AN ONLINE PARTICIPATORY ACTION RESEARCH INQUIRY INTO ONLINE INQUIRY-BASED MUSIC LEARNING

BY

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DISSERTATION

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Abstract

The purpose of this study was to better understand what is happening when learners are unsuccessful in using online open education resources (OERs) for self-directed learning. Supporting self-directed learners is an important step towards realizing the open-education goal of equalizing educational opportunities, but little is known about the needs and perspectives of this group.

To find self-directed learners for whom OERs did not provide sufficient help, visitors to music theory OERs were offered personalized help in reaching their own music-learning goals. Participatory action research provided the study methodology, with participants acting as co-researchers who understood the purpose of the study and offered their perspectives on the issues, and myself acting as both primary researcher and facilitator of their music-learning inquiries. Activity theory provided a framework for organizing and interpreting the data.

Of the 44 participants who began the study, 11 pursued substantial inquiries. Data from all 44 participants suggested that lack of a relevant community of practice may be a particularly high barrier to self-directed learning. Among the 11 long-term participants, a major barrier appeared to be the difficulty of making connections between formal ways of knowing about music, such as music theory and notation, and experiential ways of knowing about music, such as playing instruments, improvising, and composing.

Progress in the inquiries relied in part on specific supports that can only be provided through human interaction and which may be the most useful roles for instructors when students have access to open online resources. However, the study also indicated ways that music OERs might be changed to make them more useful as stand-alone help, and the underlying issues suggest ways that OERs in general could better support self-directed learning.

Dedicated to my family:

Doug,
Aaron, Peggy, and Russell

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I would not have been able to complete this project without the help and support of a great many people. I have been particularly fortunate in my dissertation committee. In putting together an unusual project, I relied heavily on the combined breadth and depth of knowledge, experience, and wisdom of Marilyn Johnston-Parsons, Liora Bresler, Matthew Thibeault, Nicholas Burbules, and Grace Oh, and on their generosity in sharing such with me.

The work and the questions that led to this project were made possible by the existence of the Connexions open education site and its willingness to host materials by any educator; I feel indebted to Rice University and particularly Rich Baraniuk for sharing their vision of open education so freely. As a non-"techie", I relied for much-needed help on the tech support team at Connexions, in particular Ross Reedstrom, as well as the technology service specialists in the College of Education at the University of Illinois Urbana-Champaign, in particular Sarah Jones and Lynn Burdick. I am also grateful to the users of my OERs who have provided encouragement and useful feedback, especially the participants in this project.

Finally, I am grateful as always to my family for their support of my slightly-crazy projects, including shifting my focus from private teaching to open education, and beginning a PhD program at what the euphemists call "a certain age." When few people understood what I wanted to do or had even heard of open education, the encouragement of my parents, John and Bonnie Schmidt, and my in-laws, Lloyd and Marilyn Jones, meant a great deal to me. My children, Aaron, Peggy, and Russell Jones, have given me not only encouragement, but also practical suggestions and help. Above all, I have relied on my husband for everything from unflagging enthusiasm to thoughtful critique. Many, many thanks to all!

Table of Contents

Chapter 1

Introduction

- I've read information on the Circle of Fifths but don't really understand it. (study participant Laura, in contact 1 of her inquiry)
- The book I have been reading has been very helpful but I seem to have hit a brick wall after learning about the major chord. I don't quite know why or what the wall is. (Jeff, contact 21)
- I found some free ear training program resources and did some tests about identifying different intervals, rhythms, and chords. And the result was terrible. (Donald, contact 3)
- Someone on Youtube. . . . He calls it lessons, but it's more like chest-beating. I admire his astounding ability, but I get very little from him that I can actually use. (James, contact 5)
- I started looking at the [Hindustani rhythm] site you recommended. I'm having a hard time inferring what some of the *bols* represent rhythmically. I'm a bit stuck. . . . Have you seen the decoder ring? (Glen, contact 14)

The internet hosts a vast amount of freely-available educational materials. The materials themselves vary widely in form, content, scope, and level, as well as in the impulses behind the offerings. Some are trying to attract customers to profit-making offerings; chest-beating is certainly another possible motive. Many of the offerings are substantially motivated by the same desires that have always motivated teachers and book authors, such as sharing knowledge and enthusiasm about a favorite subject and ensuring that everyone gets a reasonable chance to learn what they need to know to thrive. I first began publishing online open education resources (OERs), in 2002, because I was inspired by the open-education movement's explicit goal of making education more equitable by making educational materials freely available.

As a long-time music teacher specializing in private lessons on my favorite instruments, guitar and French horn, I had long wished that I could refer my students to concise explanations that focused on specific music theory or notation concepts. The typical student was uninterested in studying music theory or notation as such, but happy to learn specific information that was immediately useful for playing the instrument. I decided to publish a few such explanations myself, as a contribution to the open-education effort. The breadth and intensity of the positive

response to those first modules was itself so motivating that I continued to work on the materials, expanding on them and filling in the gaps, eventually publishing over 200 modules and courses, featuring heavily interlinked texts, illustrations, practice exercises, and short audio examples.

Much of the emailed feedback from readers praised my explanations as being unusually clear and understandable, but I gradually began to suspect that many readers, and particularly those who did not have adequate access to other music-education opportunities, still had trouble understanding them. This was a discouraging thought that called for active investigation. As an individual OER provider, I could not hope to address most of the sources of educational inequity, but I could certainly try to address the barriers that arose when learners tried unsuccessfully to use my own materials.

As illustrated in the above quotes from some of the study participants, making the relevant information freely available is not enough to help many learners, and hard-copy books are not necessarily more helpful. Learners may fail to understand an explanation and may not know what is creating the barrier to understanding, why that "wall" is there, or how to get past it. Displays of advanced knowledge and self-administered tests that give "terrible" results, even when meant to be helpful, may be more discouraging than enlightening. Glen's "decoder ring" joke suggests a feeling that may be common but difficult to voice, that there must be some key that would make sense of all of that public knowledge, a key that is itself somehow hidden or out of reach.

This dissertation describes a participatory action research study that focused on understanding what is happening when self-motivated learners struggle to use OERs independently. As is typical for action research, the study had a double rationale, being simultaneously motivated as both an action to improve a specific situation and also a research

study to create better understanding of such situations (see, for example, Herr & Anderson, 2005; Reason & Bradbury, 2006). As an action to improve a specific, real-world situation, the study can be framed as one step in a long-term effort on my part to make my own music-education OERs more accessible. As a research study that seeks a better understanding of such situations, my actions with the participants can be framed as an investigation into the needs and perspectives of those who find it challenging to use OERs on their own. The double rationale, as detailed in the following section, also serves as an explication of my stance as a practitioner and researcher in undertaking this qualitative study.

A Double Rationale

As discussed in detail in Chapter 3, this study can be understood as one step in an overarching spiral of inquiry initiated when I began to wonder how to make my music-education OERs more accessible. An attempt at surveying the users to discover what additional supports they needed (Schmidt-Jones, 2012) did not indicate clear preferences for specific changes or additions to my materials. What was clear was that a large proportion of the respondents identified themselves as "self-teaching," that is, attempting to attain a significant music-learning goal on their own. I reasoned that when such strongly self-motivated learners encountered difficulties using the materials independently, they might be interested in a study that provided active help in reaching those goals. Providing the help would give me an opportunity to better understand what the materials looked like from their perspectives, and I hoped that this would lead to insights regarding how to create OERs that are more useful from the perspective of learners who lack other supports.

Of course, the learning activities of participants in such a study would be greatly affected not only by OERs but also by my active help and by their locally-available resources. Even when

used for independent learning, OERs are part of a rich social milieu that includes numerous other influences and resources. It would be useful, perhaps even crucially important, for an OER creator to better understand the dynamic between online resources, local resources, and active instruction, so I incorporated all three into the formal research questions:

1. What makes an OER more or less useful for self-directed, informal learning, particularly for those with limited formal music education?
2. Given an abundance of online resources and a highly motivated learner, what are the most useful functions of a teacher/guide/facilitator?
3. What are the interactions between informal online learning processes and the learner's local practice as a musician and music learner?

As a formal research study, this project was framed in terms of inquiry. I view the participatory action research as my own inquiry and the participants' independent music-learning projects as their own inquiries. During the study, my inquiry interacted with theirs in ways that helped us each move towards our individual goals. This inquiry approach is not only well aligned with my own longstanding approach to teaching music theory and notation in terms of their immediate usefulness; it is also well aligned with deeply influential schools of thought and research regarding learning.

As detailed in Chapter 2, self-directed inquiry probably motivates a large proportion of the uses of OERs, and the ability to use available resources in self-directed projects is rapidly becoming a marker of the well-educated individual. Although inquiry has proven difficult to introduce into traditional classrooms (Collins & Halverson, 2009), it has long been promoted as an active, learner-centered method of instruction (Dewey, 1910/2011; Freire, 1970/2004; Learner-Centered Principles Workgroup, 1997), and respected thinkers have singled out inquiry in the arts as being particularly desirable (Dewey,1934; Greene, 1977).

OER providers should therefore be interested in providing better supports for self-directed learning. Educators in general, and arts educators in particular, should be interested in

understanding how to support learners in developing the skills needed to use a wide array of resources to pursue self-directed projects. The needs and perspectives of self-directed learners with regard to OERs have not been well studied, however, so this was an exploratory study. In fact, there is no single body of research into which this study fits well; instead, as the literature review makes clear, I have borrowed as needed from research in the fields of music education, open education, online learning, self-directed learning, inquiry based learning, participatory action research, and activity theory. There is, of course, significant overlap between these research traditions, which can cause confusion due to differing usages of certain terms. After a short overview of the rest of the dissertation, the final section of this chapter will clarify the meanings of key terms as they are used here.

Overview of the Rest of the Dissertation

Following the literature review and methodology chapters, four chapters present the analysis and findings, based on data from all participants but focusing on the eleven participants who seriously pursued an inquiry within the study. Chapter 4 consists of short overviews of each of the eleven long-term inquiries. These overviews provide an orientation grounded in the specifics of each real-world inquiry, which is useful for understanding how and why the underlying issues impacted specific participants. The inquiries varied greatly in basic parameters such as length, intensity, types of activities, immediate and long-term music-learning goals, musical instruments and materials used, and the participants' prior music education and experiences. On the surface, the barriers that kept participants from using OERs independently also appeared to be quite different. However, my analysis of these cases revealed that the main barriers could usefully be understood in terms of just three underlying issues. Each of these issues is the focus of one chapter. Chapter 5 discusses the practical barriers that make it difficult

to connect music theory to experiential ways of knowing about music, such as listening, playing an instrument, or composing. Chapter 6 focuses on music notations as tools that can help or hinder music learning and music making. Chapter 7 discusses the key roles of human interaction in removing barriers and hindrances. My own future plans in response to the study are tied closely to the specifics of the inquiries, so they are included in these chapters. Chapter 8 presents the findings in a more generalized form, as conclusions that other OER providers and teachers may find useful. In particular, I emphasize themes that emerged from the analysis as keys to solving the problems encountered by the participants:

- Meaningful activity as a way to make sense of formal knowledge;
- Learning paths that rely on familiar tools to reach interesting goals;
- Interactions with others as necessary sources of support and experiential knowledge.

Definitions

Some of the terms need to be defined, because their usage varies among educational researchers. In this dissertation, discussions of *open education* as a field or movement refer to the intent to make education more freely available, regardless of the technologies or media involved. *Open educational resource (OER)*, however, refers specifically to materials offered on the Internet with an educational intent and no restrictions to access. Following a common usage, even the requirement to register for a free course is considered a restriction, creating a distinction between OERs, which are always available as individual resources, and other offerings such as massive open online courses (MOOCs). *Open online resources* refers more generally to all resources that are available on the open Internet, regardless of the intent in making them available. They include, for example, videos of musical performances and free downloadable programs for notating music.

For reasons outlined in the literature review, I define *inquiry* in terms of its goals and

ends. For my purposes, the goals of an inquiry must be determined at least in part by the learner, and its end must be something other than the learner making a "discovery" that has been pre-approved or predetermined by the curriculum or the teacher. I will use the terms *active* or *direct instruction* (as opposed to inquiry facilitation or guidance) regardless of whether an instructor is trying to implement inquiry methods, because this terminology helps to clarify other distinctions that are key to the analysis. *Direct instruction* refers to activities in which the main explicit goal is education. Lectures, music lessons, formal inquiry facilitation, and music theory texts are all examples of direct instruction. In the following discussion, direct instruction is contrasted with activities in which learning is passed on more informally, for example in the activities of a music-making community of practice.

Active instruction refers to situations in which the instructor is interacting personally with the learner, as opposed to *broadcast* instructional methods such as textbooks or OERs. *Active instruction* includes human interactions in classroom, private lesson, and informal face-to-face settings, as well as internet-based interactions. Although it is interaction with another person that is a key strength of active instruction, I avoid using *interactive* to describe this, because in the world of OERs, *interactive* refers to objects, such as educational games, that react to the user's actions.

I will also ignore some interesting debates about what to call learners, in favor of simply making the most useful distinctions. I use *self-directed* to describe learners who maintain control over major decisions, such as what to learn, and whether, where, when, and to whom to apply for help in learning it. Under this definition, active, inquiry-based instruction is a particularly compatible approach to helping such learners, because it supports progress along an open-ended learning path in the direction of the participants' own learning goals. I use *independent* to

describe learners who are not currently receiving active instruction that is relevant to their goals. Thus, all participants in this study were self-directed with respect to their study inquiries, both before and during the study. All were trying to work towards their music-learning goals independently when they found the call for study participants, but during the study they were not acting as independent learners.

In the context of this dissertation, a *music community of practice* is any group of musicians whose collective activity serves to keep a music tradition alive. This can include the widely-dispersed and loosely-coordinated activities of interacting groups of musicians, such as those who collectively keep alive the traditions of playing "heavy metal" music or of reading common notation. In contrast, a *music-making community of practice* is a group of musicians who meet for the purpose of creating music together. This includes a wide range of groups and music-making activities, from professional orchestra rehearsals and jazz performances at clubs to the peer-led music explorations of teen bands and the active instruction of music teachers who direct school choirs or play duets with their students during private lessons.

Music-making activities can lead to a wide variety of questions, curiosities and music-learning goals. Many independent music learners are interested in aspects of *Western music theory*, which is a set of concepts originally developed to describe and discuss Western classical music. The concepts are also useful for understanding any music that shares some roots with that tradition, including the folk musics of many countries and most popular music from around the world. I will introduce, as they arise, the specific music-theory terms that are crucial to understanding the goals and difficulties of the participants in this study. The concepts are simplified so that the discussion can be understood by non-musicians, because, as I will argue in the final chapter, I believe that some of the findings of the study may be generally relevant to

open education, rather than being limited to the subject area of music.

As I will discuss in detail in the next chapter, I use the word *tool* in an activity-theory sense (see, for example, Wertsch 1998), to refer to an object or concept that is purposefully employed to mediate an action within a goal-oriented activity. For example, if a student is conscious of *playing an F major scale on the piano*, then both the physical piano and the concept *F major scale* are being used as tools. However, if the student plays an F major scale as part of the action *playing a piece of music*, with no understanding that the piece includes an F major scale, then the scale as a concept is not mediating the action, and is therefore not a tool in that instance. The word *technology* I use to refer more generally to complex systems of tools, for example as when people speak of "computer technology."

Chapter 2

Review of the Literature

This dissertation discusses a participatory action research (PAR) project. The research was driven by a desire to better understand the needs of those who use online open-education resources (OERs) for independent, inquiry-based music learning. The goal was to learn how to make OERs in general, and my own music OERs specifically, more useful for such independent learning. Activity theory provided the main theoretical framework for the analysis. This study uses an unusual combination of research areas and methods, so there is no single body of literature that provides a good background for the study. On the other hand, the various aspects of the study, such as PAR, OER users, music learning, inquiry, and activity theory, are each covered by an extensive body of research literature. Within the scope of this literature review, I cannot hope to summarize all of them well.

I will therefore focus on using the most relevant literature in each area to build a step-by-step case for this study, as follows: A widely-recognized ethic of the open-education movement is that OERs should strive to make education more accessible and equitable. Inquiry is a particularly effective form of learning, because it connects formal, academic knowledge with the learner's real-world experiences and interests. Therefore, one way that OERs might make education more accessible and equitable is to support inquiry by independent learners who lack sufficient alternative educational opportunities. In fact, independent inquiry may already represent a significant fraction of OER use, but current research on OERs is strongly centered on their use in classrooms and training programs. Little is known about the characteristics of OERs that best support independent learning, in part because independent use of OERs is difficult to study.

One feasible way to make independent online learning more visible to the research community is through a study that offers help to OER users who are struggling to learn about music independently. Inquiry in the area of music can be a particularly desirable and powerful learning experience, but formal music education may provide few opportunities for inquiry. Participatory action research is the best methodology for such a study, and it is also particularly resonant with the goals of open education. Activity theory provides a useful framework for analyzing and discussing action research and inquiry. I will discuss in turn each of the main points in this train of thought in the following sections of this chapter:

- Equity and accessibility as goals of open education
- OERs and independent inquiry
- The power of inquiry-based learning
- A lack of research into independent online learning
- Inquiry-based music learning
- Participatory action research as a methodology for studying online inquiry
- Activity theory as a framework for making sense of the data

Equity and Accessibility as Goals of Open Education

A variety of meanings is possible when the word *open* is applied to education or to online materials. One meaning of *open education* that predates online education and that was clearly a factor in the development of OERs is the idea that, as a matter of justice and fairness, learning opportunities should be equally available to all who desire them. For example, The Open University was launched in 1971 in the United Kingdom with a mission to "promote educational opportunity and social justice" (The Open University website, 2014) by making undergraduate-level courses available with no formal admissions requirements. Other open universities that raise no bars to admission and that predate widespread interest in online education include Indonesia's Universitas Terbuka (established in 1984), Polytechnic University of the Philippines Open University (1990), and Open Universities Australia (1993).

