är svart, som höjd eller sänkt beroende på om man utgår från på cirkelns kors- eller b-sida), som sedan förs över till kvintcirkeldiagrammet, där ”m” för moll läggs till. Denna strategi skapar alltså en adekvation mellan en spatial relation i kvintcirkelinskriftion och en operation med annan inskription (pianoklaviaturens inskriptionsaspekt, eller som under lektionerna, en pianoklaviatur uppritad på tavlan). Denna bygger i sin tur på att vi kan använda

samma symbol (t.ex. "C", eller en väletablerad koppling mellan ljudet [se] och bokstaven) för både en ton, en pianotangent, ett ackord och en tonart.

Den andra strategin använder sig istället rekursivt av de redan genererade tonarterna så som de är uppställda i kvintcirkeln, genom att hoppa tre steg medurs (t.ex. med början på C, hoppa till G, sedan D, och landa på A). Den symbol man landar på kopieras sedan till den vedertagna positionen för parallelltonarten och får ett "m" för moll. När denna strategi appliceras på E, B, och Fiss resulterar den dock i enharmonisk förväxling (t.ex. B-durs parallelltonart blir ass-moll istället för giss-moll). Därför presenteras även en utökad version av tekniken som syftar till att undvika detta. Istället för att hoppa från cirkelns korssida till dess b-sida (från Fiss/Gess till Dess) skall man i denna teknik hoppa lodrätt upp från Fiss till C, fortsätta eventuella kvarvarande hopp medurs därifrån, och avläsa den symbol man landar på med ett tillagt korsförtecken. För att generera B-durs mollparallell genomför man alltså följande: (1) Hoppa från B till Fiss; (2) hoppa från Fiss till C; (3) hoppa från C till G; (4) lägg till ett korsförtecken så att G avläses Giss; (5) kopiera detta Giss till rätt position innanför B; (6) lägg till "m" för moll. (Jfr. Figure 10 och Figure 12).

Den senare av dessa båda tekniker, och särskilt dess utökade version, är bland de mest tydliga exemplen i materialet på en mer generell tendens i den här utbildningspraktiken. Representationens logik hamnar i förgrunden medan den logik som representeras hamnar i bakgrunden. Med andra ord förlitar man sig på inskriptioners och teckens form snarare än deras mening.

Under den andra intervjuomgången ombads de sju elever som deltog att rita upp en kvintcirkel. Här går att urskilja åtminstone tre olika strategier. Två av dessa har gemensamt att de medieras av någon form av meningsfull struktur, men skiljs åt gällande huruvida denna är integrerad i ett ämnesrelevant begreppssystem (t.ex. kvintcirkeln är uppbyggd av kvinter) eller ej (t.ex. en minnesramsa). Den tredje strategin verkade inte förlita sig på medierat minnande i samma mån, utan på innötning och möjligtvis bildminne. För att minnas parallellerna på cirkelns insida använde de flesta någon av

de båda teknikerna som beskrivits ovan, eller kombinationer. Två deltagare hade lyckats automatisera minnandet av paralleller på ett fungerande vis i högre grad än de övriga, och kopplade detta till att de använt begreppen i musikalisk praktik. Sammantaget gör detta att det går att passa in deltagarna i en hypotetisk utvecklingsmodell (Vygotsky, 1997a; Vygotsky & Luria, 1994), där högre mentala funktioner (här minnandefunktioner) utvecklas från ett stadie där tecken inte används, eller används på ett ofullständigt vis, via ett stadie där externa tecken används, till ett stadie där tecken används intramentalt.

Intervjuerna visar även att vissa deltagare kan använda samma typ av minnestekniker som de använder för att återskapa kvintcirkeln på papper för att återskapa den intramentalt, och på så vis använda diagrammet för att lösa transponeringsproblem även utan tillgång till en inskription av diagrammet. Genom att *externalisera* delar av minnesramsor verbalt *internaliseras* en föreställd kvintcirkel som deltagaren kan genomföra operationer i med hjälp av pekandegester. Detta ska dock inte alltid tolkas som att deltagaren har förstått diagrammets bakomliggande principer, till exempel är det möjligt att göra allt detta utan att känna till att kvintcirkeln är uppbyggd av kvinter.

### 9.7.2 Tillämpa kvintcirkeln

Under lektionerna är inte definitioner eller förklaringar de vanligaste sätten att göra kvintcirkeln meningsfull, utan snarare tillämpning av kvintcirkeln för att transponera korta ackordföljder. I materialet som helhet går det att identifiera två olika sätt att begreppsliggöra transponering (av ackord): (1) Att flytta alla ackord samma intervall upp eller ned, eller (2) att återskapa samma mönster av ackord i relation till en ny referenspunkt. Kvintcirkeln används i den här utbildningspraktiken som en visualisering av, och ett verktyg för att åstadkomma (2), vilket möjliggörs av att (1) är så att säga inbyggd, under ytan, i diagrammets konstruktion.

Eftersom kvintcirkeln är en relativt abstrakt representation så behöver läraren använda begrepp på en lägre abstraktionsnivå för att

mediera transponeringsproceduren. Detta åstadkoms genom att först etablera en tonart och (ofta) en funktionsanalys för den ackordföljd som ska transponeras, och genom att använda denna terminologi för att mediera övergången mellan den linjära ackordföljdsinskriftionen och den tvådimensionella representationen av ackordrelationer i kvintcirkeln. På så vis modellerar läraren en adekvering mellan dessa båda inskriftioner, vilken i sin tur används för att illustrera på vilket vis originalackordföljden och den transponerade ackordföljden är *samma* ackordföljd i en mönsterbaserad förståelse av transponering.

Ackordföljdernas tonart och eller tonika behandlas oftast som given. När läraren behöver gå in på hur dessa bestäms använder han sig av något han kallar för en "box" – att ringa in en grupp av sex ackord (t.ex. C, Am, F, Dm, G och Em) där det ackord som hamnar i mitten kategoriseras som tonarten/tonikan. Bestämmandet av tonart, tonika och tonartens grundton medieras av att de kan benämnas med samma tecken (t.ex. "C"). När en tonika etableras använder läraren kvintcirkeln för att genomföra resten av funktionsanalysen, genom att tillämpa regler som exempelvis *subdominanten ligger alltid till vänster (moturs) om tonikan i kvintcirkeln*. Själva transponeringen genomförs sedan i princip genom att genomföra funktionsanalysen baklänges i relation till den nya tonikan. På detta vis konstrueras betydelsen av SUBDOMINANT, DOMINANT, TONIKAPARALLELL, SUBDOMINANTPARALLELL och DOMINANTPARALLELL i princip som riktningar i kvintcirkeldiagrammet. Detta är ytterligare ett exempel på hur ytfenomen hos tecken, representationer och inskriftioner premieras.