The proliferation of Internet offerings that began in the 1990's included many informational and educational websites, and open-education enthusiasts soon became interested in new possibilities. The first official use of the term *open educational resources* was at a 2002 UNESCO meeting (Friesen, 2009). The agreed definition included "adaptation by a community of users," a crucial broadening of the concept of *open* to include not only the ability to access the knowledge of others, but also the ability to share with others one's own rewriting of the knowledge. This broadening of the meaning of *open* suggests the influence of the open-source-programming movement, in which volunteers share their work freely and openly in order to collaborate on large programming projects (see, for example, Raymond, 1999/2000; Weller, 2007). This additional sense of *open* is often ignored in some discussions of online education, which frame the benefits of open education only in terms of reduced costs and increased flexibility and productivity (see for example, DeSantis, 2012; Bakia, Shear, Toyama, & Lasseter, 2012; Yuan & Powell, 2013). Among those who focus on the effects of openness on educational equity, however, the broader meaning tends to be preferred (see for example, Baraniuk, 2008; EDEN Secretariat, 2013; Pantò & Comas-Quinn, 2013). In 2007, open-education leaders from around the world met in Cape Town, South Africa. They described a revolutionary "opportunity to grow this movement to include millions of educators and institutions from all corners of the earth, richer and poorer" (*Cape Town Open Education Declaration,* 2007, para 11), and they explicitly framed openness in terms of user participation:

> This emerging open education movement combines the established tradition of sharing good ideas with fellow educators and the collaborative, interactive culture of the Internet. It is built on the belief that everyone should have the freedom to use, customize, improve and redistribute educational resources without constraint. (*Cape Town Open Education Declaration,* 2007, para 2)

> This broader definition of *open* implies that fairness and justice call for equal access, not

only to the passive consumption of knowledge produced by others, but also to active participation in the collaborative pursuits that lead to shared knowledge and understanding. This definition also informs critical discourses that focus on inequality of access to OERs. There are well-documented barriers even to relatively passive uses, for example, lack of access to the required hardware or Internet connections (Celano & Neuman, 2010; Lane, 2009); lack of the knowledge, skills, or confidence needed to use the Internet for learning (Lane, 2009; Murray & McPherson, 2006; van Deursen & van Dijk, 2008); or lack of familiarity with the language or cultural perspectives of the OERs (Hattaka, 2009; McLoughlin & Oliver, 2000).

Critical perspectives have also identified additional barriers to creative, participatory access. In particular, post-colonial discourses critique the implications of the lack of materials created by and for cultures other than the globe-spanning, dominant Westernized culture (see for example, Kanwar, Kodhandaraman, & Umar, 2010; Rizvi, 2009). Other critical perspectives target the current trend towards framing open education merely as cost-free, flexible offerings through which powerful institutions maintain their control over what counts as valued knowledge, with primary aims of making money, cutting costs, or establishing and maintaining reputations as top education "brands" (see, for example, Bartlett, 2013; Boven, 2013; Peters, 2009; Portness, 2013).

Although OERs are currently biased towards Western conceptions of knowledge, Liyanagunawardena, Williams, and Adams (2013) have argued that developing countries may still find OERs to be more useful than other "open" projects, such as massive open online courses (MOOCs), which are typically offered at no cost, but under a strict copyright. Many OERs, including my own, are offered under licenses that ensure the materials will remain open in the broad, creative-sharing sense. This permits local educators to rewrite OERs or mix them

with locally-developed materials, so that existing OERs can serve as resources for local education projects. However, as I will discuss later, there remain significant barriers to reuse of OERs by educators. A large proportion of the current use of OERs may be direct, independent use by learners.

OERs and Independent Inquiry

In an earlier project (Schmidt-Jones, 2012), I surveyed the users of my own OERs, asking them to describe their reasons for accessing the materials. Of the 488 respondents, over 39% described themselves as self-teaching, the largest category for this question. An additional 15% described themselves as "other," a category that excluded those who were using the materials as teachers, music students, or members of a music-making group, but included a variety of independent goals and projects, including spur-of-the-moment curiosity. There was also evidence that many of the 22% of respondents who identified themselves as formal music students were accessing the materials on their own initiative, in response to their own puzzlements or learning projects, rather than at the direction of their instructors. Studies that characterize the actual (rather than intended) users of an OER are rare, but Carson's (2006) evaluation of MIT's OpenCourseWare found percentages of teachers, students, and self-directed learners that were strikingly similar to the percentages that I found for my materials, in spite of large differences between the educational level and subject areas of the two sets of materials (Schmidt-Jones, 2012). Rosell-Aguilar (2013) studied yet another group of open-resource users, language learners who downloaded resources from iTunes U, and found that over 78% of survey respondents in that category were doing so for reasons of "personal interest."

While more such studies are needed to gain a better overall picture, it is reasonable in the mean time to assume that OERs support a significant amount of independent learning. Fletcher,

Schaffhauser, and Levin (2012) outline the specific benefits of using OERs for self-directed

learning:

> Self-directed learning, a much-sought goal of 21st century education, can really blossom with digital content. As students become more adept at using digital content and building their digital literacy, they're able to choose their own sources for learning rather than simply being fed lessons through the filter of a textbook or a single teacher. In the optimal scenario, the student is inspired to expand learning beyond school, and that means shifting effortlessly from school-sanctioned lessons to other resources, a feat made easier with digital content. (p. 13)

This echoes Dewey's precept that "learning in school should be continuous with that out of

school" (Dewey, 1916, p. 416).

However, school-based learning is not yet very continuous with online inquiry, so it is

likely that many interested learners struggle to use online resources independently. The amount

of information available, and its highly variable viewpoints, quality, and trustworthiness,

combined with the nonlinear (search and hypertext) organization of the internet, can confuse,

disorient, and discourage learners who are not cognitively prepared to cope with it (Anderson,

2001; Butcher & Sumner, 2011). Issues that are known to create barriers include learner

inexperience in conducting searches (Ellis, Marcus, & Taylor, 2005; Rowley et. al, 2004);

inability to assess the trustworthiness of materials (Graham & Metaxas, 2003; Pariera, 2012);

individual learning styles or traits that are not conducive to online learning (Anderson, 2001);

visual or audial impairment (Weller, 2007, p. 112); cultural differences between OER provider

and learner (Selinger, 2004; Wright, Dhanarajan, & Reju, 2009; Uzuner, 2009); and offerings

that do not follow principles of good site design and navigability (Murray & McPherson, 2006;

Nicolson, Knapp, Gardner, & Raynor, 2010).

Some barriers, such as those created by poor site design, are clearly best addressed by

improving the OERs, and such improvements might prove particularly beneficial for independent

learning. Other barriers, such as difficulty judging the trustworthiness of a resource, involve skills that can be learned. As I will discuss below, formal instruction that encourages and models good inquiry practices can remove these barriers, but such instruction may be least available to the learners who most need it. If equity of access is a goal, then OER creators should not assume that independent learners possess good inquiry skills. They should instead strive to provide OERs that are designed for ease of use by independent learners and that, as much as possible, encourage and model good inquiry practices.

Dewey was one of the most influential proponents of adopting inquiry as an educational method. Ongoing discussions of his ideas suggest an inseparable relationship between technology, inquiry, and education. Hickman (2001), for example, observed that "by identifying technology with inquiry, as he did, Dewey was identifying technology with education — with the analysis and critique of existing traditions and proposed courses of action" (p. 34). Blacker (1993) suggested that it is reasonable to "generate a sort of Deweyan pedagogical imperative regarding technology. In short, this imperative would suggest that *in order for a technology to count as educative, it must be allowed to reveal"* (p. 190, emphasis in original). Blacker concluded that "approaching educational technologies with the attitude of allowing them to reveal is thus a necessary condition for using them educatively" (1993, p. 193). An inquiry-based use of technology, then, would not use technology to guide students more efficiently towards a curriculum goal. Instead, it would, as Jonassen (2005) urged, "take the tools away from the instructional designers and give them to the learners, as tools for knowledge construction rather than media of conveyance and knowledge acquisition" (Purpose section, para. 1).

As I will discuss in the chapter on interaction, such knowledge construction ideally takes place with the active support of others, but as a particularly high bar, OERs should aim to reveal

their content in ways that support knowledge construction even for independent learners. This can be considered a sort of "Deweyan standard" for OERs, in which they seek to make their content as transparent as possible, revealing it as a useful tool in a wide variety of contexts and perspectives. By this same standard, OERs should also aim to reveal themselves not as static knowledge-dispensing authorities, but as tools-for-learning that can be viewed, used, altered, or remade in a variety of ways. This echoes the preferred definition of *open* as discussed above: Materials that are open to reuse, rewriting and reinterpretation, as well as to viewing.

Participants in this study were not focused on creating or recreating OERs. They appreciated my goal of improving online resources, but were themselves focused on creations that signaled their active participation in the world of music. In fact, tools for making and understanding music emerged as a central issue in this study, so I will use this Deweyan standard extensively in my analysis, applying it not only to OERs, but also to other tools for learning about music, such as instruments and notations. I will argue here that, for the learner, *reuse* typically refers not to formal rewriting of the materials, but to appropriation of the concepts for the construction of personal understandings that are useful in pursuing personal goals; in other words, it involves the ability to "reuse" them for their own inquiries.

The Power of Inquiry-Based Learning

A focus on the role of OERs as a support for exploratory, personally-relevant learning aligns strongly with the traditions of inquiry-based learning (IBL). In IBL, the learning process is typically imagined as a spiral, with each turn of the spiral consisting of a cycle of steps. The precise number and content of the steps varies among inquiry practitioners, but the gist of all of them is that an authentic, experience-based problem or curiosity leads to a cycle of gathering information and making sense of that information through various creative, interactive, and

reflective acts, leading to a better understanding of the problem that inspired the inquiry (see, for example, Bruce & Bishop, 2002; Herr & Anderson, 2005; Kemmis & McTaggart, 2005; Wells, 2001). A cycle ideally ends not with the complete satisfaction of curiosity, but with a better-informed curiosity, leading to the next cycle in the upward spiral of learning.

Inquiry that is driven by learners' own questions and curiosities has long been recognized as a particularly powerful form of learning that helps the learner create useful connections between the formal body of knowledge in a subject area and the learner's own real-world experiences and interests. Dewey argued from a pragmatist viewpoint that inquiry should be the preferred method for formal education because it is the natural way by which humans turn experience into understanding, not only in everyday life, but also in the formal pursuit of scientific knowledge. He believed that "the native and unspoiled attitude of childhood, marked by ardent curiosity, fertile imagination, and love of experimental inquiry, is near, very near, to the attitude of the scientific mind" (Dewey, 1910/2011, preface). He contended that traditional passive-learning pedagogies actually harmed this innate interest in learning and research (Dewey, 1938a/1997); in contrast, IBL is an active-learning pedagogy. Teachers provide guidance as learners choose resources and actions from among a wide range of possibilities (see, for example, Cochran-Smith & Lytle, 2009; Knowles, 1984; Wells, 2001), modeling and providing practice in the skills and habits needed for mature independent inquiry.

The literature on active learning uses a variety of labels, including problem-based learning, case-based learning, project-based learning, and role playing, as well as inquiry-based learning (Oliver, 2001). All of these approaches aim to connect formal knowledge to students' prior understandings and to offer guided, active learning through which students can construct new experience-based understandings. The dividing lines between the approaches are not clear-

cut, and educators in different research specialties and subject areas define and use the terms in different ways (Lim, 2004). Although there are many exceptions, the term *inquiry-based learning* (or simply *inquiry*) seems to be preferred for processes that involve open-ended learning projects in which goals are deeply influenced by learner interests and preferences (see, for example, Oliver, 2001; Wells, 2001), and that encourage learners to "draw on different dimensions of knowing - different forms of expression, different kinds of ideas, and different cultural frameworks" (Bruce & Bishop, 2002, p. 708) in order to question and challenge current real-world practices (see, for example, Bruce & Bishop, 2002; Cochran-Smith & Lytle, 2009; Mehra, Merkel, & Bishop, 2004). This study fits well within this particular tradition of inquiry, because the participants' activities were framed by their own musical interests and their own learning goals, rather than by curriculum goals based on musical interests approved by others.

For the purposes of this dissertation, then, inquiry is distinguished from other pedagogies, including other active-learning methods, chiefly by being an open-ended process that allows learners' interests and understandings to affect not only the question that drives each cycle of learning, but also resources and activities used to explore the question, the conclusions reached, and the goals and purposes of the inquiry.

This focus on the learner's own interests is also in line with the views of Freire (see, for example, Freire, 1970/2004), another highly influential proponent of inquiry. Freire focused on a critical awareness of the political implications of education, rather than on a pragmatic psychology or philosophy of how people learn, and he referred to his methods as "problem-posing" rather than as inquiry. However, a Freirean critical perspective is often an implicit or explicit aspect of IBL as it is implemented in participatory action research projects (see, for example, Cochran-Smith & Lytle, 2009; Wells, 2001); and in practice, Freire's views tend to be

compatible with Dewey's. For example, the "banking" model of education that Freire decried features knowledge that is imposed from outside the students' current experiences, to be held in reserve in the students' heads until needed. His "problem-posing" alternative model features students acting as co-investigators with teachers, researching the realities of their own situations in ways that encourage them to "come to see the world not as a static reality, but as a reality in process, in transformation" (Freire, 1970/2004, p. 83), a reality that is open to change through their own actions. This goal echoes Dewey's observation that inquiry often has the aim of developing new tools, techniques, or ways of thinking when habitual ones fail (Hickman, 2001, pp. 29-30).

A large body of research on the psychology of learning now supports a preference for active-learning pedagogies (Learner-Centered Principles Workgroup of the American Psychological Association, 1997). If experimental psychology, pragmatist, and critical perspectives all consider inquiry to be preferable to traditional passive methods, why has it not been more widely implemented? Dewey noted that inquiry places more demands on the teacher than does a traditional approach to curriculum. Although he considered his approach to be "simpler" because it is in line with natural principles of growth, he did not claim it was easy: "To discover what is really simple and to act upon the discovery is an exceedingly difficult task" (Dewey, 1938a/1997, p. 30).

To be effective, inquiry also requires that a wide range of resources be available to learners (Knowles, 1984), which is a serious challenge for classrooms that rely on costly hard-copy resources. For example, music learners may bring a wide variety of musical interests to a classroom, as they did to this study. True inquiry would require easy access to good examples of the music genres and styles that interest the learners – interests that often change from one year

to the next – as well as materials that can help them explore whatever questions they have about the practical, historical, cultural, or theoretical aspects of the music.

Although the open Internet could be a particularly useful tool for solving the range-of-resources problem, the existence of numerous free online resources has not been sufficient to cause the widespread adoption of either OERs or IBL in classrooms. Such adoption would require a widespread commitment to making deep and far-reaching changes to practices and institutions that are so complex and well-established that they are by nature inflexible and highly resistant to deep change. (See Collins & Halverson, 2009, for a thorough discussion of this issue.) However, calls for this level of change have become a common feature of the technology-in-education discourse. As long ago as 1975, Knowles argued that successful navigation of modern life requires inquiry skills:

> In the civilization of our forefathers it may have been possible for people to learn in their youthful years most of what they would need to know for the rest of their life, but this is no longer true. Education - or, even better, learning - must now be defined as a lifelong process. The primary learning during youth will be the skills of inquiry and the learning after schooling is done will be focused on acquiring the knowledge, skills, understanding, attitude, and values required for living adequately in a rapidly changing world. (Knowles, 1975, p. 16)

More recent analyses have pointed out that changes in information technologies have made fundamental changes in education not only more possible, but also more necessary. Geser (2007) urged OER promoters to focus on "open education practices," rather than on the resources, arguing that OERs will not make a substantial difference if used within traditional pedagogies. Peters (2007) pointed out that the "banking" approach to education has become less useful than ever, since modern technologies have become much better than the human brain at instantly and accurately retrieving stored information. Cope and Kalantzis (2009) implied a similar view when they argued that ubiquitous access to information "should spell doom for the

closed-book exam. Educators will need to create new measures to evaluate learner's capacities to know in this new environment" (p. 13).

This view implies that removing barriers to lifelong, technology-supported inquiry may now be a necessary step in working towards educational equity. The current push to adopt new technologies in schools sometimes leads to the adoption of active-learning approaches such as IBL. However, there is evidence that inquiry-based practices are less likely to find a foothold in schools that educate economically or culturally disadvantaged students. The drive towards high-stakes testing and standardized curriculum appears to be playing a major role in this issue (Hursh, 2008; McNeil, 2000; Sleeter, 2005). Under currently widespread views that equate high standards with standardization (Sleeter, 2005), diversity in students' backgrounds is not framed as a rich source of experiences and interests, but as a problem to be overcome, a deficit in some students' backgrounds (González & Moll, 2002; Ladson-Billings, 1995).

Schooling is, from this perspective, "a means to rescue children from their economic, social, and cultural conditions" (Popkewitz, 2000, p. 89). A "pedagogy of poverty" can lead teachers to conclude that disadvantaged learners cannot handle practices such as inquiry (Hyland, 2009). Although there is evidence that these attitudes are harmful to students (Ladson-Billings, 1995, p. 475; McNeil, 2000), learner-centered approaches that acknowledge the understandings and interests of disadvantaged groups are rare, and may come under active attack when they are suggested or instituted (see, for example, McGinnis & Palos, 2011). The educational technologies that minority students are most likely to be offered are tutoring systems that provide supplementary or remedial instruction, which the students experience as "meaningless, boring, and controlling" (Damarin, 1998, p. 13).

There is therefore a very real possibility that students from advantaged groups may receive good training in inquiry through their formal education, preparing them for lifelong learning in a fast-paced modern world in which rote knowledge is of little use. Disadvantaged students, meanwhile, may continue to experience lifelong barriers even to informal, interest-based learning, due to lack of familiarity with the processes of inquiry. The ease of use of OERs for independent inquiry may therefore be fundamental to the question of whether OERs can succeed in promoting educational equity. If OERs can be used in the independent pursuit of personal learning goals and interests, even by those with little formal experience of inquiry, then they may help close some of the gaps between advantaged and disadvantaged learners. If not, it is likely that OERs are widening rather than closing such gaps.

A Lack of Research into Independent Online Learning

Although independent learning may generate a large proportion of OER use and may be crucial to the open-education mission to support educational equity, research on OERs is focused almost exclusively on their use in classrooms and training programs. Little is known about needs or challenges associated with independent learning.

In general, the experiences of learners are not well represented in the literature on OERs. There are many papers focused on the interests of OER providers, such as authoring and licensing issues (for example, Ochoa, 2010; Pantò & Comas-Quinn, 2013; Petrides, Nguyen, Jimes, & Karaglani, 2008); funding models and sustainability (for example, Friesen, 2009; Wiley, 2007; Yuan & Powell, 2013); and whether and how OERs are taken up by students and teachers (for example, Kanwar, Kodhandaraman, & Umar, 2010; Livingston & Condie, 2006; Petrides, Jimes, et al., 2011). It is also not difficult to find OER literature that explores the needs

and experiences of teachers (for example, Hatakka, 2009; Kanwar, Kodhandaraman, & Umar, 2010; Misra, 2013; Wright, Dhanarajan, & Reju, 2009).

Of those studies that have focused on learners, most have been situated in a course with narrow learning goals defined by the expectations of school curriculum or corporate training (for example, Feldstein et al., 2012; Murray & McPherson, 2006; Padilla Rodriguez, & Armellini, 2013), even when the learning has been framed by the researchers as problem-based learning (Ellis, Marcus, & Taylor, 2005; McLaughlin & Oliver, 1999) or inquiry-based learning (Lu & Deng, 2012; Oliver, 2008). Lu and Deng (2012), for example, describe the learning process they studied as inquiry, because students were expected to respond to two required readings by posing a question and choosing a third article themselves. The goal of the activity, its overall structure, the actions required of the students, and the tools used were not affected by student choices or interests. A more or less implicit perspective in such studies is that inquiry is a pedagogical method for motivating the learner to engage with the goals of the curriculum. The possibility that learner motivation might be deeply tied to having some control over goals is not broached.

Analyses in such studies also tend to focus on numerical data such as student "uptake" of open materials, student ratings of materials or activities, student scores in pre- and post-intervention assessments, or factors that are associated with student success or retention. In a 2005 review of the literature on e-learning, Sharpe, Benfield, Lessner, and DeCicco reported a scarcity of studies that focus on understanding learners' experiences:

> In particular there is a scarcity of studies that can be characterised as expressing a 'learner voice' i.e. in which the learners' own expressions of their experiences are central to the study. . . . This scarcity is surprising when we actively sought studies that were methodologically qualitative and especially favoured those which allowed the learners' voice to shine through. (p. 3)

My own review of more recent literature suggests that it continues to be difficult to find studies that focus on learners' experiences with open online resources, with an important exception: Studies of online learning that use community of practice (CoP) or connectivist frameworks do pay attention to learner experiences within projects that provide space for the learners' goals. For example, Kop and Fournier (2010) used a connectivist model to understand autonomous learning that took place within a MOOC. Baran and Cagiltay (2010) collected insights about an education portal from preservice teachers who were using it in online CoPs. In the subject area of music, Waldron (2011) illuminated participants' experiences in "building shared and constructed knowledge among forum members, and overlapping with other on and offline OT [old time] banjo communities of practice" (p. 46).

Members of a CoP learn through their participation in the activity of the CoP. The CoP's goals provide the meaning and context for the learning, and in the process members can progress from legitimate peripheral participation to more central roles in the CoP (Wenger 1998). "Developing an identity as a member of a community and becoming knowledgeably skillful are part of the same process, with the former motivating, shaping, and giving meaning to the latter" (Lave, 1991, p. 55), so that learning in this context is often well in line with the goals of the learner. Online CoPs have been studied (see, for example, Baran & Cagiltay, 2010; Wenger, White, & Smith, 2009), while connectivist research focuses specifically on learning that occurs within widely distributed networks, of both people and objects, that can be accessed when a bit of knowledge is needed:

> Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing. (Siemens, 2005, Connectivism section, para 1)

Due to the centrality of human interaction to these frameworks, the focus of online-CoP and connectivist research has been on human interaction and the tools that support it, such as blogs and discussion forums, rather than on content-providing resources such as OERs. There is little information about learners who struggle to use OERs independently while also trying to join or learn within a relevant CoP or connectivist-style network. If such learners exist, then altering OERs to better connect with active online learning communities and networks might be very useful to them. However, another possibility is that lack of access to a relevant community or network is one of the issues affecting self-motivated music learners:

> Most young popular musicians in the West are not surrounded by an adult community of practicing popular musicians, and therefore 'legitimate peripheral participation' of the sort studied by Lave and Wenger is largely unavailable to them. Hence they tend to engage in a significant amount of goal-directed solitary learning. . . . In so far as a community of practice is available to young popular musicians, it tends to be a community of peers rather than of 'master-musicians' or adults with greater skills. (Green, 2002, p.16)

Such informal, goal-directed, solitary or peer-supported learning tends to be invisible to open-resource research. For example, in their study of the use of video lectures, Zhang et al. (2006) listed self-directed learning among the benefits. However, the study compared only different classroom-based groups of students, with interactive video acting as a replacement for a standard course lecture. Their findings might, or might not, be applicable to self-directing learners who view open video lectures. In fact, taken as a group, course-based studies provide a list of issues that might also be relevant to self-directed learning. These issues include basic site design principles (Murray & McPherson, 2006); site design for active learning (McLoughlin & Oliver, 1999); multimedia design principles (Erlandson, Nelson, & Savenye, 2010); interactive capabilities of media (Zhang et al., 2006); cultural issues (McLoughlin & Oliver, 2000); learners'

approaches to online materials (Ellis, Marcus, & Taylor, 2005); and a need for scaffolding as students learn the process of designing their own learning (Cameron & Tanti, 2011).

It is also possible that self-directed, independent learning involves issues that do not arise in classroom situations. Engaging with the self-directed learners themselves is the only way to discover which issues are most relevant in their situations. Just as the OER literature has not engaged much with self-directed learning, the literature on self-directed learning has not yet engaged much with learner experiences with open online resources. Lam and Ratto (2012) have conducted an exploratory study with the goal of better understanding what non-musicians who want to learn about music on their own might need from "online platforms that provide additional support for the exploration and discovery of music-related knowledge" (p. 135). However, Lam and Ratto's research is also still in the exploratory stage; their 2012 study focused on interviewing self-described non-musicians in order to gain a better understanding of their music-learning trajectories and modes of learning.

This suggests that one likely cause for the current lack of research into independent online learning is simply that researchers have not had time to catch up to the fast pace of technology development. However, another underlying cause may be a research focus on demonstrating that curriculum standards can be met using the new technologies:

> The overwhelming majority of e-learning research to date has focussed on establishing the value of particular e-learning course designs, teaching methods or tutor interventions. The objectives have been teacher, course or programme-focussed rather than student-focussed, with an evaluative objective aimed at investigating the pedagogic worth of e-learning innovations. There are good reasons why this should be the case. E-learning is relatively new and with respect to learning in general, under-researched. It has attracted significant educational investment but its educational value is often contested (see for example Holtham & Courtney, 2005). These factors cause an emphasis on evaluating "worth." (Sharpe et al., 2005, p. 3)

Another factor underlying the lack of research is the inherent difficulty of studying self-directed online learning (Harley, 2008). Even when inspired by participation in a course or CoP, self-directed use of OERs tends to be a lone, anonymous activity, unconstrained by time and place, often sporadic and unplanned, and distanced in time and space both from the resource providers and from more social learning activities. Rich qualitative data can be difficult to gather using traditional methodologies such as observation, while the meaning of easily-gathered quantitative data such as OER "visit numbers" can be difficult to interpret. As I discuss below, central to my rationale for choosing a participatory action research methodology was the need to overcome these challenges, by embracing the participants' own learning goals in a way that would motivate them to engage with the study over an extended period of time.

Inquiry-Based Music Learning

In terms of attracting strongly motivated, self-directed learners, this study was probably also strengthened by being situated in the subject area of music. As evidenced by the number and variety of musical offerings on YouTube, music is an integral part of many popular forms of self-expression and social participation. Intrinsic motivation to be able to use music creatively is widespread but is strongly tied to desires to participate or express in specific ways: A youth whose self-image resonates with rock guitar is unlikely to be satisfied with classical piano lessons. Unless there are adequate opportunities for everyone to learn how to engage in the music activities that most interest them, music should be an unusually good subject area in which to offer opportunities for self-motivated inquiry.

One indication that such opportunities are not always available is the large number of users who responded enthusiastically to my own music theory and music notation OERs; their interest provided the original impetus for this study. The literature provides additional evidence

that desired music learning is not always available. Many disadvantaged students lack equitable access even to basic music education in school (ISKME, 2013). Even for advantaged students, school offerings may fail to connect with personal musical interests and activity goals. Often, the presumed goals of music education have been to impart "appreciation" and passive fact-oriented knowledge of an approved canon of Western classical compositions, along with the skills needed to adequately perform such compositions (see, for example, Bresler, 1998; Regelski, 2006). Knowledge and skills pertaining to other music traditions, or the development of reflective, critical understandings that might be used to pursue different goals, have not been high priorities (Myers, 2008). Even for students who do pursue Western classical music, both music theory and practical skills are typically presented in "abstracted and somewhat artificial" formats (such as major and minor scales) "that must be manipulated and extended in order to be recognized as components of music" (Nettl, 2005, p. 391).

Thoughtful criticisms of these practices are widespread in the music-education discourse (see, for example, Dunbar-Hall, 2005; Elliot, 1989; Green, 2002; Saether, 2008; Skelton, 2004). Folkestad (2006) has noted a broad shift in interest in music-education research, from how music is taught to how it is learned in both formal and informal settings. Innovative approaches are being developed and discussed that promote active, creative learning, and that take into account students' musical interests (see, for example, Peppler, 2013; Peppler, Downton, Lindsay, & Hay, 2011; Thibeault, 2007; Thibeault & Evoy, 2011).

Affordances provided by new technologies are a major factor in many of these efforts, but use of new technologies is no guarantee of fundamental change. Beckstead warns that music-education "technologies may actually reinforce the traditional notions that they are supposedly trying to supplant" (2001, para 1), if they are understood as promoting efficiency in education

rather than transformation. Snodgrass' (2013) and Rhodes' (2013) studies are examples of approaches that focus on using new technologies to teach music theory more efficiently. More transformative approaches to notation can be found, for example using new technologies to permit students to create music without requiring that they write it down, which frees novices to be much more musically creative (see Jennings, 2005). However, these approaches do not appear to be providing the learners with a connection to music theory; transformative approaches to teaching music theory are difficult to find in the literature.

As already discussed, the complex, well-entrenched school processes tend to resist fundamental change, including in the area of music education. There are many gaps between music curricula and the musical interests and goals of students. The resulting demand for extra-curricular music education has long supported a variety of community-based programs, private instruction, and "teach yourself" method books. However, issues of money, time, and geography can prevent self-motivated learners from taking advantage of these options (Schmidt-Jones, 2012). In fact, because gaining certain musical skills requires considerable leisure time and money, part of the appeal of some music-learning activities can be that they signal a family's high socio-economic status (Kok, 2011).

Formal extra-curricular programs and lessons often follow the lead of schools in adopting passive-learning pedagogies that focus on abstracted, artificial knowledge (Myers, 2008), leaving students to discover on their own how to extend the knowledge to real-world musical activities. Nor is such discovery guaranteed; Hultberg (2002) found that when piano teachers presented pieces as objects to be reproduced rather than interpreted or explored, it was "difficult for the students to transfer the knowledge achieved in one piece of music to another one" (p. 194).

Popular music traditions can feature an explicit rejection of formal music education

methods, with informal music activities described as "more authentic" by both students (Hargreaves & Marshall, 2003) and professional musicians (Lilliestam, 1996). This may be in part a reaction to the shortcomings of formal music education, but it is also a recognition that informal learning is an integral part of many music traditions. Throughout most of human history, the typical way to learn music was aurally and holistically (Nettl, 1985). Self-taught musicians can develop a highly sophisticated and broadly useful aural knowledge of music (Woody & Lehmann, 2010), although it is not uncommon for such musicians to develop a desire to also understand formal music notation and theory (Green, 2002).

With the advent of recording technologies, learning based on listening and imitation has become common even as a solitary activity (Green, 2002). Crucially for this study, such solitary activity provides an aural connection to a widely-dispersed music CoP that practices a particular music tradition, but does not provide a connection to a local music-making CoP in which to actively participate in the tradition. The ability to learn music through self-directed inquiry is thus valued and perhaps even expected in some music traditions, but the opportunity to develop this ability in the traditional way, through making music with others, may not be available to some learners.

Formal music education may also fail to help students develop this ability. Dewey has not been alone in expressing concern that passive pedagogies actually disable, rather than develop, innate tendencies toward independent learning. Freire (1970/2004) argued that passive "education inhibits creativity and domesticates (although it cannot completely destroy) the *intentionality* of consciousness by isolating consciousness from the world, thereby denying people their . . . vocation of becoming more fully human" (p. 83-84). Illich (1970) asserted that "school prepares for the alienating institutionalization of life by teaching the need to be taught.

Once this lesson is learned, people lose their incentive to grow in independence" (p. 47). Bartlett (2013) has asserted that contemporary pedagogy, by framing technology as a way to offer difference in technique rather than true educational reform, teaches incapacity for independent thought "in order precisely to forestall the transformative effects of education as such—known to be troublesome for all states throughout history" (p. 2).

In the terms of the Deweyan language adopted above, we might therefore suspect that music education often fails to reveal that its tools can be appropriated by the learner for use in inquiry about music. This appears to be the case even for some successful music learners; in interviews with professional musicians, Green (2002) found that "most of them had not made any links between [formal classical piano] lessons and their informal popular music learning practices" (p. 148). She concluded that "music education has had relatively little to do with the development of the majority of those musicians who have produced the vast proportion of the music which the global population listens to, dances to, identifies with, and enjoys" (p. 5). Observing a music theory course that would be recognizable to most serious music students, Bresler (1993) noted the missed opportunity to connect the subject to the students' own experiences:

> Since the concepts presented in class (e.g. scales, harmonic progressions) are the backbone of popular music, the students had a rich and perfectly appropriate frame of reference in which to anchor the concepts. The material taught in class, however, was not related to these musical experiences. The few examples played in class were exclusively drawn from classical music.
> (p. 43)

Music theory and music notation both exist, in large part, because they are exceptionally powerful tools for learning, and learning about, music. As Bresler pointed out, they are perfectly relevant to popular music. As tools-to-learn-music, however, they are strongly associated both with classical music and with formal education. When music classes fail to challenge such

associations, they strengthen unexamined assumptions that music theory and notation are useful tools *only for* classical music and formal education goals. Music education may thus not only be failing to engage with the interests of many learners, but also failing to show them that its tools could be appropriated to pursue those interests informally, through self-directed inquiry.

The ability to pursue inquiry in the area of music is not only valued by many learners; it may also be a particularly powerful learning experience that influences a learner's general ability to pursue inquiry. Dewey, Greene, and Eisner have all argued that exploration in the arts can play a particularly powerful role in an individual's development. In *Experience and Education* (1938a/1997)*,* Dewey placed experience at the center of the acquisition of knowledge and understanding. In *Art as Experience* (1934), he singled out aesthetic experiences as the most common means by which something becomes a consciously shared human possession, "the most effective mode of communication that exists" (p. 286). In other words, Dewey was claiming that art is a uniquely powerful way for humans to interact to share their understandings of their experiences with each other:

> The enduring art product may have been, and probably was, called forth by something occasional, something having its own date and place. But what was evoked is a substance so formed that it can enter into the experiences of others and enable them to have more intense and more fully rounded out experiences of their own. (1934, p. 108)

That connection – between people's experiences of art and their own everyday experiences – was for Dewey a crucial point. He considered aesthetic perceptions to be "necessary ingredients of happiness" (1934, p. 10):

> To be set on fire by a thought or scene is to be inspired. What is kindled must either burn itself out, turning to ashes, or must press itself out in material that changes the latter from crude metal into a refined product. Many a person is unhappy, tortured within, because he has at his command no art of expressive action. (1934, p. 65)

Citing Dewey, but taking a more critical, political perspective, Maxine Greene (1977) argued that characteristics unique to aesthetic experiences provide a path for the development of critical perspectives. Similar to Freire, Greene blamed feelings of boredom and vacuity among the privileged, as well as feelings of hopelessness and despair among the impoverished, on a widespread passivity created by "the anaesthetic character of so many institutions in our culture, including schools" (p. 283). In particular, the unrelenting attention to knowing what is true, as presented by the teacher, or as found by well-defined linear methods, discourages the kinds of questioning necessary for critical inquiry. Greene argued that encounters with the arts encourage people to step out of their immersion in what is and encounter the possibilities of what is not; to learn to shift attention and see from different viewpoints; and to question, explore and reinterpret what has been perceived. Thus perceptive experience of the arts has a singular potential to encourage the problematization of what is perceived; to "stimulate the 'wide-awakeness' so essential to critical awareness" (p. 287); and to challenge linear, positive thinking and "the taken-for-grantedness of much of what is taught" (p. 285).