Det visar sig dock att denna problemlösningstrategi kan vara svår för eleverna att tillämpa när problemen rör sig utanför den smala problemkategori den demonstreras på. Exempelvis när ackordföljden går i moll, eller när det inte går att anta att den börjar på tonikaackordet. BOX-begreppet och operationen att ringa in en grupp ackord för att representera en tonart kan exempelvis inte skilja mellan moll- och durtonarter. I Lenas första intervju går det även att se hur BOX-begreppet lägger hinder i vägen för en sammanhängande redogörelse för kompositionsprocessen. När Lena försöker redogöra för hur hon valt slutackord använder hon sig av

kvintcirkeln och ritar upp en box, och menar att hon ”valt” C som tonika under harmoniseringsprocessen. Eftersom BOX-begreppet, till skillnad från TONARTS-begreppet, är uteslutande harmoniskt, går det inte att formulera att tonarten etablerades redan under melodikompositionsfasen av kompositionsprocessen.

### 9.7.3 Definitioner, förklaringar, algoritmer för benämning och avsaknaden av musik

Som nämnts ovan är definitioner och förklaringar ovanliga i lektionsmaterialet. Även formuleringar som ser ut som definitioner genom att de har formen *X är Y*, ibland kompletterat med *alltid*, går oftare att förstå som regler för att åstadkomma klassificeringar, för att benämna någon symbol som tillhörande någon viss kategori (t.ex. klassificera symbolen ”C” i en ackordföljd som varandes TONIKA). Liksom den övergripande transponeringsproblemlösningstrategi läraren demonstrerar kan dessa förstås som algoritmer, som tar en eller flera symboler som input, och med tillämpandet av en regel ger en annan symbol som output. I flera fall leder detta till att begreppens mening döljs i beskrivningar av förhållanden inom eller operationer med kvintcirkeln.

Det händer dock att läraren försöker utreda vad vissa begrepp betyder eller hur de låter. Framför allt gäller detta TONIKA och GRUNDTON, som får en förklaring. Denna är dock svår att reda ut, och visar möjligtvis på hur svårt det kan vara att sätta ord på den fenomenologiska aspekten av dessa begrepp. Denna svårighet beror åtminstone delvis på att de lektioner som tar upp tonart, funktionsbegrepp och kvintcirkeln i princip helt saknar musikaliska inslag. De kretsar helt kring tekniker för symbolmanipulering. Det är inte heller särskilt vanligt att läraren talar om hur de fenomen som exempelvis TONIKA, SUBDOMINANT och DOMINANT konventionellt refererar till faktiskt låter.

## 9.8 DISKUSSION

Avhandlingens första forskningsfråga gällde hur kvintcirkeln introduceras, reproduceras och används i utbildningspraktiken. Jag visar att kvintcirkeln framför allt konstrueras som ett verktyg för att lösa en viss typ av transponeringsproblem, och som något som ska memoriseras i detta syfte. Detta ligger i linje med den tidigare forskning som finns på ämnet Gehörs- och musiklära i den svenska gymnasieskolan (Zimmerman Nilsson, 2009). Anledningen till att förmågan att reproducera kvintcirkeln med hjälp av minnestekniker värderas så pass högt är troligtvis att detta syftar till att göra den portabel, så att den kan tas med i situationer där det är omöjligt eller otillåtet att ha med sig en inskription (t.ex. i olika testsituationer).

Kvintcirkeln används framför allt för att lösa transponeringsuppgifter, och mycket lektionstid läggs på att demonstrera en algoritm för att genomföra sådana transponeringar. Kvintcirkeln fungerar därmed även som en visualisering av en mönsterbaserad förståelse av transponering, som dock inte görs explicit, annat än genom användandet av tonalitetsrelaterad terminologi för att mediera processen. Dessa termer får dock ofta sin förklaring utifrån kvintcirkeln, vilket skapar ett cirkulärt begreppssystem där operationer med kvintcirkeln förklaras med hjälp av begrepp som definieras med hjälp av kvintcirkeln. Utbildningspraktiken kan möjligtvis förstås som att den syftar till att orientera eleverna i ett teckensystem snarare än i ett begreppssystem, vilket leder till det fokus på tecknens, representationernas och inskriptionernas ytnivå som dokumenterats. Denna cirkularitet kan även förstås utifrån elevernas förkunskapsnivå. Läraren står inför utmaningen att bygga ett begreppssystem mer eller mindre från grunden, och det är kanske ofrånkomligt att begreppsrelationer som framstår som hierarkiska lokalt blir cirkulära i ett vidare perspektiv.

Avhandlingens andra forskningsfråga gällde hur de sätt på vilka kvintcirkeln introduceras, reproduceras och används i utbildningspraktiken stöttar lärprocesser. På ett vis är den begreppsanvändning som analyserats i den här avhandlingen ett typexempel på vetenskapliga begreppsbildningsprocesser. Det är en lång kedja av mellanliggande begrepp från kvintcirkeln, via tonarts- och funktionsbegrepp, till ackordbegrepp och ackordsymboler, och

slutligen till de musikaliska fenomen som ackordföljderna på tavlan representerar. Läraren står dock, som sagt, inför utmaningen att bygga ett begrepps-system i princip från grunden, vilket gör det svårt att skapa hierarkiska relationer mellan begrepp. Istället tenderar mycket av begreppens mening att förbli implicit i upprepad tillämpning på ett vis som är karaktäristiskt för vardagliga begrepps-bildningsprocesser. Men avsaknaden av klingande musikexempel leder till att styrkan hos vardaglig begrepps-bildning blir svår att ta tillvara på. Detta bidrar till den cirkulära begrepps-användningen, då det saknas en möjlighet att stanna upp och säga *men lyssna på hur det låter!*

Det går att se spänningar mellan den i grunden tonartsagnostiska, mönsterbaserade transponeringstekniken och de tonalitätsbaserade begrepp som medierar den. Detta leder till svårigheter när elever försöker tillämpa dessa utanför den problemkontext som de introducerats i. Detta glapp mellan begrepps-systemet och dess tillämpning visar sig exempelvis i hur Lena redogör för sin kompositionsprocess. BOX-begreppet, och de operationer med kvintcirkeln som det medierar, förmår inte förklara hur valet av tonart görs i en melodisk kontext. Detta isolerar kvintcirkeln, och den förståelse av tonalitet som iscensätts med hjälp av diagrammet under lektionerna, från tonalitet som musikalisk erfarenhet och praktik.