Eisner (1992) similarly argued that the arts contribute generally to education by encouraging ways of thinking that typically are not taught in other subjects and yet are ultimately useful in any pursuit. Some of Eisner's examples of generally-useful lessons taught by the arts are directly applicable to inquiry; the lessons, for example, that not all problems have a single, correct answer; that following clear-cut methods to reach fixed objectives may not prove as successful as having flexible goals that take advantage of surprises and new insights; that qualitative judgements about what "feels" right are sometimes more appropriate than judgements based on set algorithms; and that journeys of discovery need not be tied to the literal or the concrete. Eisner ties the kinds of thinking promoted by the arts to the development of persons

who can take active part in solving the complex, open-ended problems they find in today's world:

> Our lives increasingly require the ability to deal with conflicting messages, to make judgments in the absence of rule, to cope with ambiguity and to frame imaginative solutions to the problems we face. Our world is not one that submits to single correct answers to questions or clear-cut solutions to problems; consider what's going on in the Middle East. We need to be able not only to envision fresh options, we need to have a feel for the situations in which they appear. In a word, the forms of thinking the arts stimulate and develop are far more appropriate for the real world we live in than the tidy right-angled boxes we employ in our schools in the name of school improvement (Eisner, 2003, p. 382).

Perhaps because it plays an integral part in modern life and in personal and community identities, music is by far the art that is most commonly pursued in self-motivated inquiry, suggesting that music inquiry could play an important, even crucial, role, in providing the experiences and lessons valued by Dewey, Greene, and Eisner. Inquiry should be a powerful way to learn in any subject area, but under present circumstances, core subject areas such as reading and science are strongly focused on standardized curriculum goals and testable results, while music educators often have more leeway to act on their own initiative. As Sleeter (2005) has noted, "the fact that the arts are not part of the state's testing regime has had the contradictory effect of pushing arts out of some schools while creating relatively unregulated space for transformative work in others" (p. 99). Given adequate interest by teachers and adequate open resources, inquiry could flourish in less-regulated spaces inside, as well as outside of schools.

Open resources could be an important support for such teachers, but there has been little overlap or collaboration between the OER and music-education research communities. Internet-based research on music learning appears to be focused on methods for delivering traditional instruction over distances (see, for example, Bond, 2002; Rhodes, 2013). Studies that look at inquiry-style music learning in online environments are rare. Keast (2010) attempted to

implement constructivist-style scaffolding in an online graduate-level music-education course. Seddon and Biasutti (2010) tested a self-paced online music-learning course that taught adult non-musicians how to improvise blues by ear, an approach well in line with Green's (2002) recommendations. Both studies reported positive results, with the caveat that they were exploratory studies with very small sample sizes. Neither attempted to draw conclusions about ways to support independent music inquiry in an online environment, but Keast did point out the strengths of working with primary source materials rather than teacher-provided texts. As discussed above, it is difficult to study the kind of self-directed online learning that permits learners to choose their own materials as and when they need them, because such activity tends to be invisible to teachers and researchers.

Participatory Action Research as a Methodology for Studying Online Inquiry

One way to make this type of learning more visible would be through a study that benefits self-directed online learners when they report and discuss their experiences. Specifically, the most interesting pool of study participants would be those who tried, and failed, to learn something from an OER. An offer from the OER creator of personalized help with the learning project that brought them to the OER should attract such participants, providing a benefit that is not only well aligned with their own goals, but also well aligned with research commitments to open education and inquiry. The more the participants shared details of their learning goals, and the barriers encountered, with the OER creator, the more extensive and personalized the additional help would be. In acting to provide the help, and monitoring its usefulness, the OER creator would gain insights about why the OER was not sufficient as stand-alone help, and what might be done to help independent learners.

As an experienced music teacher who had published a very popular set of OERs, I was

unusually well situated to do this type of study. As a pool of potential study participants, the large number of visitors to the materials represented an unusual opportunity to work closely with self-motivated OER users, so the insights gained, as well as helping me improve my own work, might also be of interest to other OER developers, researchers, and educators.

When a researcher plans to work extensively with people, in order to understand and help resolve their real-world problems, action research provides a methodological approach that is particularly well suited to the needs and goals of the study. In action research, the researcher actively intervenes in a real-world situation, with simultaneous goals of better understanding the situation from a formal research perspective, while also trying to improve the specific situation (see, for example, Herr & Anderson, 2005; Reason & Bradbury, 2006). Action research is an umbrella term that has been used to describe a variety of research practices (Noffke, 1997b; Somekh & Zeichner, 2009). The branch of the action research discourse that is most relevant to this study is participatory action research (PAR). In PAR, the researcher acts in cooperation with others who have a stake in the real-world situation, treating them as co-researchers rather than as research subjects, so that participants' perspectives deeply influence both the actions and the findings of the research (see, for example, Heron & Reason, 2006; Kemmis & McTaggart, 2005). A study based on working directly with learners on their real-world goals, in order to gain insight into their perspectives as learners, can thus be framed as a PAR project, providing access to a useful discourse on how such studies should be conducted. However, that is not the only reason for choosing a PAR methodology; a number of other aspects of this study also resonate strongly with PAR, providing additional internal connections that strengthen the study.

First, action research (including PAR) projects typically have a dual goal, directed at both improving the specific, real-world situation under study and also adding more generally to the

relevant academic and policy discourses (see, for example, Cochran-Smith & Lytle, 1999; Kemmis & McTaggart, 2005). This fits well with my own research goals, which place the highest priority on improving my own practice as an OER creator, although they also include sharing what I learn with the open-education and music-education communities.

Second, in action research, it is more important to adopt the goal of understanding and improving a practice than it is to adopt specific research methods (see, for example, Brydon-Miller & Maguire, 2009; Herr & Anderson, 2005; Reason & Bradbury, 2008). Initial methods, issues, and even research questions may evolve during the study in response to what is being learned, because the researcher is understood to be undertaking the study with an incomplete understanding of the problem. Such an open-ended and flexible methodology is ideal for an exploratory study in an under-researched area, permitting the study to adapt if its initial assumptions get in the way of gathering and understanding the data.

Third, there is a rich tradition of action research in the field of education, possibly because education research tends to be more directly motivated than other social sciences by the desire to improve specific practices. Practitioner research is a type of action research in which the researcher systematically studies her own professional practices in order to try to improve them (Anderson, Herr, & Nihlen, 2007). Practitioner research is particularly prominent in the teaching profession, but the question of whose values underlie the idea of "improvement" can be contentious. The goals of teacher practitioner research are not always stakeholder-inclusive PAR-style goals. As Noffke (1997a) has pointed out, the aims of practitioner research projects can be framed in personal, professional, or political terms – although these three spheres are in practice not truly independent of each other – and studies labeled as "action research" have run the gamut, from projects that take a critical stance towards the status quo, to projects with goals

that are infused with status-quo standards.

A study that questions whether OERs are living up to their egalitarian ideals should take a critical, PAR-informed stance towards the status quo: "The explicit aim of participatory research is to bring about a more just and humane society" (Zeichner & Noffke, 2001). PAR involves a commitment to viewing other stakeholders in the practice-to-be-studied, not as subjects to be studied, but as co-researchers with valuable knowledge about, and legitimate perspectives on, the practice (see, for example, Freire, 1970/2004; Heron & Reason, 2006; Reason & Bradbury, 2006).

In PAR, a main purpose of taking seriously the perspectives of other stakeholders is in order to challenge the prior assumptions of the researcher. A primary goal is to help bring about positive social change, by improving the practice from the perspective of those who are not well represented in academic, policy and other official discourses (see, for example, Brydon-Miller & Maguire, 2009; Freire, 1970/2004; Reason & Bradbury, 2006; Zeichner & Noffke, 2001). Thus, PAR in particular resonates with this study in two additional ways: first, in that a major goal of the study is to bring to light the perspectives of a group that is not well-represented in the official discourse about OERs; and second, in that the impulse underlying the study is the open-education impulse to bring about positive social change by making educational opportunities more equitable.

Of particular interest from the viewpoint of open education, there is a strong PAR tradition in the area of adult-education projects that seek to challenge the assumption that learning is defined by the acquisition of approved knowledge through approved channels. Two such educational projects are widely recognized as being particularly influential exemplars of PAR: the Highlander Research and Education Center and the "cultural circles" work led by

Paulo Freire in Brazil. The Highlander project, dedicated to empowerment through adult

education in an area of Appalachian Tennessee known for persistent poverty and lack of

educational opportunity, "served as a focal point for researchers and activists involved in labor

organizing, the civil rights movement and environmental justice, among many other initiatives"

(Brydon-Miller & Maguire, 2009, p. 80). Freire's work focused on adult literacy programs built

around the learners' own understandings of the problems they were encountering in the world.

Freire (1970/2004) observed that independent *educational projects* are better placed to take

critical and political stances that would not be tolerated within *systematic education*, and he

advocated treating project participants as co-teachers and co-researchers rather than as passive

students and research subjects.

This highlights another crucial resonance with my study, which was an adult-education

project in the Freirean sense. The theoretical roots of action research are grounded in Freirean

and Deweyan notions of inquiry (Herr & Anderson, 2005), and individual action research

projects are often framed as being individual cycles of action and reflection in an ongoing spiral

of inquiry (see, for example, Anderson, Herr, & Nihlen, 2007; Cook, 2009; Kemmis &

McTaggart, 2005). Many PAR projects take the form of inquiries that are co-developed by

teacher and learners (see, for example, Cochran-Smith & Lytle, 2009; Wells, 2001). Dewey

wrote extensively about inquiry both as a basis for teacher-guided learning (Dewey, 1910/2011)

and as a basis for conducting research (Dewey, 1938b), and he considered the learning-goal and

the research-goal of inquiry to be so closely related that there is no clear line between the two.

Peters, Taylor, and Doi (2009) have argued that self-directed learning (SDL) and action research

(AR) are so congruent in terms of goals and processes that "scholars and practitioners alike in

each field stand to gain from one another, in terms of theory building, methods, knowledge of

learner and researcher characteristics, and practical guidelines for conducting SDL projects and various forms of AR" (p. 29). Bresler (1995) has identified action research as under-utilized in music-education research, in light of the contributions that inquiry approaches might make to the theory and practice of music instruction.

The above discussion regarding the lack of research into self-directed online learning focused on the practical difficulties. A PAR study should also consider the political implications of a lack of research. Self-motivated and self-directed learning challenge many assumptions that are currently implicit in the dominant education discourse. As noted above, the current research focus on the use of open materials within existing institutional structures has been criticized as an attempt to obscure the fact that open materials can be used for learning that is not approved and directed by an institution. The billions of dollars currently being poured into open education (Yuan & Powell, 2013) are clearly tied to expectations that it represents an opportunity to make a great deal of money, an expectation that places learners in a passive role as "consumers" of education. In a discussion of Massive Open Online Courses (MOOCs), Boven (2013) warned that, when open resources are offered within traditional educational structures, they necessarily lose their ability to challenge the assumptions underlying those structures:

> Those who fear the iconoclastic nature of MOOCs can develop strategies for co-opting them. Indeed, several top private and public universities have signed on to the Coursera MOOC in what seems to be an effort to reduce its impact. Likewise, those that hope MOOCs will make good on the promise of opening education to all would be wise to look to the past for models of how to avoid this co-option by the educational community. (p. 5)

The appropriation of open education by powerful institutions is probably not so much a conscious attempt at squelching student initiative, as it is an attempt by those institutions to maintain a powerful, central role in a rapidly changing world. Most teachers and educational institutions are sincerely dedicated to helping students learn and are often very successful at it;

unfortunately, such good intentions and positive results can create an unexamined assumption that the interests of learners *automatically* coincide with those of teachers and institutions. This has led to a discourse on open education that "is much more focused on the social, institutional, technological and economical aspects than on the need for development of new pedagogical approaches" (Guardia, Maina, & Sangra, 2013, p. 1).

Teachers who practice action research within an institutional setting may not be in a position to deeply challenge the status quo and change existing practices (Anderson, Herr, & Nihlen, 2007; Noffke, 1997a). In contrast, a PAR project that does not need to take account of institutional goals, and that can therefore focus more freely on learner needs and goals, is well situated to try to make changes in the world that are improvements from the perspective of learners. This resonance of political perspective is another strength of PAR as a methodology for this study.

Given my research goals, I originally chose PAR because it was the approach most likely to provide useful insights that I could act on. As I have grown to understand the action-research perspective of "revisioning our understanding of our world, as well as transforming practices within it" (Heron & Reason, 2006, p. 144), I have come to appreciate how well it is suited to my long-term goal of transforming my own open-education practices through a process that includes "revisioning" my own understanding. Cochran-Smith and Lytle (2009) advocate the adoption of inquiry as a personal stance that deeply influences approaches to both teaching and research, and I find I have in fact become committed to inquiry as a personal stance explicitly informing my actions as a teacher, researcher, and OER provider. Regardless of the specific methods I take in the future to offer open education, and to understand the effects of such offerings, I plan to view them from a PAR perspective.

Rather than adopting rigid validity criteria that can limit researchers' abilities to make practical and ethical research choices based on the specific situation (Schwandt, 1996), action researchers seek to show what was possible within the real-world context of the study, and to do so in ways that establish the trustworthiness of the study. Of particular value, from an action-research perspective, is evidence that the actions taken led to improvements in the real-world situation; that the study included multiple perspectives and multiple types of data; that choices affecting the study design were conscious, explicit, and transparent; and that the researcher's own prior assumptions, understandings, roles, practices, routines, and goals were problematized and challenged (Anderson, Herr, & Nihlen, 2007; Cochran-Smith & Lytle, 2009; Heron & Reason, 2006; Herr & Anderson, 2005; Wells, 2001). In this chapter, I have tried to make explicit and transparent my choices regarding the study design and the perspective that drove those choices. In the methodology chapter, I will discuss the variety of data collected and the ways it helped to reveal the multiple perspectives involved. In the analysis chapters, I will discuss what was possible (and not possible) in the specific context of this study, as well as the opportunities it created to challenge my prior assumptions and my practice as an OER creator.

Activity Theory as a Framework for Making Sense of the Data

For obvious reasons, the flexibility and adaptability of PAR as a methodology must extend to choosing methods of analyzing the study data. It became clear as I was gathering data that the crucial issues fell into two broad categories that could be described as *tools* and *interactions* for learning about music. These two areas were not easily separable from each other, however; within each inquiry, issues in one area deeply affected issues in the other. After gathering the data, I struggled for some time to find a framework for analysis that could accommodate the resulting complexity. As will be described further in the methodology chapter,

I eventually found activity theory to be a particularly useful framework for organizing, understanding, and analyzing the data. By focusing on activity as the basic unit of analysis, and by framing both tools and human interactions as key elements of each activity, I could use activity theory to take into account both sets of issues, as well as their interconnections with each other. "Activity theory is a powerful and clarifying descriptive tool rather than a strongly predictive theory" (Nardi, 1996, p. 7), so it is a useful tool when chosen in order to organize gathered data, rather than in order to design a study around a hypothesis.

      Activity theory in music education research. Although there are as yet few music-education studies that use activity theory, it has been recognized as a useful theoretical framework in this research area. Welch (2007) has posited that using activity theory can strengthen the ecological validity of a music education study, because it can take into account the multifaceted nature of music education situations. Echoing a more general argument made by Wertsch (1998), Welch argued that activity theory takes a purposefully holistic approach to understanding research data, helping to break down the barriers between various disciplines and theoretical frameworks, so that multiple useful perspectives can be brought to the problem. He hypothesized that activity theory has been underutilized in music education research in part due to strong researcher identification with a specific disciplinary focus. My study provides an example supporting Welch's contentions. Although the focus of this study was improving OERs as stand-alone resources, the use of activity theory to consider that goal in relationship to interactions with people proved to be crucial to the findings.

      Burnard (2007) has also pointed out that activity theory has been underutilized in the area of music education, arguing that it could provide a powerful tool for studying musical learning:

    It has the potential to overcome some of the most profound problems that have plagued
    attempts to look well below the surface of interactions – at the exchange sequences and

mechanisms of creativity and technology mediating pedagogic processes (and musical learning). Furthermore, it relates to what music educators (and researchers) might usefully do to create, consult and research adaptive learning environments in music education settings. (p. 45)

In a list of particularly promising areas for practitioner research in music education, Burnard included "evaluating the affordances (or enabling conditions and limitations) of web-based and e-technology environments" (2007, p. 48).

Folkestad (2012), in an analysis of his own research on music learning, composition, and music technologies, revealed a process similar to the one I underwent in this study, of finding that the data called for a sociocultural perspective that emphasized both mediation by tools and activity systems as situated contexts:

> Accordingly, the theoretical framework for viewing composition and creative music-making as situated practice, first presented in Folkestad (1996) and further elaborated in the view of musical learning as cultural practice (Folkestad, 1998), is just as much a result of the empirical studies as it is a foundation for the analysis of the data—in fact it constitutes a good example of the dialectic between theory and practice in research. (Folkestad, 2012, p. 195)

Because I came to understand the findings within an activity-theory framework, the chapters below will use activity-theory concepts to discuss, among other things, the uses of music-theory concepts. I have tried to construct a discussion that can be understood by non-musicians, because I believe that some of the findings could be relevant to online open education in any subject area. In order to provide a useful orientation for that discussion, in this section I will introduce only the aspects of activity theory that are most relevant to this study, and I will illustrate the activity-theory concepts with concrete examples from music, rather than the traditional examples from activities such as driving cars and hunting. The theoretical discussion in this section is a review of the relevant literature, but the musical examples are my own.

A Vygotskian view of musical understanding. Activity theory was first formalized by

Aleksey Leontiev, who began his research career as a student of Lev Vygotsky. Vygotsky's cultural-historical approach to psychology has had a deep and lasting influence on many of the social sciences, including education. Although Leontiev was pursuing different questions than Vygotsky and was also influenced by other thinkers (Kaptelinin & Nardi, 2006/2009, p. 173), the two are still so closely connected that activity theory is sometimes referred to as cultural-historical activity theory, or CHAT.

In developing his cultural-historical approach to psychology, Vygotsky took a radically different stance towards human understanding than did other psychologists and philosophers of the time. Instead of proceeding from the assumption that humans come to understand reality either through internal reasoning or through direct sensory perceptions of the world, Vygotsky argued that human understanding, and therefore human reality, is saturated in, and dependent on, meanings borrowed from and shared with others. For example, the culturally-based understanding that a series of sounds constitutes *a song* so deeply affects the perception of those sounds that it is not possible to separate the perceived-sound-reality from the concept of *a song*. The person who hears the sounds as a song is experiencing a different sound-reality than would a chimpanzee hearing the same sounds; in fact, the person is in fact no longer capable of hearing the sounds as the chimpanzee does, unaffected by cultural meanings. Further, ethnomusicologists have demonstrated that one culture's conception of *a song* can include aspects that are not shared by all cultures (see, for example, Nettl, 2005), so the perceived-sound-reality depends on meanings acquired from the individual's culture, such as local conceptions of *a song*.

This does not mean that all human experience is culturally mediated. Vygotsky distinguished between natural mental functions, which he believed that we share with animals similar to us, and higher mental functions, which are dependent on concepts. For example, there

are many sounds that a human might hear in essentially the same way as a chimpanzee, such as the sound of a nearby crash of thunder, because the sound is not being experienced through higher mental functions.

Based on his developmental-psychology observations and experiments, Vygotsky reached a number of conclusions about higher mental functions that are important to activity theory and to this study. First, higher mental functions are not possible without the cultural concepts through which we view reality. Natural mental functions deal holistically with direct experiences. In contrast, higher mental functions depend on concepts that are abstractions or generalizations of specific qualities of those experiences. The higher mental functions are so inseparable from the shared-language meanings of the concepts that "thinking in concepts does not exist beyond verbal thinking" (Vygotsky, 1986/1934, p. 107).

In this view, it is the abstraction of a particular quality of an object or situation that allows the comparisons and classifications on which higher understandings are created. Consider, for example, what happens when an orchestra tunes to an "A" sounded by an oboe. Orchestra members only tune to a particular quality of that sound; other qualities, such as its loudness, its length, or its reediness, are not imitated. Although tuning is a matter of frequency, even the oboe's actual 440-hertz frequency is not the crucial quality of the sound; large instruments tune to it using a lower-sounding "A" of 220 hertz. It is therefore an abstract quality of the sound – its A-ness, the aspect of it that makes it an example of what Western musicians conceive of as "the note A" – that is useful not only directly, in activities such as *tuning the orchestra,* but also as a basis for more complex musical concepts, such as scales and chords, which are in turn a basis for even more complexity in the form of melodies, chord progressions and entire pieces of music.

Clearly, in order to join successfully in the activity called *tuning*, a musician must share with the rest of the orchestra the meaning of *the note A*. An individual cannot fully participate in complex human endeavors, such as music, literature, science, or engineering, without developing the symbol-based higher mental functions that organize, and give meaning to, those endeavors. Deacon (1997) has assembled evidence from numerous fields suggesting that the ability to think symbolically is such a powerful advantage for individuals in human society that it has deeply affected the evolution of the human brain, possibly even acting as a primary driver in the development of intelligence in *homo sapiens*. Vygotsky (1986) pointed out that systematic education helps individuals attain these higher mental functions, essentially offering the individual a well-travelled route to sharing the symbolic understandings that have already developed within a community.

Music theory courses are an example of systematized education. Such courses traditionally focus on functional harmony, which conceptualizes pieces of music as being fundamentally organized as progressions of chords. The harmony of a piece, created when different notes are heard at the same time, changes from one chord to another as the notes change. These changes are perceived as progressions, because they follow semi-predictable patterns that create a sense of motion towards a satisfying ending. Musically-enculturated listeners can easily follow the progressions subconsciously.

The chord progression of a piece provides an orienting framework and background against which other elements of a piece, such as melody and rhythm, are perceived and understood. Organization by chord progression is not only the strongest indicator that a piece of music is part of the dominant, European-originated, "Western" music tradition; it is also the most complex aspect of that tradition. Western music theory is most highly developed in the area of

harmony, providing numerous conceptual tools for understanding, discussing, and manipulating this particular aspect of musical sound. In this study, more participants expressed an explicit interest in learning about harmony than in any other aspect of music theory. In Vygotskian terms, they were seeking the ability to move beyond a direct, holistic enjoyment of harmony experiences. They wanted to be able to classify aspects of those experiences using formal, verbal signs. This would open up to them the wealth of knowledge that musicians have already accumulated, over several centuries, about how functional harmony works. The discussion of the study findings includes examples illustrating why this knowledge is so useful to practicing musicians.

In order to make sense of such formal knowledge, however, an individual must be able to link it to personal experience. Vygotsky (1986) pointed out that the systematic understandings developed in school do not displace "the child's spontaneous concepts, but that, on the contrary, they presuppose the existence of rich and relatively mature representations. Without the latter, the child would have nothing to systematize" (p. 172). Vygotsky's work remained little known outside of Russia until it was later translated into English, but Dewey, working as an educator in the U.S., was at approximately the same time making a similar point. He argued that education is deeply harmed when children's formal learning is not sufficiently tied to their real-world experiences (see for example, Dewey, 1938a/1997).

This problem can be acute when the learner's home culture is too different from the culture of the school (Ladson-Billings, 1995; Moll, Amanti, Neff, & Gonzales, 1992; Sleeter, 2005). In music education, problems can arise even from the wide range of formal musical experiences available. To illustrate, consider the readiness-to-learn-music-theory of two hypothetical young students in a music theory course; one has taken violin lessons and the other

guitar lessons. The violinist may be aware that notes played simultaneously are considered chordal harmony, and she can hear that the music she plays in orchestra is based on such harmony. She herself may never have played multiple simultaneous notes *as chords*, however, nor is she accustomed to conceiving of the single notes she plays on her violin in terms of their place within the progressing harmony. Even if she succeeds in meeting the expectations of the theory course, the discussion of harmony is likely to remain abstract, disconnected from her practice as a violinist, and thus eventually may be largely forgotten. On the other hand, the guitarist, who is used to conceiving and playing music *as a progression of guitar chords,* may be better prepared to understand discussions of functional harmony, more likely to put them to use in practice, and thus more likely to remember the information.

  Activity, action, and operation in music learning. Leontiev, a student of Vygotsky, became interested in the potential of studying human activity as a way to understand how higher mental function develops. Leontiev posited that unplanned learning through direct experience results only in knowledge of properties of specific objects; it is only learning through planned activity that creates generalizable knowledge and conceptual development. For example, pulling and releasing a taut string, such as a hunting-bow string, reveals the property of making a specific pitched (high or low) sound. It is only through purposeful activity, however, that humans abstract that property, experiment with it, and come to conceptualize taut strings in terms of musical instruments such as violins and guitars. Of our two hypothetical music learners, the guitarist alone can easily experiment systematically with chords on her instrument, for example by changing one of the chords in a progression and hearing how that change alters the progression, thus coming to understand functional harmony through purposeful exploration.

  In activity theory, human consciousness and activity are considered inseparable, so the

best way to understand consciousness is to study human activity. In fact, attempts to abstract general characteristics of individuals, objects, or circumstances are considered misleading, because "no properties of the subject and the object exist before and beyond activities (e.g., Leontiev 1978). These properties do not just manifest themselves in various circumstances; they truly exist only in activities" (Kaptelinin & Nardi, 2006/2009, p. 31). For example, a violinist does not, as an individual, have some abstract measurable quality of "musical ability" or "musical knowledge." Any measurement of her ability or knowledge depends too much, for example, on whether she is asked to demonstrate it by playing scales on a violin in an orchestral setting or chords on a guitar in a rock-band setting.

Activity is therefore considered the basic unit of analysis, with a focus on understanding all of the major components of the activity. For Leontiev, the three primary constituents of an activity are the subject(s) engaged in the activity, the tools used, and the object of the activity. The subject is the person or persons undertaking the activity. The mediating tools include conceptual tools as well as physical tools. For example, the music-learning activity conceptualized as *practicing scales* is mediated by concepts such as *music practice* and *major scale* as well as by physical tools such as a piano or trumpet.

Leontiev pointed out that physical tools can themselves embody the abstract concepts of the culture that uses the tool. A tool is created and adopted within a culture because it solves a problem experienced within that culture's activities. In learning to use the tool for an activity, the individual also comes to understand the cultural concepts – including the activity, the perceived problem and its solution – that the tool reflects. Through the use of the tool, the concepts it embodies become a culturally-shared feature of the reality of the activity. For example, consider the conceptualization of the frequency of a musical sound. As mentioned above, in Western

music, the quality of highness or lowness of a sound is understood not in terms of its absolute frequency, but in terms of a limited number of named *notes* (such as "A" or "F sharp"). These notes are organized in a repeated pattern that spans the range of audible sounds, so that one can have, for example, a low A, middle A, and high A, which are all, in a fundamental way, the "same" note, although their frequencies are very different (220, 440, and 880 hertz). The concept is difficult to grasp from a text-based explanation, but is nicely embodied in a piano keyboard. One can see the repeated pattern of the notes in the arrangement of black and white keys, and can experience the ways that the notes are both the same and different, by playing the same melody using low, middle, and high versions of the "same" notes. Thus a piano student comes to intuitively understand a fundamental concept of Western music theory simply through using a physical tool that embodies that concept. In contrast, trumpets do not provide such an obvious visual representation of the pattern, another example of differences in personal musical experiences that can affect theoretical understandings.

One of Leontiev's most-cited findings involved the interchangeability of conceptual and physical tools. In a study on memory, he found that middle-school students who attempted a feat of memory performed better when they used a set of cards as an external mnemonic tool. However, neither younger students nor university students benefitted from using the cards. Leontiev concluded that the younger students could not yet make use of the tool, but the university students performed just as well without it, because they had already internalized mnemonic tools that performed a function similar to the cards. An analogous example from music education would be to ask students a question such as "what is the fifth note in a B major scale?" Students who had never played that scale would not be able to make use of any tool to answer the question. Students with limited experience of the scale could probably arrive at the

correct answer if allowed to play it on their instruments or look at a notated version of it. More-experienced students could answer correctly without looking at or playing the scale, by mentally consulting an internalized representation of *B major scale*. As Vygotsky (1978) pointed out, external tools are typically used to exert influence and control in the world, while internalized tools (such as an internalized representation of a scale or of a piano keyboard) are used to organize and control one's own mental activity. Internalizing a tool restructures the individual's consciousness in ways that make it easier to understand and manipulate the concepts represented by the tool. This internalization of external tools and actions is a key concept in activity theory that is crucial to understanding why music theory can be of practical use to musicians.

The third basic element of an activity is its object, which motivates the activity; in attaining the object, the subject will meet some need. According to activity theory, all activity is motivated by needs. These can be psycho-social needs, such as a need to be recognized by others as a competent pianist, as well as physical needs such as hunger. The desired object does not have to be a physical object; it can be an event, such as an acceptable performance of a B major scale, or a change in circumstances, such as joining an orchestra.

The relationship between the need and the object may not be obvious. The immediate object of an activity may represent only one step towards fulfilling the need (Leontiev, 1978). For example, practicing scales may not sound like improvising jazz, but a music student whose immediate object is *scales played correctly* may have in mind a long-term goal of *being good at jazz improvisation*. Also, in group activities, the needs, objects, and actions of the various members of the group may interact with each other in complex ways, so that the immediate object of one person's actions may seem quite separate from, or even antithetical to, the need that drove her to take action with the group (Leontiev, 1978). For example, it might be difficult to

believe that a cymbal-player is motivated by a desire to make beautiful music, if one considers only the noisy crashes of her own activity. However, the connection between the immediate goal of *well-timed cymbal crashes* and the object *to make beautiful music* is revealed in the context of the group activity of an orchestra performance.

Given the above discussion, the reader could be forgiven for wondering what activity theory manages to "pin down" in a research context, if a scale can be either an internal tool (in the form of a concept), an external tool (in the form of a written representation), a fulfilled object (in the form of a scale performed well), or a temporary object on the way to fulfilling another need (such as jazz improvisation), but it is precisely this fluidity which allows it to usefully describe human activity. Consciousness itself is fluid; attention, objects, and activities are typically juggled and switched quickly, easily, and often. For example, a jazz player, fully engaged in improvisation, may stumble over a note, switch attention momentarily to playing the relevant scale, and when satisfied, switch attention back to improvisation, having absorbed the learning from the scale practice with barely a stutter in the flow of notes.

Activity theory posits that, in order to understand what happens in such real-life situations, it is useful to focus on the relationship between subject, object, and tools. A hierarchical structure is used to organize some of the complexity involved. The highest level in the hierarchy is the activity, which is oriented toward the motive, the object of the need that inspired the activity. However, people are typically not very conscious of the motives of their activities. Children usually cannot articulate them, and even reflective adults, who can state a motive when asked, are typically not focused on the motive during the activity. Group activity can obscure or even subvert motives: A student whose immediate goal is to get a good grade on a music theory test may have little understanding of the educational motives behind the test. In

fact, the individual's motives can be at odds with the group motive of the activity, as when a focus on the personal motive of good grades causes the student to decide to cheat, completely subverting the group's purpose for the test activity.

The middle level of the activity hierarchy is the one that enjoys conscious attention. Activity consists of actions, which do have conscious goals. For example, the music-learning activity *practicing the guitar* might include actions such as tuning the instrument, playing scales, practicing a piece that will be performed soon, working intensively on a difficult spot in that piece, and reading through an unfamiliar piece. The sociocultural needs that motivate the decision to practice probably are not foremost in the guitarist's consciousness, but the goals of specific actions – a guitar that sounds "in tune" or the ability to play the difficult spot flawlessly – are clear and conscious.

Leontiev made some important points about actions that are crucial to the analysis of what happened in this study. In one way, actions and activities are not separable. Activity is completely comprised of actions: "If the actions that constitute activity are mentally subtracted from it, then absolutely nothing will be left of activity" (Leontiev, 1978, p. 100). At the same time, actions and activities are independent of each other in at least two important ways. First, actions that appear to be "the same" may have different goals and be part of different activities. For example, consider the action of a young violinist playing a B major scale. This action can take place in completely different contexts, including individual practice, private lessons, orchestra rehearsals, and auditions. In each case, the action appears to be the same, but is part of different activities that have different objects. These differences affect the focus of the violinist's attention and her experience of the action, thus affecting, among other things, what she can learn from the action.

Second, because the most important characteristic of an activity is its object or motive, the "same" activity can be accomplished using completely different sets of actions. For example, consider two musicians who have conceived a need to play the "Greensleeves" melody. One plays it on trumpet, and the other plays it on violin. They would agree that they have completed the same activity – playing "Greensleeves" – but they have used very different actions to do so. When a perceived need sets an activity in motion, the series of actions taken to reach the desired object depends strongly on the tools that the individual perceives to be useful for that activity. The violinist's first action, for example, might be to go to another room to get her violin, ignoring a nearby trumpet.

This is because there is another unconscious level below the conscious action level in the activity hierarchy. Activity also involves operations, which are automatic actions that do not require conscious attention. For example, a beginning violinist must pay attention to the physical movements required to create a specific note. At that point, *playing the note* is an action. After some practice, however, she has only to desire to play that note and her body will automatically take the actions needed to play the correct note. At that point, playing the note becomes an operation that is automatically available for the more complex, conscious action of *playing a melody*. With further practice, playing that melody can itself become an operation that is automatically available for activities in which conscious attention is on a yet more complex action, such as *playing the melody with feeling*. As already described, operations can quickly shift back to being conscious actions when necessary. For example, if a wrong note is noticed during the action *playing a melody*, attention shifts and *playing the note* temporarily becomes a conscious action again, rather than an operation.

Activity theory also characterizes each level of the hierarchy as having a different

orientation. As already discussed, the activity is oriented toward the object that fulfills the need, but it is not uppermost in the subject's mind. Actions are oriented toward goals, which are the focus of conscious attention. Operations are oriented toward the conditions in which the activity takes place. For example, the specific operations with which the violinist completes the action *go get my violin* will depend, among other things, on where the violin is located. Operations are automatic, unconscious responses to the conditions; one does not need to think about walking to another room or opening the door, unless a problem is encountered. If the door is difficult to open, however, the operation *opening the door* can quickly become a conscious, goal-oriented action. If the door is locked and the key is missing, *opening the door* can become the short-term object of a new activity, setting in motion a whole series of actions and operations that still has the long-term object of *playing "Greensleeves" on the violin*.

Crucially for this study, operational conditions also include the tools that the subject has become accustomed to using in similar situations. For example, a jazz musician and a Hindustani musician, when asked to improvise, will automatically rely on very different physical and conceptual tools: One might use a saxophone and jazz scales while the other uses a sitar and a *raga*. Their prior experience, that a particular set of tools is useful for improvisation, is a condition of their activities. Conceptual tools in particular can influence the individual's understanding of the activity so deeply at the unconscious, operational level that it can be difficult to switch to a different set of conceptual tools. For example, jazz improvisers trained on saxophone often take up a new concrete tool, such as a clarinet or flute, with relative ease. In comparison, the difficulty of switching between different conceptual traditions, such as jazz and Hindustani music, is widely recognized.

Chapters 5 and 6 feature discussions of two conceptual tools – music theory and music

notation – because one or the other, or both, were fundamental issues in nearly all of the inquiries in this study. Music theory and music notation are both sign systems; they are useful conceptual tools because they are shared, formal sign systems for "pointing to" real-world musical phenomena, such as a specific characteristic of a sound. Vygotsky believed that such sign systems are particularly powerful tools: "One can summarize [Vygotsky's] work by saying that he was concerned with how humans come to master sign systems and then use those sign systems to organize their activity" (Wertsch, 1979/1981).