För avhandlingen formulerades ett övergripande forskningsproblem gällande de processer genom vilka elever lär sig musikteoretiska begrepp och modeller, och gällande hur dessa processer relaterar till specifika utbildningspraktiker. Detta problem specificerades sedan som en fallstudie med kvintcirkeln och dess associerade begrepp samt elever involverade i Gehörs- och musikläraundervisning som fall. Går det att dra några mer generella lärdomar utifrån denna fallstudie? Jag skulle vilja uppmärksamma två aspekter:

För det första, den här studien visar på en skillnad mellan olika typer av meningsfulla strukturer som semiotiskt medierar och reglerar olika aktiviteter. De minnestekniker, regler, definitioner och förklaringar som beskrivits kan sägas befinna sig på ett spektrum från stängda till öppna. Minnesramsor skapar små meningsfulla enheter som kan hjälpa oss att minnas eller orientera oss i en representation, men är stängda i den meningen att de inte använder



ämnesrelevanta begrepp, och därmed inte är integrerade i ett musikteoretiskt begreppssystem. De regler jag beskrivit är mer öppna, eftersom de använder ämnesrelevanta begrepp. Men de skapar ingen begreppshierarki. Det finns inget i regeln *grundtonen är samma som ackordet heter* som talar om att ackordet heter vad det heter för att det har en viss grundton. De tenderar även att operera med tecknens ytfenomen. Definitioner skapar en begreppshierarki, och öppnar på så vis ytterligare en dimension i begreppssystemet. Om jag vet att SUBDOMINANT är en typ av ACKORD så kan jag tillämpa det jag vet om ackord på subdominanter, men inte tvärt om. Det finns även exempel på hur begrepp utreds på ett vis som varken går att reducera till en regel, eller går att analysera som en definition. I brist på en bättre term kallar jag här detta för förklaringar. Förklaringar kan förstås som att de öppnar ytterligare en dimension av begreppsutveckling, då de kan användas för att mediera vetenskapliga begrepp i termer av vardagliga begrepp, och på så vis hjälpa elever att grunda abstrakta begrepp i musikalisk erfarenhet.

För det andra vill jag peka på vikten av klassificering och benämning. Det finns en anledning till att många av de regler som dokumenterats i den här studien medierar en klassificering. Utan klassificering i termer av något begrepp kan vi inte tillämpa generella problemlösningstrategier som formuleras i termer av detta begrepp. Men även mer spontana, ad hoc-klassificeringar spelar en viktig roll för möjligheten att dra in musikaliska erfarenheter och praktiker i semiotiskt medierade begreppsbildningsprocesser.

Det är dock viktigt att inte se detta som en linjär process. Musikpedagogiken fångas ofta i frågor som t.ex. ”ljud-före-tecken eller tecken-före-ljud?” (McPherson & Gabrielsson, 2002), där begreppsbildning ses som något som antingen handlar om att sätta etiketter på redan formade musikaliska erfarenheter, eller att ha språkliga begrepp tillhanda för att organisera musikalisk erfarenhet. Utifrån en linjär syn på utveckling och lärande blir då den naturliga frågan ”vad ska vi börja med?” Jag menar dock att frågan är felställd. Gruhn (2006) argumenterar exempelvis för en musikdidaktik som undviker att introducera begrepp och teckensystem tidigt, utifrån en dikotomisering av språkligt medierad kunskap och musikalisk

kunskap, samt antagandet att autentiskt musikaliskt lärande enbart kan ske i musikalisk praktik. Med en linjär syn på utveckling och lärande blir det (till synes) självklara svaret på frågan om var vi ska börja ”med musiken förstås!” Men hela frågeställningen bygger på det tvivelaktiga antagandet att vi måste börja med det ena eller andra, snarare än med båda samtidigt. Om vi istället ser begreppsutveckling som en dialektisk process, så kan vi ställa andra typer av frågor, och belysa hur abstraktion och generalisering i handling samspelar med vardagliga och vetenskapliga begreppsbildningsprocesser.

#### 9.8.1 Metodologiska svagheter och utvecklingsmöjligheter

I linje med studiens abduktiva analysansats har jag försökt formulera relativt starka slutsatser. På så vis menar jag att de blir lättare att pröva, kritisera och bygga vidare på. Studien har förstås vissa svagheter som dessa slutsatser bör läsas i ljuset av. Jag har i Avsnitt 5.2.1 lyft några etiska problem jag varit tvungen att hantera under studiens gång, och i Avsnitt 6.4.1 har jag diskuterat begränsningar i lektionsmaterialet. Här vill jag istället börja med att lyfta en mer övergripande fråga.

Om en studies design värderas utifrån hur väl den svarar upp mot forskningsproblem och forskningsfrågor, så är en svaghet i den här studien att dessa har förändrats under studiens gång, och att alla designval därmed inte svarar upp mot de slutgiltiga forskningsfrågorna. Särskilt gäller detta intervjuerna, som jag delvis planerat i närmast experimentella termer. Fokus på kvintcirkeln växte gradvis fram, främst på basis av lektionsobservationerna, vilket har gjort att framför allt intervjuomgång ett inte planerats med kvintcirkeln i åtanke. Detta kan i sin tur ha inverkat på mitt val att låta ett av elevfallen (Lena) hamna i förgrunden, då hennes första intervju var särskilt relevant för frågeställningar om kvintcirkeln. Detta val har fördelar och nackdelar. En fördel är att läsaren får en relativt fyllig insyn i och förståelse för detta enskilda fall, en nackdel är att det försvårar jämförelsen mellan fall.

En liknande problematik finns kring lektionerna, men där handlar det inte så mycket om fokus på kvintcirkeln specifikt,

och mer om hur jag i planeringsstadiet såg på lektionernas roll i avhandlingen som helhet. Hade jag vetat från början hur viktigt inskriptionsbegreppet skulle bli hade en mer genomtänkt kamera-placering i klassrummet, som kunde fånga elevernas arbete med sina anteckningar (och inte bara dokumentera dem i slutet av lektionen), varit att föredra. Hade jag vetat hur lärardominerade de lektioner som kom att bilda fokus för analysen skulle vara skulle jag antagligen ha utvecklat en mer kollaborativ design, där jag kunnat ta del av lärarens didaktiska överväganden eller till och med vara med och planera lektionerna.