The social context of music-learning activities. The conditions of an activity also include social conditions, such as community approval of certain musical goals and activities, or the availability of others to help with music learning. Kaptelinin and Nardi (2006/2009) have pointed out that, although Vygotsky and Leontiev were most interested in understanding the psychology of individuals, later developments in activity theory have tended to focus more on understanding the collective activities of groups. In particular, the original three-part subject/object/tools focus has been expanded to include specific social aspects of the activity, such as community, rules, and division of labor (see, for example, Engeström & Sannino, 2010).

Social connections and perceptions were interesting and important aspects of the inquiries in this study; Chapter 7 focuses on the interactions with me that helped each participant to make progress towards a music-learning goal. An activity-theory analysis that delves more deeply into issues of community, rules, or division-of-labor aspects of their music-learning activities would be interesting; in fact, some of the participants might have benefitted from rethinking or changing their perceptions or understandings of the rules and division of labor in music-learning activities. However, none of the participants accomplished such changes within the time frame of the study, so expanded versions of activity theory were not needed to interpret

the data. I also did not seek to challenge the participants' choices of music-learning goals or relationships to their music communities; it felt inappropriate to do so given the "help with your goals" promise made in the call for participants. Nor did the study create an opportunity to challenge my own conceptions of music theory or practice, since the goals and prior understandings of all of the long-term participants were situated in Western-music traditions that are comfortable and familiar to me.

In the final chapter, I will discuss these issues as possible directions for future research. I will also use a PAR perspective to question some of the social conditions that appear to have created barriers to the participants' progress, challenging OER providers and educators to consider making some of the changes that might remove such barriers. Meanwhile, I will frame the relatively stable social conditions of the participants' activities using a community of practice (CoP) perspective. CoP research shares cultural-historical roots with activity theory, and activity systems are often analyzed in terms of CoPs (Gee, 2008, p. 91).

In contrast to the relative stability in social perspectives, many of the inquiries were characterized by changes in tool use by the participants. Kaptelinin and Nardi find that individual-motivation and collective-activity frameworks provide "complementary versions of activity theory. . . . Each has a different scope and can be applied fruitfully to solve different types of research and practical tasks" (2006/2009, p. 142). In this study, maintaining Leontiev's original focus, on the effects of tools in mediating individually-motivated activity, was more useful for interpreting the findings with regard to the research questions.

The participants' learning goals often explicitly included gaining new music-making or music-learning tools. Even when adopting a new tool was not a goal, several participants reported progress towards their goals that was facilitated by adopting new tools, making new

connections among the tools already available to them, or using those tools in new ways. Their inquiry activities were all heavily mediated by physical tools, including musical instruments, music-creation software, online and hard-copy texts, and audio and video recordings, as well as by conceptual tools such as music theory and notation. Even their interactions with me were always mediated by multiple layers of tools, including the Internet, the Moodle-based interface at the study site, and the text messages, notated music, and recordings that comprised our communications. Each inquiry is thus best described as a series of asynchronous activities, undertaken individually by myself and the participant, with coordinated goals, rather than as collective activities undertaken by multiple subjects.

In contrast, the most influential education research that uses activity theory has focused on learning that takes place through direct interaction with other people in face-to-face situations (see, for example, Rogoff, Correa-Chavez, & Navichoc Cotuc, 2005; Wertsch, 2008). In the specific areas of music education and music learning, there are, as noted above, few studies presented using activity theory, and most of these also focus on collective activity in face-to-face situations, such as music classrooms (Burnard & Younker, 2008; Hogenes, Van Oers, & Diekstra, 2014), individual music lessons (Heikinheimo, 2009; Johansson, 2013), music communities of practice (Burnard & Dragovic, 2014; Welch, 2007), and music projects (Henley, Caulfield, Wilson, & Wilkinson, 2012). A relevant exception is Keast's (2009) description of using principles of constructivism and activity theory to design an online college music history course. Keast noted that online resources act as learner-selectable and "just-in-time" scaffolding for the learning process, arguing that such resources should not only be accessible, but also actively engaging to the students.

There is a relevant research area in which it is more common to use activity theory to

understand individual learning and tool-mediated activity: Interaction design, an area of human-computer interaction (HCI) research, is the study of purposefully designing tools (particularly hardware and software) so that they are easy and intuitive to learn and use. Many studies in the area of HCI have used activity theory to improve the design of technologies by means of understanding the perspectives of users in real-world situations. Because people often use tools individually, even when working on group projects, interaction-design research is more focused on individual rather than group activity. Described using a variety of terms such as *activity exchange*, *participatory design, cooperative design,* and *design-in-use* (see discussions in Beguin, 2003; Kaptelinin & Nardi, 2006/2009, p. 111), this approach has strong parallels to PAR in general and to this study in particular.

OERs are not typically the focus of interaction-design investigations, but from the perspective of design-for-ease-of-use, OERs could be viewed as analogous to software interfaces. Interaction-design research often takes a participatory approach, working closely with users to understand their perceptions and experiences of the tools being designed (Nardi, 1996), with aims that are well in line with PAR:

> Considering information technology a mediating artifact, rather than merely a pole of human-computer interaction, has a straightforward implication for design. If taken seriously, this notion requires that the most important design objective should be to help people attain their meaningful goals. (Kaptelinin & Nardi, 2006/2009, p. 117)

In the following chapter, I will describe how this study was designed with the objective of helping the participants achieve their meaningful music-learning goals, with a longer-term object of designing OERs that help independent learners achieve their meaningful goals.

Chapter 3

Methodology

As outlined in the literature review, action research offered an approach well aligned with my goals and research questions. Using action research as a framework, my 2012 user survey could be viewed as the investigation/reflection step of the first turn of a spiral of inquiry that began when I first took the action of publishing some OERs. The survey included questions about how to make the materials more useful to the respondents, but those questions did not yield results clear enough to suggest which changes in the materials might be most beneficial to struggling music learners. The clearest result from the survey was that, regardless of whether they described themselves as students, teachers, or independent music-learners, the respondents appeared to be engaging in self-directed inquiry when they used the materials (Schmidt-Jones, 2012). From an action-research perspective, focusing on supporting self-directed inquiry was thus the most appropriate next step.

As discussed in the literature review, participatory action research (PAR) in particular seemed the most likely way to glean insights from the users that were clear enough to suggest specific useful changes to the OERs. As a long-time private music teacher, I was experienced in helping musicians pursue their own music-learning goals. I did not expect to be knowledgeable about every aspect of music that interested the participants, but inquiry processes allow space for the instructor to learn along with the student, acting as an experienced guide to resources rather than as the source of all needed information (see, for example, Knowles, 1975).

My prior experience was entirely in face-to-face teaching, but I felt that setting up in-person observations with local volunteers would result in artificial, laboratory-type situations in which the participants' primary motivation was to "be a good study subject" rather than to use

OERs to reach personal music-learning goals. An artificial, local set-up would also have ignored the unusually large pool of potential volunteers who were already trying to use the OERs on their own. A PAR approach called for a study that took place entirely online, so that actual user-stakeholders could participate, regardless of where they lived.

Participatory Action Research as a Framework for the Study Methodology

As described above, PAR provides a guiding ethic and attitude towards research projects, rather than defining specific methods to be used (Brydon-Miller & Maguire, 2009; Herr & Anderson, 2005; Kemmis & McTaggart, 2005). Research techniques and methods depend on the specific circumstances of the practice-to-be-understood. In this case, the users of my online materials served not only as the inspiration to do research, but also as a valuable source of possible participants for the project. The enthusiasm and good will that accompanied many of the responses to my survey suggested that some users would be interested in engaging seriously with a more extended project. On average, the respondents rated the materials as very helpful to them (Schmidt-Jones, 2012), and it is likely that this was due in part to a higher response rate by readers with positive feelings about the OERs. Bergquist and Ljungberg (2001) explained that, in the social calculus of internet-based open-information communities, acceptance of a free gift of information may create a sense of moral obligation to pay back the giver in some way. In the Internet-based "gift culture" of OERs, grateful readers may want to "give back" by participating in research that will help other OER readers. A few of the participants in the current study in fact mentioned this type of motivation when they signed up.

On the other hand, of the survey respondents who were willing to express dissatisfaction with the materials, a majority were beginners or inexperienced musicians who appeared to be experiencing little success in using OERs. Their comments indicated to me that their prior

knowledge and expectations of music learning were so far from the standard music-education assumptions on which the materials were based that they were unlikely to make progress without active guidance. I reasoned that by offering my OER readers personalized help with their own learning goals, I could expect to attract participants who wished to use free online materials for music learning but were experiencing some hitch in doing so, in part due to a lack of prior music-learning experience. It was just such learners who might be able to offer insights into how to make my own offerings, and perhaps OERs in general, more widely and equitably accessible.

The methodology for this project then developed from the need to engage with such users in ways that treated them as thoughtful co-researchers whose perspectives and needs would be a force in creating the final shape of the project, since "sharing power . . . in a PAR process can significantly change the nature of the project itself" (Brydon-Miller & Maguire, 2009, p. 88). In the rest of this chapter, I will provide a formal statement of the research questions that drove the study and an overview of how the study proceeded, followed by more-detailed descriptions of specific aspects of the methodology, including recruitment, study timeline, demographics and characteristics of the participants, study site, data sources, data coding, and analysis.

Research Questions

The research questions arose from my expectation that some of the hitches in using online resources might be solvable by changes in the OERs themselves, while others would reveal needs that could only be met by active help from a guide or facilitator. I also suspected that there is a complex interplay between online offerings and each learner's local resources. The following research questions thus provided a framework for the study design, data collection, analysis and discussion:

1. What makes an OER more or less useful for self-directed, informal learning, particularly for those with limited formal music education?

2. Given an abundance of online resources and a highly motivated learner, what are the most useful functions of a teacher/guide/facilitator?
3. What are the interactions between informal online learning processes and the learner's local practice as a musician and music learner?

A fourth research question was "What are the influences on the learner of practicing a structured inquiry approach to online resources?" This question will not be discussed in the analysis, because it turned out not to be useful. As described below, the participants refused to use the highly structured inquiry approach that was offered. Most of the long-term participants were clearly already comfortable with self-guided inquiry as they began the study. They benefited from specific suggestions regarding what to do in an unfamiliar learning situation (such as learning to compose music), but given useful suggestions, they had little trouble organizing and pursuing their own inquiries. Only Lee and Donald appeared to have noticeable difficulties with inquiry as a process, and as I will discuss below, there was little evidence that the study had a lasting influence on their approaches to music learning.

Overview of the Study

In order to attract participants, I added links from my online music-learning modules, indicating that study participants would receive individualized help with their own music-learning goals. With the help of university personnel, volunteers were registered for a non-credit "Music Inquiry" course at the University of Illinois Moodle course site. I collected all data from and about participants through the course site.

Participants began by completing an introductory questionnaire, which gave me some idea of their background and music-learning goals. After that, each inquiry unfolded through one-on-one conversations in a private discussion forum. Although the inquiry process was informal, participants did proceed through successive inquiry cycles, with opportunities in each cycle for the learner to pose questions, explore possible answers, and respond with a creation,

while also reflecting on the process and discussing it with me. The inquiries of long-term participants involved multiple such cycles: The first cycle typically led to the creation of a short-term goal that was in keeping with the learner's long-term music-learning goals and doable within the time frame of the study. Subsequent cycles produced creations such as completed practice exercises, music-theory analyses of highly-regarded popular or classical compositions, original arrangements of favorite tunes, and original compositions.

I was prepared to also offer a group forum at the site if there seemed to be a reason for participants to interact with each other. However, with most participants dropping out quickly and the eleven long-term participants pursuing markedly different inquiries at different times over the course of a year, the opportunity never arose.

I kept the course site open for a full year, because I wanted to offer each participant a chance to receive substantial help towards the music-learning goal, and I also wanted a chance to develop a reasonably in-depth understanding of each inquiry as a case of needing-something-not-yet-found. As anticipated, the registration rate was low and the dropout rate high. Google analytics suggested that the materials in which I posted the call for participants were averaging a total of about 2690 visits per day, but only 60 volunteers responded during the 5 months that the link to the study was available. Seven of the respondents developed manageable inquiry goals and reached them before the end of the study; four others did not reach their inquiry goals but conducted inquiries at least as extensive as the "completed" inquiries. Understanding these eleven long-term inquiries (18% of registrants) became the focus for my analysis.

Of the remaining volunteers who registered, sixteen (27%) never became active participants. Fourteen (23%) only completed the introductory questionnaire; fifteen (25%) dropped out after completing the questionnaire and beginning a discussion; and four (7%) went

on to choose a goal and complete one creation-producing inquiry cycle before dropping out. The 33 short-term participants are all grouped together in the analysis as study dropouts. Although my analysis focuses on understanding the eleven extensive inquiries, I also discuss, when relevant, the statistics of those who dropped out, comparing them as a group to those who completed extensive inquiries. Although no quantitative conclusions can be drawn from the statistics, the comparisons do appear to offer useful clues as to why the long-term participants remained while others did not.

Each inquiry proceeded either until the participant dropped out, or we agreed that the inquiry goal had been reached, or the study deadline required ending it. If after any activity (such as registering, filling out a questionnaire, beginning a discussion, or working on an inquiry), I did not hear from a participant for some time, I emailed once asking if my help was needed. Often there was no response. Some participants responded with specific problems, which we solved, often with help from the university Moodle site support team. Most who responded said they had been busy or distracted but planned to continue. Some responded with one or two discussion posts, and some expressed gratitude for the reminder; I suspect that a study incorporating regular reminders might have had a slightly higher retention rate. In keeping with my IRB, however, I sent no further reminders unless a participant made significant progress in an inquiry and then disappeared again. At the beginning of each inquiry, I sent a reminder after two weeks of inactivity. Many of the committed participants had irregular contact habits, however, and while some gave warning that they were going on vacation or would be unusually busy at work, others did not. As I got to know the participants, I checked on them only when a period of inactivity was both unexplained and unusually long.

In order to ensure that my own response time was a positive factor in the inquiries, I set a goal for myself of responding to any contact within 24 hours. In asynchronous learning, a short response time by the instructor creates the sense of an online social and teaching "presence"; Gorsky and Blau (2009) have shown that such instructor presence is crucial for both learner satisfaction and engagement when participation in an online forum is entirely optional. I rarely failed to meet my 24-hour goal, and never by more than a few hours. Serendipitously, this also resulted in a useful unit of analysis. The amount of interaction with me is an interesting factor that varied widely among participants, so it is useful to have some unit-of-interaction for the sake of comparing inquiries. Therefore I have defined a *contact* as a unit of interaction consisting of the participant posting something at the course site and my posting a response. If the participant posted numerous times within a few hours, and I responded to all of the posts at the same time, I count that as only one contact. Such follow-up posts were typically on the order of "here's another example" or "I forgot to ask" or even "aha, I figured this part out myself." If I responded to a post and the participant then quickly posted a reply to my response, requiring a further response from me, I count that as two separate contacts. If a participant's post was essentially "I understand and I'll work on it soon," I did not feel a need to reply, and did not count this as a contact that moved the inquiry forward. The number of contacts is thus loosely a number-of-lessons measure; the intensity and complexity of each lesson also varied widely, as will become clear in the analysis chapters.

I purposely kept the course of study unplanned and open-ended, in order to get the best possible idea of what the participants themselves actually wanted or needed. Their goals, backgrounds, and needs varied greatly, so there was no typical course of inquiry. The time taken to reach an inquiry goal varied in length between 50 days and 194 days. Some of the

"unfinished" inquiries were even longer; Glen's lasted 348 days, nearly the entire length of the study. Sonia completed two different inquiries over the course of the study, with a long break in between. The number and rate of contacts needed to finish an inquiry also varied greatly. For example, Alex, the participant who finished in only 50 days, contacted me 21 times within that time period; while Cole, the participant who took 194 days to successfully complete his inquiry, did so with only 10 contacts.

Seven of the eleven extensive inquiries, and a similar proportion of those who dropped out, included a focus on composition, so the nearest thing to a "standard" inquiry was a series of analyze-and-compose cycles. I borrowed this approach from a widely-used method of teaching music theory, arranging, or composition: The learner analyzes good examples of a certain style of music, paying particular attention to how musical elements (such as rhythm, harmony, and form) work to create the style, and then demonstrates understanding by composing an exercise in that style. This activity lends itself well to creative inquiry, so the only major changes I made were to encourage creative composition rather than the typical highly-constrained exercises, and to allow the learner to choose the music style, the pieces to be studied, and the musical elements to be analyzed. Only one participant chose a style that is traditionally taught in music theory classes – Baroque counterpoint – while the rest chose jazz, rock, or pop styles.

The resources available for any inquiry included the local and online resources that the participant had already been using, as well as active online help from me, and any relevant free online resources that either of us could locate. As described below, the types of resources that were used varied greatly among inquiries.

Most inquiries ended when the participant dropped out. Two of the completed inquiries were followed by the participant dropping out soon after beginning a second inquiry. Only three

inquiries formally ended when the participant and I agreed that the goal had been reached. Four of the long-term participants ended their inquiries only because the time to close the study was approaching, and two of those asked to continue our conversations outside of the study.

I kept a research journal during the study and also did some preliminary analysis during the year that I was interacting with the participants, so that I could get some idea of what the data were suggesting and could ask for further clarifications from participants as needed, but I did the majority of the analysis after closing the study.

Recruitment

In order to recruit participants, I added a link to my 50 most-visited modules, promising help from the author of the module with the participant's own music-learning goals. The subject matter of the recruiting modules varied considerably. The focus of 28 of the modules was some specific aspect of Western music theory or notation; while seven featured Western musical instruments, five discussed acoustics, four gave specific suggestions for teaching music, four discussed non-Western music, and two discussed specific eras in Western music history.

The link in each module led to a consent letter explaining the purpose of the study and describing inquiry-style learning. For each consenting volunteer, the Moodle site administrators created a password for the course site and a randomly assigned false name to use as a public persona in the site. I used their real names in the private, one-on-one Moodle discussions, in order to foster personalized relationships with them, but in the analysis below I use the false names.

Timeline of the Study

I could not predict the dropout rate, but wanted to ensure that I had enough, but not too many, committed participants, so I made the call for participants available twice. The Moodle

"course" and the first call for participants were made available on January 18, 2013. By February 15, 26 volunteers had registered. Eighteen of those had become active and only six appeared to have dropped out; the rest had registered too recently to have had a chance to become active. With the potential for up to 20 active inquiries, I took down the call for participants. By March 30, it was clear that the dropout rate among active participants would be higher than it had appeared in mid-February, so I made the call for participants available again. The registration rate was much lower the second time. It may be that most of those who were very interested had already signed up the first time, but other variables, such as the time of year, may also have had an effect. By July 30, I had 58 registrants, 12 of whom were active participants. Some of those had already been active long enough to make progress towards their goals, and others had surprised me by becoming active long after their registration, so I decided I could take down the call for participants for the final time without the risk of having too little data. Two final volunteers contacted me shortly after the call for participants disappeared, and they were also included in the study.

During the summer and autumn, participants who were proceeding slowly sometimes asked when the study would end. I gave them an approximate date of December 31 and assured them that there would be enough flexibility to finish any project that they were actively working on at that time. On November 16, I posted an announcement through the site's news forum, which sent an email notice to all participants who had ever been active, that the study would end some time in January, and that they would receive a two-week notice before the closing date. On January 17, with most active participants having found good stopping points for their inquiries, I posted a second announcement that the study would close at the end of January. By January 31, only one participant, Sonia, was actively trying to finish an inquiry creation. She was an

unusually ambitious and hard-working participant, but had been encountering serious health problems for months, so I quietly kept the study site open until she submitted her composition on February 3. I responded positively when a few of the long-term participants asked to continue contacting me informally by email after the study ended, or asked to be notified if I began another study.

The Participants

The study was open to anyone, anywhere in the world, between the ages of 18 and 65, who had sufficient access to open online resources and sufficient interest in learning about music to register, so the characteristics of the participants are largely a result of self-selection. The introductory questionnaire, which was completed by all participants who became active in the study, provided basic demographic information, such as the participant's age and country of residence, as well as relevant information such as musical backgrounds and learning goals.

This provided an opportunity to compare the characteristics of study dropouts with those of long-term participants. I will discuss participant demographics and characteristics here in terms of the two groups – dropouts and long-term participants – because the analysis revealed high similarity between the groups in most characteristics, but also two large differences that are relevant to the research questions. As a rule, it is not wise to attach too much importance to statistics when dealing with small numbers of self-selecting participants, but the differences are interesting enough to discuss because of the size of the two disparities, the similarities between the groups in other respects, and the theory-based arguments that I will use below to connect the disparities to other data in the study.

The range and distribution of the ages in both groups were very similar. In order to comply with IRB concerns about vulnerable populations, consenting participants were asked to

verify that they were between 18 and 65 years of age. (Four people over 65 emailed and asked whether they might be considered in spite of their age; I declined as politely as possible, explaining the issues involved.) Among dropouts, reported ages ranged between 18 and 61, the mean age was 42.2, and the median age 42. Among long-term participants, reported ages ranged between 22 and 65, the mean age was 46.4, and the median age 44. The mean of 18 and 65 is 41.5, so participants in both groups were well distributed through the permitted age range. Long-term participants as a group were slightly older, but given the qualitative nature and small size of the study, the size of the difference is so small that it was likely created by chance.

Men were much better represented than women both among long-term participants (8 to 3), and among those who dropped out (21 to11). Among those who registered but never filled out a questionnaire, women appeared to predominate; nine of the names were clearly female, while only five were clearly male. However, because the disparity occurred before participants became active (dropout rates among active participants were similar for men and women), I do not have enough data to do more than take note of this as a potential issue that future studies might address.

Participants in both groups were widely distributed geographically but were mainly from wealthy countries in which English is a dominant language. Of the long-term participants, four were from the United States, two from the United Kingdom, two from Canada, one from Singapore, one from Taiwan, and one from South Africa. Of those who dropped out, twenty were from the United States, five from the United Kingdom, and one each from Canada, Australia, India, the Philippines, Mexico, Brazil, Guatemala, and the Netherlands. The only noticeable difference between the groups, a higher dropout rate among participants who lived in countries where English is not the predominant home language, is not surprising.

More surprising to me was that long-term participants, as well as dropouts, ranged from beginners with less than one year of formal music instruction to highly experienced musicians, including teachers with a degree in music. Both groups also included participants who were currently working with music instructors. I had assumed that the study would be most valued by inexperienced musicians who did not have local access to music instruction, but, as far as I could ascertain, the amount, level, and type of musical education and experience did not differ significantly between the two groups. There were in fact only two ways in which the groups appeared to be very different: the musical instruments that participants brought to their inquiries, and their rate of participation in a relevant community of practice. Because the two groups appeared to be similar in other ways, and because there are strong theoretical connections between the differences and other study findings, I will discuss these differences in detail in the analysis below and will argue that they are relevant to the study's conclusions.

The Study Site

The participants were gathered through links at the beginning of fifty OER modules that had been created by me and had been available for many years at Connexions (http://cnx.org), a popular open-education site (Ochoa, 2010) that features text-based OERs published as separate modules that can be consulted individually or used and reused as customizable elements of bespoke course texts. The site supports free publication by any registrant who is willing to publish materials under a Creative Commons attribution license. All materials are viewable on the open internet, without registration. This site was used in this study only to recruit participants.

All data was gathered through a University of Illinois Moodle course site (https://learn.illinois.edu/). Use of this site was required by the IRB, because the university had

vetted it as secure enough to protect participants' privacy. A non-credit "course" was created specifically for the research project; it was not accessible to other students or instructors. The Moodle course site included many tools that would be useful for teaching a typical university course, but which I did not find to be useful for this inquiry study, such as tools for creating on-line quizzes, reporting grades, and making course announcements, as well as assignment-upload areas with automatic deadline cutoffs, areas for whole-class and small-group on-line discussions, and a home page pre-structured to feature a linear syllabus divided into "topics."

It is rather ironic given my interest in OERs, but I am not particularly capable with technology. I chose to publish at Connexions in part because it was structured to make it relatively easy and intuitive to do what I wanted to do. In comparison, I found that the Moodle course site was not structured to make it easy or intuitive to create a course site to support inquiry. Lane (2009) has pointed out that learning management systems (LMSs) typically provide a default design that supports and implies traditional, instructor-centered pedagogy, and instructors who are not proficient with the technology tend to use the default design even when a system also offers more constructivist options. Similarly, Feldstein & Masson, (2006) complain that LMSs tend to be less flexible than physical classrooms, although in principle virtual learning spaces should be more flexible. It did not occur to me while setting up the study that the Moodle interface might have inquiry-friendly settings. They were not explicitly offered as instructor settings, and if they were possible-but-hidden, I would have needed considerable support to understand and make use of them. Like many novice users of a technology (Norman, 2013), I assumed that any difficulties encountered must be due to my own shortcomings, rather than any shortcomings in the LMS.

Although I was dissatisfied with my solution, I could think of nothing better than to use the "topics" on the home page to represent the stages of a cycle of inquiry. Under each topic I included appropriate readings, resources, instructions, questions to be formally answered, and places for participants to post their work for that part of the cycle. Participants tended to ignore these resources, however, and instead made almost exclusive use of the private, one-on-one discussion forum that I set up for each participant. Most even posted their work within their discussion forum. In keeping with a PAR ethic, I went along with their clear preference for informal discussion. After numerous participants ignored reminders and requests to use them, I left the other resources in the site for reference, but stopped even suggesting that participants take a more formal approach.

Even so, participants seemed to actively dislike the course site. All eleven of the long-term participants, and several of the dropouts, contacted me regarding at least one difficulty with using the site. Among the problems brought to my attention were trouble using or remembering passwords; preferences (which I could not accommodate) for choosing their own user-id over a difficult-to-remember, randomly-assigned one; trouble navigating to their private discussion from the home page; difficulty uploading large files to the site; and difficulty reading the forum discussion in its default display mode. Three long-term participants tried to switch to using email; two were only persuaded to use the site when I explained that I could get into serious trouble for using email. One short-term participant dropped out after losing hours' worth of work to an automatic time limit that closed the site without warning and without saving his work. The only other dropout who specified a reason for leaving the study, other than "too busy," cited the "unfriendly" nature of the site, and it seems likely that at least a few other decisions to leave the study were affected by difficulties or annoyances with the site.

Data Sources

The main source of data was the online discussions with the participants. The Moodle discussion forum was designed to support text-based, asynchronous messages organized as discussion "threads," so the one-on-one, informal discussions preferred by participants automatically generated ready-for-analysis text. As I worked with each participant, I created a journal specific to that participant by reproducing all of their online discussion threads with me. Whenever any data was generated outside of the discussion that was relevant to the participant, I saved the data as a separate document with a reference code, and noted the reference code in the appropriate place in the journal.

This included, for example, creations that participants uploaded to the site's assignment area. Participant creations included recorded audio files, computer-generated audio files, image files of pages of personal music journals and of hand-written music scores, and files that could be read by MuseScore, an open-source program which creates both a written and audio version of a piece of music. Participant posts also included links to other sites that they were using, or embedded videos from those sites. Some included links to their own musical works published at other sites. I listened to or viewed their work that was published elsewhere, and noted my assessment of it, but did not collect the work as study data. In order to protect their privacy as developing musicians, the inquiry-related creations that I did collect and analyze as part of the study are not included in this dissertation; when needed, I will include instead a music-theory analysis (with explanation for non-musicians) of their work.

The materials used as resources for each inquiry are also a crucial data source. The materials available included anything relevant that we could find on the open Internet, as well as anything locally available to the participant and any bespoke resource that I could manage to

create during the course of the inquiry. The materials used varied widely from one inquiry to another. For example, Cole consulted many hard-copy books that he already had on his shelves, while Sonia's inquiry was strongly influenced by a MOOC course that she was taking, and Alex relied on study guides that I prepared specifically for him.

When possible, I recommended materials that I or others had already published online, and some participants also found online music-education resources that were useful. When necessary, and much more than I had expected, I resorted to lengthy, tutoring-style explanations within the private Moodle discussion forum. Before beginning the study, I imagined that participants' questions would mostly be answerable by referring them to existing materials. As it turned out, even when materials existed that in theory answered the question, the participant often needed a highly-contextualized variation of the explanation in order to pursue the inquiry within the time frame of the study. I will discuss the specific problems involved in the analysis chapters.

Given a longer time frame, it might have been possible to rely more on the learners as inquirers to research and puzzle out relevant answers for themselves, although that might also have risked discouraging them by slowing down progress towards their goals. Challenging learners' goals and assumptions in a more Freirean style of inquiry might also have been possible and desirable given a different context, but was not within the scope of this study. Given the questions driving the study, the most practical approach was to provide tailored resources and check to see whether they were sufficient.

For many of the participants, inquiry materials also included open online resources that are not intended for education, such as music videos and lead sheets (highly simplified written versions) of popular songs. Local tools such as the participant's own musical instrument, digital

audio workstation, or music-notation program were also crucial to all of the long-term inquiries. Because there were so many possible resources available, and because the final choice of resources rested with the participant, analyzing the chosen and successful resources and materials in the context of the inquiry was a crucial step in understanding how and why current OERs provided insufficient help for these self-directed learners.

Finally, I also kept a research journal to serve as a record of my own thoughts, concerns, confusions, decisions, preliminary assessments and analyses, and development as a co-participant over the course of gathering and analyzing the data.

Data Coding and Analysis

I coded the data from each participant-contact within 24 hours of my response, in part to keep from being overwhelmed by the large amount of data created, but also for two additional reasons. First, the immediate review of each contact was an opportunity to reflect on and better understand what had just occurred, which helped me to be more useful to the participant in subsequent contacts. Facilitating these inquiries in a useful way was a challenge, in part because of the wide variety of participant backgrounds and goals, and in part because I lacked experience in this style of instruction, but also because it took a certain amount of contact for me to begin to really understand the participants as learners. This step helped minimize the disruptions to an inquiry caused by my own inexperience or lack of understanding.

Second, reflecting on the previous contact helped me formulate my own questions to bring up in the next contact. This was a crucial step not only for improving my own understanding, but also for checking on whether participants agreed with my interpretation of what was happening. This turned out, in fact, to be the best opportunity for conducting member-checks. Except for the introductory questionnaire, participants nearly always failed to fill out

formal questionnaires and requests for feedback. This appeared to be due to their finding the standardized questions to be lacking in immediate relevance, rather than due to a lack of desire to help with the study. Participants regularly expressed enthusiasm for the study's goals, gratitude for my assistance, and a desire to be helpful in return. When I posed specific questions as part of the discussion about their inquiries, participants typically responded helpfully, sometimes at great length, even when I stated that the purpose of the question was to gather information for the study.

My coding system began with the issues that I guessed would be most relevant. It developed gradually and continuously as I worked with the participants. Some of the original issues were dropped as they gathered little data and other more productive issues emerged. Once all of the inquiries ended, I recoded all of the journal data using the final coding system. For this system, I identified 31 categories of discussion-objects, such as e*xplanation of a musical concept; concrete examples;* and *inquiry method*. I also identified 14 actions a participant might take regarding each discussion-object, such as *request for*; *expresses understanding of*; or *disagrees with me about*, and 11 actions I might take, such as *provide*; *explain that I cannot provide*; or *agree with participant about*. Each action recorded in the journals was then coded as a specific action regarding a specific discussion object. A participant statement could be coded, for example, as *request for concrete example* or *expresses understanding of concrete example*. A response from me might be coded as *provide concrete example* or *agree with participant's concrete example*.

The total number of possible codes was 775 (25 x 31), but some of the possible combinations were used much more commonly than others, and many were not used at all. *Request for feedback*, was a common participant action, for example, while *disagrees with my*

feedback was unusual and *disagrees with my concrete example* was never used. I coded the long-term participants' journals in as much detail as possible using this system. The codes then helped me locate all of the information in each journal that was relevant at each stage of the analysis. They also provided a useful overview of actions and concerns in each inquiry; and patterns, such as clusters of *expresses lack of understanding of*, helped to locate useful focuses for the analysis.

For each long-term inquiry, I also created a list of the open-online and locally-available resources used or discussed, along with notes on both the participant's and my overall assessment of the usefulness of the resource for reaching the inquiry goal. This provided sufficient context for understanding the inquiry, so I did not analyze the resources in detail.

I analyzed all of the participants' inquiry creations to the extent necessary to give encouraging, actionable critiques that were relevant to their goals. (Details about what I consider an encouraging, actionable critique can be found in my module on the subject, at http://cnx.org/contents/c14a0ab9-43ba-4d9b-82c5-75f44acce8b5@2/Providing_Constructive_Critici). In order to protect the participants' privacy, the creations will not be published, nor will the complete critiques or musical analyses. The success of each inquiry will be presented here in terms of whether the participant and I believed that the inquiry goal had been reached, as evidenced in the interactions recorded in the journals. If certain characteristics of a creation indicated that the participant did or did not have a concept or skill relevant to the inquiry, then those specific characteristics will be mentioned as additional evidence.

For each of the long-term participants, I also looked at each journal individually with each of the research questions in mind, asking for example, "what were the most useful roles I played as instructor in this particular inquiry?" As discussed above, I also divided respondents

who filled out the opening questionnaire into two groups, long-term participants and dropouts, and compared the groups.

Activity Theory as a Framework for the Analysis

I also compared the long-term inquiries to each other, asking whether they shared similarities in issues. Similar issues in dissimilar inquiries might suggest answers to the research questions that are strong enough to act on as an OER provider or music teacher. Even before I finished the data-gathering phase of the study, I felt strongly that the participants were experiencing difficulties that were related to each other in subtle ways. On coding, the data concerning my research questions did seem to cluster within two overarching issues: tools that were useful for learning about music, and interactions with others that supported the learning process. However, because the inquiries were so different on the surface, I could not articulate how their specific issues were related or even why I felt so strongly that they were.

I tried organizing and expressing my findings within the frameworks of the theories that most informed the design of the study: inquiry-based learning, communities of practice, and tool affordances. Each of these frameworks seemed useful for understanding some, but not all, of the issues raised in the inquiries. I also tried organizing the data within other theoretical frameworks, particularly connectivism and complexity theory, but these did not lead to new insights about the data. Finally, a chance reading led me to take a close look at activity theory. To help further my own understanding, I developed the music-oriented summary of activity theory featured in Chapter 2.

Activity theory proved to be a particularly useful framework for this study, for several reasons. First, using goal-oriented activity as the basic unit of analysis was a natural fit for this study. At the level of each inquiry, the study could be understood as a series of actions aimed at

achieving the participant's music-learning goal. Activity theory also allows each action within an inquiry to be understood as an activity, with its own goal related to the overall goal of the inquiry, because activity is understood to be composed of actions which themselves can also be understood as activities whenever they become the focus of attention. This allowed me to focus the analysis at whatever level had held the attention of the participant, treating as "activity" the entire inquiry, individual inquiry cycles, or specific attempts at working on a creation or completing an exercise, as needed to make sense of the data.

It was particularly useful to view barriers to learning as interruptions in activity that redirected a participant's attention because the tools and actions necessary to reach the goal were not at hand. My actions as inquiry director could then be understood as attempts to either help the participant gain the needed tools and actions, to suggest alternative, more doable, activities that might lead to the same goal, or even to suggest alternative, more-reachable goals. Activity theory also easily accommodated the asynchronicity of the Moodle-based method of providing online teaching; rather than analyzing one synchronous activity by two people, I could, as needed, analyze my own activities in terms of my goals, tools-at-hand, and interactions.