I det här projektet har jag experimenterat med intervjuer i musik. Dessa kom att spela en mindre roll än förväntat (p.g.a. bytet av inriktning), men jag tror ändå att jag kan peka ut några möjliga förbättringar av metoden för den som skulle vilja tillämpa den. Jag vill understryka att anpassning av svårighetsgraden hos det musikaliska problem deltagaren ställs inför har visat sig vara viktigt. Det är när problemet blir svårt nog att kräva externalisering och samarbete som det rikaste datamaterialet produceras. Hade jag genomfört intervjuerna idag hade jag låtit samtliga utgå från förkomponerade inledningar, då dessa tenderade att lägga hinder i vägen för deltagarnas mest invanda problemlösningsstrategier. Var dessa hinder bör ligga beror förstås på vilka frågor intervjuerna är tänkta att besvara. Ytterligare en lärdom är att musikinstrumentet spelar en viktig roll. Den intervju som genomfördes med en deltagare som valde att sjunga gav mycket mindre information. Det beror både på att rösten är alltför intuitiv, och på att utan ett (externt) instrument saknas ett verktyg för att referera till specifika musikaliska fenomen, vilket gör det svårare att samtala om (och i) musikaktiviteten. Ett starkare fokus på vilka redskap som introduceras i aktiviteten hade varit bara, både gällande planeringen och gällande dokumentationen.

### 9.8.2 Utveckling av undervisningspraktik

Jag vill vara försiktig med att komma med rekommendationer för undervisningspraktik, eftersom innevarande studie inte har varit upplagd som en intervention. Jag kan komma med några konkreta

förslag som jag menar är grundade i studiens teoretiska perspektiv och empiriska underlag, exempelvis att använda musikaliska exempel, variera exempel för att undvika felaktiga övergeneraliseringar, och att göra implicita begreppsliga relationer explicita. Jag tror dock att ett viktigare bidrag till lärares praktik är att utveckla teoretiskt och empiriskt grundade begrepp och distinktioner som kan vara användbara i planering och utvärdering av undervisning. Jag menar att de konkreta rekommendationerna ovan i någon mån följer ur en tillämpning av dessa begrepp och distinktioner.

Efter att ha kört Vygotskijs (Vygotsky, 2012) distinktion mellan vardagliga och vetenskapliga begrepp, samt hans beskrivning av potentiella begrepp, genom den empiriska köttkvarnen tror jag mig kunna säga något om hur de kan tillämpas i musikpedagogiska sammanhang och särskilt i relation till Gehörs- och musikleäraundervisning. Dessa begrepp-om-begrepp riktar vår uppmärksamhet mot vikten av att lärare stöttar dialektiken mellan olika typer av begreppsbildningsprocesser. Där ingår att skapa musikaliska aktiviteter som skapar förutsättningar för potentiella begrepp, att stötta verbalisering av ad hoc-generaliseringar i sådana sammanhang, och att begagna sig av dessa för att mediera vetenskapliga begrepp, men även att skapa vetenskapliga begreppssystem. Dessa kanske till en början är verbalistiska, men är redo att fånga upp och systematisera generaliseringar i termer av vardagliga begrepp.

Jag tror även att distinktionen mellan mer eller mindre öppna meningsfulla strukturer kan vara användbar för lärare. Jag vill understryka att denna distinktion inte ska tolkas som att öppna strukturer är bra och stängda strukturer är dåliga. Undervisning som uteslutande utgick från vad jag kallat förklaringar skulle bli hopplöst subjektiv, alla försök att utgå från endast definitioner skulle leda till en oändlig regress. Snarare menar jag att vi behöver vara uppmärksamma på att olika meningsfulla strukturer erbjuder olika handlingsmöjligheter och har olika utvecklingspotentialer. Minnestekniker, som exempelvis minnesramsor för tonarternas ordning i kvintcirkeln, är av värde för att de tillåter elever att genomföra handlingar som de inte hade kunnat genomföra utan att, exempelvis, minnas tonarternas ordning i kvintcirkeln. Den didaktiska frågan vi

måste ställa oss när vi väljer om vi vill lägga tid på en minnesramsa eller regel, eller (sannolikt) mer tid på att etablera en mer öppen meningsfull struktur som åstadkommer samma sak, är vad eleverna kan lära sig av att genomföra dessa handlingar.

### 9.8.3 Vidare forskning

Jag har, som sagt, försökt formulera relativt starka slutsatser. Min förhoppning är att detta ska göra det lättare för de som vill vidareutveckla min analys, tillämpa den i en annan kontext, eller (kanske viktigast) visa att den är felaktig. För den som vill försöka sig på något av detta, och kanske särskilt det sista, skulle jag rekommendera ett fokus på två aspekter av mitt resultat som framför allt bygger på en avsaknad av något i den studerade kontexten: Musik och definitioner i musikteoriklassrummet. Båda dessa ämnen skulle göra sig väl som praktisknära forskning i samarbete med lärare. Variationsteori och *Learning Study* skulle exempelvis kunna utgöra ett ramverk för att begreppsliggöra och studera olika sätt att använda musikaliska exempel. Även en studie av definitionsanvändning skulle tjäna på planering och uppföljning i samarbete med lärare, eller kanske ett lärarlag från olika skolämnen.

En aspekt av den här undersökningen som inte fick ta så mycket plats som jag hade önskat är gränssnittet mellan musikaliskt och teckenbaserat tänkande (och handlande). Här tror jag att klassrumsbaserade studier kan behöva kompletteras med intervjustudier och/eller experimentellt inriktade studier, kanske med någon variant av intervjuer i musik. Bambergers och andras studier av barns påhittade notationer tar upp en del av denna problematik, men det verkar finnas ett behov av liknande studier som riktas mot etablerade begrepps- och symbolsystem – de som tenderar att fokuseras i undervisning.

Ytterligare en aspekt av avhandlingens resultat som inte har utgjort ett primärt fokus är hur musikteori och gehörslära som discipliner konstrueras i utbildningspraktiker. Jag har exempelvis noterat hur läraren tenderar att försöka avdramatisera ämnet och hur detta relaterar till en konstruktion av musikteoretisk kunskap som godtycklig. Det hade varit värdefullt att få reda på om detta är

vanligt förekommande, och hur det relaterar till mer övergripande musikpedagogiska diskurser.

Det finns nu två empiriska studier av Gehörs- och musikläraundervisning i svensk gymnasieskola (föreliggande avhandling samt Zimmerman Nilsson, 2009). Båda visar bland annat att undervisningsinnehållet behandlas som en verktygslåda som elever förväntas lära sig att använda för att lösa en viss typ av problem med, och att innehållet presenteras som isolerade enheter. Dessa likheter är slående, men det rör sig om två kvalitativa studier, och vi bör vara försiktiga med att försöka generalisera detta till Gehörs- och musikläraundervisning i allmänhet. Det vore därför intressant att följa upp dessa studier med mer omfattande observationsstudier på flera skolor, med någon form av enkätundersökning (liksom vad Buonviri & Paney, 2015, gjort i USA), eller någon kombination av dessa.

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## Appendices



## HÖGSKOLAN FÖR SCEN OCH MUSIK

### Information och medgivande för deltagare i forskningsprojekt

Som deltagare i ett forskningsprojekt är det viktigt att du känner till vad projektet går ut på och vad din medverkan innebär. I det här dokumentet sammanfattar jag projektets bakgrund, syfte och övergripande upplägg. Jag beskriver även vad deltagande i projektet innebär praktiskt, dina rättigheter som deltagare i ett forskningsprojekt, hur det material som produceras i den empiriska studien kommer att hanteras samt hur din identitet kommer att skyddas.

#### Projektets bakgrund, syfte och upplägg

Det här forskningsprojektet bedrivs som en del av min forskarutbildning inom forskarskolan CUL (<http://cul.gu.se>) vid Göteborgs universitet, och kommer att ligga till grund för min doktorsavhandling. Projektet syftar till att skapa en bättre förståelse av hur elever lär sig musikaliska begrepp, och hur sådana begrepp blir meningsfulla för eleverna i termer av deras praktiska musikkunnande. Detta syfte har sin bakgrund i frågor som dykt upp i min egen verksamhet som musiklärare, men även i att relationen mellan att kunna musik och att kunna tala om musik är teoretiskt intressant. Förhoppningen är att forskningsprojektet skall bidra till en bättre grund för musiklärarens undervisning och till framsteg inom det musikpedagogiska forskningsfältet mer generellt. För att uppnå projektets syfte behöver jag samla in empiriskt material som jag kan analysera. Därför kommer jag att följa och dokumentera undervisning i ämnet Gehörs- och musiklära under en period då ett lämpligt begrepp introduceras och används, samt intervjuar ett urval av elever före, under och efter perioden.

#### Vad innebär deltagande praktiskt?

Som deltagande lärare är du av central betydelse för projektet. Vi kommer tillsammans välja ut ett lämpligt begrepp, en lämplig tidsperiod samt en lämplig elevgrupp utifrån din planering och din kännedom om dina elever. Det kan hända att jag behöver dokumentera vissa av våra samtal med ljudinspelning. Den del av datainsamlingen som påverkar dig kommer sedan gå till på så vis att jag sitter med under ett antal lektioner och dokumenterar dem med videokamera (jag kommer även vilja fotografera/kopiera stenciler o.dyl.).

#### Dina rättigheter, materialhantering och anonymitet

Som deltagare i ett forskningsprojekt har du rätt att när som helst avbryta din medverkan. Din integritet och din rätt till privatliv skall respekteras. För att skydda din och övriga deltagares identitet kommer fingerade namn (på individer, skola, kommun, etc.) användas i alla publikationer som använder sig av det material som produceras under den empiriska studien. I den mån bilder publiceras kommer de att redigeras så att deltagare inte kan identifieras utifrån bildmaterialet. Eftersom den här studien intresserar sig för specifika lärandeprocesser, snarare än generella statistiska samband, så kan inte total anonymitet garanteras. Särskilt i de fall då läsaren redan känner till att du varit med i forskningsprojektet (t.ex. en kollega) kan det gå att sluta sig till vem som sagt vad trots fingerade namn. Det material som produceras kommer enbart att användas i forsknings syfte. Sådant material som inte är anonymiserat (videospelningar, ljudinspelningar, insamlade dokument där deltagares namn framgår, etc.) kommer förvaras i låst säkerhetsskåp på institutionen. Jag står till förfogande under hela forskningsprocessen, om det skulle dyka upp frågor eller om någonting upplevs som problematiskt. Ansvarig handledare för projektet är Monica Lindgren, professor i musikpedagogik vid Högskolan för scen och musik, Göteborgs universitet (för kontaktuppgifter, se följande sida).



## Medgivande

- Jag är införstådd med det ovanstående och vill delta i studien (sätt kryss i rutan för medgivande)

Datum: \_\_\_\_\_ Namnförtydligande: \_\_\_\_\_

Signatur: \_\_\_\_\_

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## HÖGSKOLAN FÖR SCEN OCH MUSIK

## TILL ELEVER I GYMNASIESKOLANS ESTETISKA PROGRAM

## Information och medgivande för deltagare i forskningsprojekt

Jag är doktorand på Högskolan för scen och musik (musikhögskolan) i Göteborg. Att jag är doktorand innebär att jag håller på att utbilda mig till forskare (du kan läsa mer om min forskarskola här <http://cul.gu.se>). Som en del av min forskarutbildning genomför jag ett forskningsprojekt. Mitt forskningsprojekt handlar om musikutbildning och hur vi lär oss prata om musik, mer exakt om hur elever lär sig musikaliska begrepp, t.ex. i ett ämne som Gehörs- och musiklära (GeMu). Jag blev intresserad av den här frågan när jag själv arbetade som GeMu-lärare, men jag tycker även att den är viktig för att jag minns hur det var att vara *elev* på det estetiska programmet, inriktning musik.. Förhoppningen är att forskningsprojektet, genom att skapa kunskap om hur den här typen av lärande går till, ska leda till en bättre grund för musikundervisning. För att kunna genomföra mitt projekt behöver jag ta del av undervisning och dokumentera den, så att jag kan analysera den noggrant, och prata med elever för att få reda på hur ni förstår, uppfattar och tänker om musik. Därför vill jag följa och dokumentera undervisning i Gehörs- och musiklära under en period, samt intervjua elever före, under och efter perioden.

## Vad innebär deltagande praktiskt?

Jag kommer att delta under era GeMu-lektioner under en period, och jag kommer att videodokumentera vad som sägs och vad som händer. Anledningen till att jag vill videofilma istället för att bara spela in ljud är att det är viktigt med kroppsspråk och gester, inte bara ord, när vi pratar om musik. Jag kommer även att fotografera de läromedel ni använder under lektionerna.

## Dina rättigheter, materialhantering och anonymitet

Det material som produceras (t.ex. videofilmer och fotografier) kommer inte att spridas, utan enbart att användas i forskningssyfte. Sådant material som inte är anonymiserat (videoinspelningar, stencilar där deltagares namn framgår, o.s.v.) kommer att förvaras i låst säkerhetsskåp på Högskolan för scen och musik. För att skydda din och övriga deltagares identitet kommer jag ändra alla namn (på individer, skola, kommun, etc.) i alla publikationer. I den mån bilder publiceras kommer de att redigeras så att deltagare inte kan identifieras utifrån bildmaterialet. Eftersom den här studien intresserar sig för specifika lärandeprocesser, vad just ni som är med säger och gör, så kan inte total anonymitet garanteras. Särskilt i de fall då läsaren redan känner till att du varit med i forskningsprojektet (t.ex. om du berättat om det för en av dina lärare) kan det gå att gissa vem som sagt vad trots att jag ändrat alla namn. Resultatet av studien kommer dock inte att publiceras förrän du avslutat dina studier vid gymnasieskolan. Som deltagare i ett forskningsprojekt har du rätt att när som helst avbryta din medverkan. Jag står till förfogande under hela forskningsprocessen, om det skulle dyka upp frågor eller om någonting oroar dig. Ansvarig handledare för projektet är Monica Lindgren, professor i musikpedagogik vid Högskolan för scen och musik, Göteborgs universitet (för kontaktuppgifter, se nästa sida).

### Medgivande

- Jag har läst och förstått det ovanstående **och** vill delta i studien (sätt kryss i rutan för medgivande)
- Jag är **över** 15 år
- Jag är **under** 15 år

Datum: \_\_\_\_\_ Namnförtydligande: \_\_\_\_\_

Signatur: \_\_\_\_\_

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## HÖGSKOLAN FÖR SCEN OCH MUSIK

## TILL ELEVER I GYMNASIESKOLANS ESTETISKA PROGRAM

## Information och medgivande för deltagare i intervjustudie

Du som läser det här har redan tackat ja till att delta i den del av forskningsprojektet som gäller observationer och videodokumentation av lektioner, därför är bakgrundsinformationen här lite nedkortad. Denna information handlar om den del av projektet där jag vill genomföra intervjuer. Du kan tacka nej till att vara med i intervjudelen av projektet men fortfarande vara med i lektionsdelen om du vill.

## Vad går det här ut på?

Forskningsprojektet handlar om musikutbildning och hur vi lär oss prata om musik, mer exakt om hur elever lär sig musikaliska begrepp. Förhoppningen är att forskningsprojektet, genom att skapa kunskap om hur den här typen av lärande går till, ska leda till en bättre grund för musikundervisning. För att kunna genomföra mitt projekt behöver jag observera lektioner och prata med elever för att få reda på hur just ni förstår, uppfattar och tänker om musik. Därför vill intervjuva elever före, under och efter den period då jag följer era lektioner.

## Vad innebär deltagande praktiskt?

Jag kommer att intervju dig tre gånger under projektets gång: i början, i mitten och i slutet. Den första intervjun kommer vara lite längre än de två följande, men ingen av dem bör vara längre än en timme. Intervjuerna kommer gå till så att vi först spelar och/eller sjunger lite musik tillsammans och sedan samtalar om det vi spelat. Därför vill jag att du tar med dig ett instrument du trivs med till intervjuerna (om det är portabelt). Under den första intervjun kommer jag även fråga dig om din musikbakgrund och musikutbildningsbakgrund, t.ex. vilket/vilka instrument du spelar, hur länge du har spelat och i vilka sammanhang. Liksom lektionerna kommer intervjuerna videofilmas, och av samma anledning – när vi talar om musik kan kroppsspråk och gester vara minst lika viktiga som ord.

## Dina rättigheter, materialhantering och anonymitet

Det material som produceras (t.ex. videofilmer och fotografier) kommer inte att spridas, utan enbart att användas i forskningssyfte. Sådant material som inte är anonymiserat kommer att förvaras i låst säkerhetsskåp på Högskolan för scen och musik. För att skydda din och övriga deltagares identitet kommer jag ändra alla namn (på individer, skola, kommun, etc.) i alla publikationer. I den mån bilder publiceras kommer de att redigeras så att deltagare inte kan identifieras utifrån bildmaterialet. Eftersom den här studien intresserar sig för vad just du som är med säger och gör, så kan inte total anonymitet garanteras. Särskilt i de fall då läsaren redan känner till att du varit med i forskningsprojektet (t.ex. om du berättat om det för en av dina lärare) kan det gå att gissa vem som sagt vad trots att jag ändrat alla namn. Resultatet av studien kommer inte att publiceras förrän du avslutat dina studier vid gymnasieskolan. Som deltagare i ett forskningsprojekt har du rätt att när som helst avbryta din medverkan. Jag står till förfogande under hela forskningsprocessen, om det skulle dyka upp frågor eller om någonting oroar dig. Ansvarig handledare för projektet är Monica Lindgren, professor i musikpedagogik vid Högskolan för scen och musik, Göteborgs universitet (för kontakttuppgifter, se nästa sida).

## Medgivande

- Jag har läst och förstått det ovanstående **och** vill delta i intervjustudien (sätt kryss i rutan för medgivande)
- Jag är **över** 15 år
- Jag är **under** 15 år

Datum: \_\_\_\_\_ Namnförtydligande: \_\_\_\_\_

Signatur: \_\_\_\_\_

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## HÖGSKOLAN FÖR SCEN OCH MUSIK

### Information om forskningsprojekt

Med anledning av ett forskningsprojekt som planeras tillsammans med en lärare på skolan följer här information om projektets bakgrund, syfte och övergripande upplägg. Jag beskriver även vad deltagande i projektet innebär praktiskt i relation till den dagliga verksamheten på skolan, deltagande lärares och elevers rättigheter som deltagare i ett forskningsprojekt, hur deras identitet kommer att skyddas, samt hur det material som produceras i den empiriska studien kommer att hanteras.

#### Projektets bakgrund, syfte och upplägg

Det här forskningsprojektet bedrivs som en del av min forskarutbildning inom forskarskolan CUL (<http://cul.gu.se>) vid Göteborgs universitet, och kommer att ligga till grund för min doktorsavhandling. Projektet syftar till att skapa en bättre förståelse av hur elever lär sig musikaliska begrepp, och hur sådana begrepp blir meningsfulla för eleverna i termer av deras praktiska musikkunnande. Detta syfte har sin bakgrund i frågor som dykt upp i min egen verksamhet som musiklärare, men även i att relationen mellan att kunna musik och att kunna tala om musik är teoretiskt intressant. Förhoppningen är att forskningsprojektet skall bidra till en bättre grund för musiklärares undervisning genom komma till användning i musiklejarutbildning och fortbildning, samt till framsteg inom det musikpedagogiska forskningsfältet mer generell. Projektets empiriska del består i att följa och dokumentera undervisning och i anslutning till detta intervjua ett urval av elever.

#### Vad innebär deltagande praktiskt för lärare och elever?

Tillsammans med deltagande lärare kommer jag välja ut en lämplig tidsperiod samt en lämplig elevgrupp att följa. Det kan hända att jag behöver dokumentera vissa av dessa samtal med ljudinspelning. Den del av datainsamlingen som involverar elever kommer bestå av två delar, lektionsobservationer och intervjuer. Lektionsobservationerna är den enda del av projektet som direkt påverkar lektioner. De kommer att gå till på så vis att jag sitter med under ett antal lektioner och dokumenterar dem med videokamera (jag kommer även vilja fotografera/kopiera läromedel som används). Som en del i studien kommer jag också intervjua ett urval av elever (utanför lektionstid). Intervjuerna kommer att genomföras i början, mitten och slutet av perioden med lektionsobservationer. För att göra det så enkelt som möjligt för de elever som väljer att delta i intervjuer hoppas jag kunna använda mig av någon lokal på skolan för detta ändamål.

#### Deltagares rättigheter, materialhantering och anonymitet

För att skydda deltagares såväl som skolans identiteter kommer fingerade namn (på individer, skola, kommun, etc.) användas i alla publikationer som använder sig av det material som produceras under den empiriska studien. I den mån bilder publiceras kommer de att redigeras så att deltagare inte kan identifieras utifrån bildmaterialet. Eftersom den här studien intresserar sig för specifika lärandeprocesser, snarare än generella statistiska samband, så kan inte total anonymitet garanteras. Särskilt i de fall då läsaren redan känner till att en deltagare varit med i forskningsprojektet (t.ex. en förälder eller en lärare på skolan) kan det gå att sluta sig till vem som sagt vad trots fingerade namn. Det material som produceras kommer inte spridas och kommer enbart att användas i forskningssyfte. Sådant material som inte är anonymiserat (videoinspelningar, ljudinspelningar, insamlade dokument där deltagares eller skolans namn framgår, etc.) kommer förvaras i låst säkerhetsskåp på institutionen. Samtliga deltagare i projektet informeras om att de har rätt att när som helst avbryta sin medverkan. Jag står till förfogande under hela forskningsprocessen, om det skulle dyka upp frågor eller om någonting upplevs som problematiskt. Ansvarig handledare för projektet är Monica Lindgren, professor i musikpedagogik vid Högskolan för scen och musik, Göteborgs universitet.

APPENDIX D: INFORMATION LETTER, SCHOOL MANAGEMENT AND INTER-  
ESTED PARENTS

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# 1

Interjuguide

**OBS, skriv på papper först!!!**

**Dubbelkolla hur mycket tid vi har, sätt timer så de inte missar ngn lektion**

- Vad ska vi göra?
  - Snabba bakgrundsfrågor
  - Hitta på en låt och spela
  - Prata om det vi just spelade
  - Boka in en ny intervju
  - Undrar du något innan vi börjar?
- Snabba bakgrundsfrågor
  - Vilka instrument (inkl. sång) spelar du?
  - Hur länge har du spelat?
  - Hur lärde du dig?
  - Har du tagit lektioner i kulturskolan eller privat?
  - Har du spelat i band, i någon orkester, eller sjungit i kör?
  - Håller någon annan i familjen på med musik, spelar ett instrument, eller sjunger i kör, etc?
  - Kan du läsa noter? Mycket? Lite? Kunde du innan du började här?
  - Tabulatur?
  - Ackordanalys, typ Am eller Dsus4



## 2

### Interjuguide

#### Musikaktivitet

- Jag tänkte att vi skulle hitta på en liten melodi tillsammans, det behöver inte vara så långt och häftigt, tänk typ en barnvisa: den behöver inte bli fantastisk, bara en liten melodi som funkar och inte låter jättekonstig. När vi är klara med melodin tänkte jag att vi skulle sätta ackord till den också.
- Det går inte att göra fel här, jag är intresserad av hur just du tar dig an det här
- Om du inte har någon idé om hur den kan börja så har jag några idéer
  - En låter ganska klassisk, en är lite som en jazzvals, och den tredje är i sextakt, men inte så jazzig
- Komponera, harmonisera, spela, sammanfatta musikaliskt resultatet

### 3

#### Interjuguide

#### Samtal

- Vi ska prata lite om det vi just gjorde
- Om det är något du tycker är svårt att förklara så kan du visa på ett instrument, eller rita på tavlan eller ett papper, eller skriva noter eller så
- Det går fortfarande inte att ha fel. Jag är intresserad av hur just du tänker och förklarar
- Blev melodin/fortsättningen av melodin okej? Blev ackorden okej?
- Vad funkade bra och vad funkade mindre bra?
  - Varför?
- Kan du berätta om hur det gick till när du valde att göra just så?
- Hade vi kunnat göra på något annat sätt? (möjligtvis illustrera några konstigare)
  - Hur?
  - Blev det bättre eller sämre?
  - Vad är skillnaden? Varför låter det ena bättre än det andra?
- (om det inte redan dykt upp) Varför valde du att sluta på just den tonen?
  - (möjligtvis jämför andra)
- (om det inte redan dykt upp) varför valde du att sluta på det ackordet?
  - (möjligtvis jämför andra)

## 4

Interjuguide

Samtal, forts

- Känner du igen ordet grundton?
- Hur skulle du förklara vad det betyder?
- Kan du ge ett exempel eller visa?
- Känner du igen ordet tonika?
- Kan du förklara vad det betyder?
- Kan ge ett exempel eller visa?
- Tycker du att man kan förklara att vi slutade låten såhär med hjälp av de orden?

Avslut

- Var det något du tänkte på som du inte hann med att säga?
- TACK!
- Boka tid för nästa intervju

APPENDIX F: PRE-PREPARED MELODIES FOR INTERVIEW I

The image displays musical notation for Interview I, consisting of two staves. The first staff begins with a treble clef and a 4/4 time signature. It contains two sections: Section A, which starts with a quarter rest followed by eighth notes (G4, A4, B4, C5, B4, A4, G4), and Section B, which begins with a double bar line, a common time signature, and a half note G4. The second staff starts with a treble clef and a 4/4 time signature, with a measure number '6' at the beginning. It contains Section C, which starts with a double bar line, a 3/4 time signature, and the word 'Swing' above the staff. The melody in Section C consists of eighth notes (G4, A4, B4, C5, B4, A4, G4) and quarter notes (G4, A4, B4, C5, B4, A4, G4).

## 1

## Intervjuguide, intervju 2

**Inledande information:**

- Jag kommer ställa en hel del frågor med utgångspunkt i saker ni gjort på lektionerna. Det kan göra att det känns lite som ett läxförhör, men det är det inte! Jag är *inte* intresserad av att bedöma hur mycket du kan eller så, och redan baserat på den förra intervjun vet jag ju att du kan väldigt mycket. Vad jag är intresserad av är *hur* du förstår saker som ni pratat om på lektionerna, och *hur* du lär dig de här sakerna. Det kan hända att vissa saker jag frågar om känns svåra, och det är okej. Det är inte för att du inte vet tillräckligt, utan för att jag avsiktligt ber dig göra saker som jag vet kan vara svåra. Varför gör jag det? Jo, för att det är när vi gör saker som är svåra som det går att se *hur* vi lär oss de här sakerna. Så se inte detta som ett läxförhör, utan kanske mer som en chans att lära dig lite grejer som du kan använda för att briljera inför [LÄRARE] i framtiden...
- **Rita en kvintcirkel**
  - Kan du berätta hur du tänker medan du gör det?
- **Kan du förklara de olika delarna av kvintcirkeln?**
  - Vad står bokstäverna för?
  - Varför ser kvintcirkeln ut såhär?
  - Varför står C, G, D, A, osv i just den här ordningen?
  - Varför är det en *kvintcirkel* och inte, säg, en *terscirkel*?
  - Vad är en tonart?
  - Vad är en tonika, subdominant, och dominant?
  - Vad är en parallell, vad är en parallelltonart?

\* These were altered in later interviews based on feedback in the first interview.

# 2

## Intervjuguide, intervju 2

- **Transponera med hjälp av kvintcirkeln**
  - Jag har sett att ni använder kvintcirkeln för att transponera på era lektioner, jag tänkte att vi skulle prova det tillsammans
  - (Några exempel med gradvis ökande svårighetsgrad:)
    - | C | F | G | C | (transponera S3 upp)
    - | Eb | Cm | Fm | Bb7 | (transponera L3 ned)
    - | A | F#m | B | E | (transponera R4 ned)\*
    - | Cm | Fm | G | Cm | (transponera R4 upp)
    - | Ab | Bb | Eb | Cm | F7 | Bb7 | Eb | (transponera L3 upp)
  - Till varje exempel:
    - Vad är det för tonart?
      - Hur vet du vilken tonart det är?
    - Kan du hitta den på kvintcirkeln?
    - Vilka funktioner är det?
      - Hur vet du vilka funktioner det är?
    - Vilken tonart ska det bli?
    - Kan du hitta den på kvintcirkeln?
  - Avsluta med att spela och lyssna om det blev rätt
- **Transponera utan kvintcirkeln, med hjälp av enbart funktioner**
- Ok, om du vänder pappret med kvintcirkeln upp-och-ned... Jag tänkte att vi skulle försöka göra detta utan att använda pappret. Jag säger en ackordföljd, och så försöker vi tillsammans lista ut vilka ackord som är tonika, subdominant, dominant, och paralleller
  - (Några exempel med gradvis ökande svårighetsgrad):
    - | D | G | A | D | (S6 upp)
    - | Bb | Eb | Cm | F7 | (L3 ned)
    - | F | Dm | Gm | C | (R5 upp)\*
    - | Db | Gb | Dd | Bbm | Ebm | Ab | (L2 ned)
    - | A | D | E | C#m | F#m | Bm | E | A | (S3 ned)
  - Till varje exempel:
    - Vad är det för tonart?
      - Hur vet du?
    - Vilka funktioner är det?
      - Hur vet du?
    - Vilken tonart ska det bli?
  - Avsluta med att spela och lyssna om det blev rätt

\* These were altered in later interviews based on feedback in the first interview.

## 3

## Intervjuguide, intervju 2

- **Identifiera funktioner på gehör och transponera m.h.j.a. dem**
- Nu kommer jag att spela en ackordföljd, och så ska vi försöka höra vad det är för funktioner. Det kanske låter svårt, men jag vet från förra intervjun att du kan det här—du vet kanske bara inte att du kan eller hur du gör...
- Vi börjar med att bara lyssna efter tonikan. Kommer du ihåg hur vi talade om [XYZ beroende på person] i den förra intervjun? Det vi talade om då var ju egentligen om hur tonikan låter, eller hur den känns...
- Okej, nu skulle jag vilja att du vänder ryggen mot mig. Ta penna och papper, så du kan skriva upp vad du hör.
  - Enkla ackordföljder för att höra tonikan:
    - T S D7 T
    - T D D7 T
    - T S T D T
    - S Sp D7 T\*
    - S D D7 T
    - T Tp Sp D7 T
  - Frågor till alla:
    - Vad tror du vi landade på för ackord nu?
      - Hur känner du igen det?
      - Hur skulle du beskriva att det låter?
    - Var det samma som vi började på?
    - Var det med på något annat ställe?
  - Ok, vi provar att lyssna efter dominanten också. Dominanten är det ackordet som liksom strävar mest mot tonikan. Säg till när du tycker att du hör en dominant
  - Enkla ackordföljder för att höra dominanten:
    - T D D7 ... (T)
    - T S T D ... (T)
    - T S D7... (T)
    - S Sp D7... (T)\*
    - S D D7... (T)
    - T Tp Sp D7... (T)
  - Frågor till alla:
    - Vad tror du vi landade på för ackord nu/vad ackordet vi stannade upp på var?
      - Hur känner du igen det?
      - Hur skulle du beskriva att det låter?
    - Var det samma som vi började på?
    - Var det med på något annat ställe?
  - Och så subdominanten... Den kan vara lite klurigare att sätta fingret på. Ofta känns den mer som att man är på väg bort från tonikan än som att den leder till tonikan. Ibland känns den som om man är på väg mot dominanten, som att man behöver ta ett steg till innan man kommer hem till tonikan igen. När man går direkt från subdominanten till tonikan känns det ibland som ett aaa-meen-slut... Hur tycker du att den låter? Säg till när du tycker att du hör en subdominant
  - Ackordföljder för att känna igen subdominanten:
    - T S... D T
    - T S T

\* These were altered in later interviews based on feedback in the first interview.

# 4

## Intervjuguide, intervju 2

- T S... T S... D T
- T S... T D T
- S D D7 T
- T S... Sp D T
- Frågor till alla:
  - Vad tror du vi landade på för ackord nu/vad ackordet vi stannade upp på var?
    - Hur känner du igen det?
    - Hur skulle du beskriva att det låter?
  - Var det samma som vi började på?
  - Var det med på något annat ställe?
- Okej, så nu kan vi börja transponera på gehör också! Jag kan spela en ackordföljd, säg i G-dur, du kan höra vilka funktioner det är, och så kan vi transponera den till Eb-dur!
  - Enkla ackordföljder att transponera:
    - G D D7 G (S3 upp)
    - F Bb C7 G (R4 upp)
    - A D A E A (S3 ned)
    - Bb Eb F Bb (S3 upp)
    - B F# B E F# B (L3 ned)
- **Avslut**
- Var det ngt du ville ha sagt som du inte hann med?
- Någonting du undrar över?
- Någonting som kändes jobbigt?
- Du gjorde jättebra ifrån dig, tack så mycket!

\* These were altered in later interviews based on feedback in the first interview.



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