Another major benefit of adopting activity theory was that it provided a single framework for discussing both tool-related and people-related issues. The data suggested that there were three issues that dominated the long-term inquiries: music theory, music notation, and human interaction. Because the basic unit of analysis is an activity that includes human interaction as well as tools such as music theory and notation, activity theory provided a way to understand and discuss the issues both individually and in relation to each other. I will therefore present the study findings in activity-theory terms, over the next four chapters. Chapter 4 presents a short overview of each of the eleven long-term inquiries, as an introduction to the goals, interruptions,

and activities of each of the main participants. Chapters 5, 6 and 7 will discuss each of the main

issues in turn, drawing on relevant data from these individual inquiries as well as from the

comparison of long-term and dropout participants. The conclusions chapter will then combine

the findings regarding the three main issues with the arguments presented in the literature

review, in order to make recommendations for OER providers, teachers, and researchers in this

area.

Chapter 4

Eleven Inquiries

In order to provide context for the analysis that follows, this chapter introduces the eleven long-term participants by providing a brief summary of each inquiry and a short excerpt that gives a sense of the participant's unique voice. Please note that in their discussions with me, participants were not particularly concerned with the niceties of English, which are not relevant to this study. In quoting them in this dissertation, I have edited spelling and punctuation as needed for readability, but have made no other alterations except where indicated by brackets. A table at the end of the chapter provides a one-page summary of all of the inquiries, in case the reader needs a convenient reference guide to keep track of which participant is which, while reading later chapters.

Alex

Alex was a 65-year-old beginning guitarist living in England with minimal prior formal education in music. He had been taking lessons for about a year from a guitarist who used tablature with his students rather than common notation. (Guitar tablature is a specialized notation for guitarists, while common notation is the widely-familiar notes-on-a-staff that can be used with any instrument.) Alex felt that his teacher's approach was both enjoyable and effective, so he viewed the study as an opportunity to learn common notation "on the side," without disrupting the lessons. His expectation were very realistic; Alex understood that smooth reading ability requires time and practice, so his goal for the inquiry was to be able to use common notation to work on learning new pieces. His long-term aspirations as a musician included being able to perform with his teacher's band.

I was surprised to discover that I could find no open materials suitable for Alex's inquiry;

instead I prepared single-page "study guides," each of which explained one or two aspects of common notation, comparing and contrasting it with tablature, and included examples and pieces to practice reading. Alex was reluctant to make recordings of himself playing, so in order to check whether or not he was performing a piece correctly, I included with each guide a widely-known tune, without the name. He was to work on playing the tune until he recognized it and could name it for me. This method worked well for him, but relied heavily on skills and knowledge that not every novice guitarist possesses. Over the course of the inquiry, Alex demonstrated that he had strong internal motivation, a good ear and a good memory for melodies, as well as a habit of trying to solve problems himself before asking about them. He was also an unusually conscientious participant, typically finishing one study guide and asking for another within a few days, and notifying me beforehand when he knew he would be too busy to keep to that schedule. When he took a two-week trip without his guitar, he asked for a list of online reading to provide him with more information on common notation, and in spite of that long break, he finished his inquiry in 50 days.

Alex began his inquiry with knowledge of the names of the notes in the appropriate (treble clef) common notation staff and the names of the notes as played on the guitar, but did not know how to map the two sets of information to each other, because there are multiple pitches with the same name. (For example, both the highest and lowest strings of the guitar are "E" strings, but the E's involved are two octaves apart.) In my estimation, this lack and a misunderstanding about how key signatures work were the main obstacles that kept him from learning to read on his own; I strongly suspect that if he had found the set of study guides on the open Internet, he would have been able to decipher common notation without active assistance.

We began with locating the natural notes in the staff in first position on the fretboard,

along with rhythms and time signatures, then covered notes written above and below the staff,

higher positions on the fretboard, sharp notes and flat notes, and key signatures. At that point,

Alex declared himself satisfied with his understanding, primarily in need of practice, and ready

to work on his own. Several months after he finished, Alex contacted me and reported that he

often used common notation to help him learn new pieces and was pleased with his progress.

His own voice (in contact #7 of 21):

I have solved the three mystery scores, I think. They were "London Bridge is Burning Down," "Ode to Joy," and "Good King Wenceslas Looked Out." This is what I did. I wrote each note above the stave, then found those notes, in the first position, i.e., using the notes of all six strings on the first four frets. I hope this is what was required.
Then I played the tune until I recognised the melody. Ode to Joy drove the family mad! We knew the tune but could not name it for quite a while. I found it on the soundtrack of the film Dr. Strangelove!
I now understand the quarter and half notes, and their images. Best of all I can find quite a few fretboard notes now, well, in the first position.

Cole

Cole was a 35-year old teacher in England. He was somewhat familiar with the idea of

inquiry-based learning and unusually articulate regarding his learning preferences and the

difficulties he was encountering in using materials. He had a degree in music history, and

clarinet had been his major instrument. Recently he had focused on learning, on his own, to play

organ. He also wanted to be able to compose Baroque-style fugues, and had spent considerable

time and effort on that project, but was unable to write anything that pleased him. When I asked

for a sample of something that he had written, he could send me only a short fragment, reporting

that he had destroyed his other attempts in frustration.

Cole already possessed a large collection of books on how to write counterpoint. He

reported that doing the exercises in those books had not led him to create satisfying music, but

there did not seem to be a need to introduce more sources, so no open resources were used in this

inquiry.

      We agreed that the creation of a fugue that pleased him was the goal for the inquiry, and that he would begin by analyzing sections of a fugue that he respected, then using what he learned in his analysis to begin constructing his own fugue. The work he chose was Bach's "Little" Fugue in G Minor. His analyses of sections of it were thorough and correct. He quickly came up with workable fugue subjects and countersubjects, and was able to manipulate them using standard counterpoint techniques, but at the point of beginning to put together a fugue, he declared himself dissatisfied and said he wanted to start over. I felt that the material he had created could have been turned into a good fugue, and said so, but also encouraged him to work on creating thematic ideas that he enjoyed working with. Over the next 152 days I heard from him only once, a belated, still-working-on-it response to my standard you've-been-gone-awhile-can-I-help query. Eventually, I assumed that he had dropped out of the study, so I was surprised when he abruptly reappeared to report that he had just completed a fugue of which he was "inordinately proud" (contact 10). He also described in detail for me the insights and program of study that had led to his success, which included locating books on his shelf that took an approach that he liked and taking a significantly different attitude and approach towards the suggested exercises. Although Cole had clearly reached his inquiry goal, he stayed in touch for a short time after that, sending me three more completed fugues and reporting that he was considering trying to compose something more substantial. The four fugues he sent me were short but had compelling melodic ideas that were well worked out in Baroque style, They were not only competent but quite pleasant; in my experienced judgment, any one of them could have served successfully as a postlude to a church service. They also differed substantially in mood and character, demonstrating creative flexibility within this genre.

His own voice (in contact #7 of 10):

> I'm hypothesizing now, but I wouldn't mind betting that there's quite a large amount of strong self criticism built into any self motivated learner, and it's this, at least in part, which inspired the initial decision to take action and begin self improvement. In my personal experience though, this also leads to a lot of second guessing yourself.
>
> I'll only speak generally here, since there's a danger that this would otherwise turn into a book review of my music library, but major sources of these "bumps" have included a tendency for the books I've used to take knowledge for granted in the reader, to provide poor summaries, and no reminders or revisions of information, and to be full of off-putting, poorly explained and vague obfuscating terminology and examples (I'm talking about you especially, Schenkerian scholars!). Also, the biggest crime, as far as I'm concerned, is the theoretical and analytical bias of all the texts. I studied music because I wanted to learn practically how to produce music I liked, not in order to become a musicologist.

Donald

Donald was a 24-year-old living in Taiwan. While in school, he had enjoyed playing violin, viola, and piano. He was no longer playing with any groups, but still wanted to make music, so he was interested in composition. He submitted a short digitally-produced composition that was a convincing example of new age music, with all the basic elements handled well. He wanted to learn more about harmony and orchestration, and his initial questions were primarily about following composition rules and creating musical styles. We agreed that the goal for the inquiry was for him to study pieces in a specific style, in order to discover the harmony, orchestration, and rhythm "rules" that were being followed to create the sound of the style, as well as the rules that were "broken," and then to use what he learned to create a new composition in that style. He was interested in a wide variety of styles, but chose to begin with pop rap, choosing to study both American and Taiwanese examples of the style.

Donald had trouble analyzing the pieces, however, and became concerned about his "ear" not being good enough, because he could not consistently identify the notes and chords that he was hearing. I encouraged him to use a piano to work them out for himself, a common approach

for novice composers, but I also expressed willingness to change the focus of the inquiry to ear-training if that was his preference. He chose to continue with composition, and, to my surprise, submitted a digitally-created pop rap composition without any preliminary discussion of the composition process. The piece was persuasively in the style, except that it lacked a vocal track, so I asked whether there was a vocalist who might be able to work with him. I was also concerned that he was not learning the process of making conscious, deliberate connections between what he had learned from other composers' choices and the musical choices he made in creating his piece, so we discussed the piece and worked on it further. He could not find a vocalist, so he added a vocal track that he had recorded himself, though he was not pleased with the result. He then chose new pieces to study that I would characterize as "modern light-classical instrumental," and began to analyze those, but at that point dropped out of the study.

Although Donald did finish one composition pertinent to his goal, I felt that the inquiry was not as helpful to him as it might have been. I do not know whether he would characterize it as successful, since he did not offer any conclusions before or after dropping out. There are several factors that may have had a negative impact on his engagement with the inquiry or on our ability to communicate and work together successfully. Donald was one of the youngest long-term participants and the only one living in a country in which the main language of schooling is not English. Neither one of us was familiar with the local musical culture of the other, and although his English writing was sufficient for the task, we did experience misunderstandings, particularly about music terminology. With only limited, asynchronous interactions, we did not manage to create a music-composition culture of our own, nor did Donald find local musicians to work with on his music. His inquiry was intermittent and unfocused; Donald sometimes disappearing for weeks, and often interrupted a discussion or activity with a new question or new

concern, so it is unlikely that he experienced the inquiry as being strongly oriented towards the

goal. It is also possible that he valued the discussions that his questions engendered and preferred

a more exploratory approach.

His own voice (in contact #12 of 18):

I would like to research more music styles later on and I'll start another topic about it. But there are some things I would like to discuss more.
A music style [that] doesn't have stern harmony rules may [instead] have strict pattern to make it like that style. For example, hiphop has no stern harmony rules but specific rhythmic rules to make a song like hiphop. I would like to know something about rhythm perception. It seems that sounds can create rhythm as long as they are played in a regular pattern whether they are monotone or not. (e.g. a drum is monotone and a piano has a lot of pitches.)
Next, you mentioned that chords have different functions. [What] does chord function derive from?

Glen

Glen was a 31-year-old living in the United States. His prior experience included

extensive private guitar instruction and numerous university-level music courses, as well as

performing in, and composing for, rock/metal bands. At the time of the study, he had a few

guitar students of his own and sometimes "jammed" with other musicians, but was not in a

performing group and felt that he was not playing with anyone who shared his musical interests

and vision. He signed up in January, one of the first active participants, with the intention of

exploring Indian music and the goal of incorporating some of its melodic and rhythmic elements

into new compositions of his own.

We began an inquiry with that goal, using online resources for information on Indian

music, which poses significant challenges for anyone raised and trained in Western music

traditions, and about which my own knowledge is very basic and theoretical. Glen did some

preliminary research, but his participation over the spring and summer was very sporadic, often

consisting only of a note that he was still interested but that his job was leaving him too little free

time. During this time, his only completed work for the inquiry was a pair of recorded guitar compositions, which he intended as the "before" part of a before-and-after demonstration of the effects of his research into Indian music.

In October, his work situation changed and Glen had more free time to devote to his music, but at this point he also decided to change his inquiry. He resisted setting a specific goal, preferring to explore a variety of ideas that would stretch his composition skills. From October to January, when the study officially ended, Glen worked on three more compositions: a guitar-and-digital piece inspired by the timbre of a music box, a guitar piece inspired by Indian rhythms, and a guitar piece that required significant amounts of practice, because it used a sweep-picking technique that he had never used before.

Glen submitted his works as recordings created using a digital audio workstation. Each had at least one track featuring recorded guitar; some had additional tracks featuring either guitar or digitally-created-and-manipulated sounds, such as the music-box sounds. The guitar tracks often featured metal-style distortion or other manipulations. Glen had a strong interest in the digital manipulation of sound; in a discussion about his desire not to frame his inquiry goals in terms of music theory, he brought up a music-generating program he had written for a college project, as an example of a use of music theory that had deeply interested him, describing the program in detail and sending numerous examples of its output.

Glen included his own assessment whenever he submitted a recording of a creation, and I responded with my assessment. I did not limit my comments to addressing the concerns expressed in his assessment, but I did try to focus my suggestions on what his options might be for "fixing" the things that bothered him. He was clearly comfortable with rejecting suggestions that did not interest him, but was also interested in refining his work; he sent three versions of

the music-box composition and four of the sweep-picking one.

Throughout the inquiry, Glen demonstrated more self-assurance and less deference to my suggestions than any of the other participants. Citing negative experiences with other music teachers, he explicitly stated that he was not interested in learning more music theory or in learning from the compositions of others, and that he preferred to learn through working out his own ideas. His descriptions of his inquiry creations demonstrated a high level of facility and comfort with music-theory concepts. My role in this inquiry was not instructor so much as informed, friendly critic who was interested in his work and expected to hear from him regularly. When I asked whether he felt the inquiry had had any positive effect beyond what would have been gained by doing the same projects on his own, he framed his reply in terms of the study acting as a catalyst and providing a collaborative environment that was missing from his sessions with fellow musicians.

His own voice (in contact #19 of 42):

I've also been interested in experimenting with playing both minor and major thirds as if they were in the same scale. The image illustrates very little dissonance between these two intervals. Assuming an even temperament, the most consonant intervals are actually slightly higher than the minor third, and slightly lower than the major third. So I felt it would be worth investigating playing the minor and major in non-exclusive phrases as a trick to brighten up a solo. These are the kind of thoughts my theory teachers hated. . . .

James

James was a 44-year-old living in Canada. He reported that he had been playing guitar as a hobby for over fifteen years, but in the past five years had been working on it more seriously. He played rock and classical pieces and was interested in learning to play blues and jazz. He considered face-to-face lessons too inconvenient and expensive, and had been using an online guitar-teaching site that disappeared shortly before the study began.

James hoped to learn about composition and harmony, specifically chord progressions.

We agreed that he would have to learn something about chord progressions in order to create a good composition for guitar, so that became the initial goal for the inquiry. I suggested that we begin by studying a chord progression from a piece that he liked, but James found the task overwhelming and frustrating. The song's progression included not only major and minor chords, but also minor seventh, major ninth, sixth, and suspended fourth chords. As well as dealing with the theoretical, notational, and aural aspects of all of these chord types, James was also learning how to use an unfamiliar music-notation program. In order to simplify the analysis/composition task, we decided to study progressions that used only major, minor, and seventh chords. This worked so well that seventh chords became the focus of James' inquiry.

A focus on seventh chords may seem narrow in terms of learning music theory, but there are three different types of seventh chords – major, minor, and dominant – which sound quite distinct from each other and do not have the same functions in chord progressions. The narrow focus of the inquiry also afforded James opportunities to develop a wide range of ways of knowing about chords, without overwhelming him. His inquiry activities included choosing chord progressions from favorite pieces; recording himself playing basic (major-or-minor-chords-only) versions of the progressions; experimenting with adding various seventh flavors to the progressions; writing notated versions of the basic and seventh-chord progressions; creating charts of the major, minor, and seventh chords that are implied by different scale types, including major, natural minor, harmonic minor, and blues scales; composing a piece featuring seventh chords; and practicing ear-training exercises that involved hearing a seventh chord and either naming it or echoing it on his guitar before the name of the chord is revealed. The variety of activities helped him not only to learn seventh chords from the perspectives of notating music, hearing it, playing it on a guitar, and naming it in terms of concepts, but also to connect those

four perspectives in a way that should be useful to him as a guitar player and composer, and that

could serve as a useful template for how to continue to learn about music theory.

James completed all of the activities mentioned, including a first draft of a composition,

but then had to withdraw from the study due to a serious family issue. He was an unusually

conscientious and enthusiastic participant, remaining in touch after withdrawing and requesting

to be informed if I need participants for another study at a later date.

His own voice (in contact #10 of 19):

As things stand, I don't like the way EITHER of the 7th chord versions sound, LOL! It's the G chord that bothers me; it's just not ringing right to my ears. I find the other 7ths are fine, and even interesting in terms of how they color the sound. If I had to choose, I would say I like the sound of the G7 better, but I can't really explain why. I've re-attached the score with the regular dominant G7 so you can do a side-by-side comparison.
So do my ears simply need to get used to the sound of the G chord, or could we substitute something else again?

Jeff

Jeff was a 22-year-old living in South Africa who had no formal training in music and did

not "play" any instrument, but was already an active composer. He created his works using a

digital audio workstation (DAW), and he reported that his work was published on the Internet

and had attracted an appreciative audience. He offered as a sample a piece that he identified as

being in "psychedelic trance" style. It featured spoken words layered with driving rhythms,

electronic melody lines, and musical effects. Although the building blocks were simple, they

were organized effectively into an extensive, complex, and persuasive example of the genre.

Jeff wanted to learn some music theory, with the goal of enriching his compositional

capabilities, but was not interested in taking a traditional music theory course. He wanted to

learn how to create the kinds of "twisted, spooky" sounds that he had admired in the

compositions of others, and he believed that that goal had nothing to do with the major and

minor scales, keys, and chords that are the focus of traditional music theory courses. Such courses also require familiarity with common notation, which he did not need to create DAW compositions.

We set a "twisted, spooky" composition as the goal of the inquiry, and he chose to study a section of the sound track from an anime series. The piece featured "open fifths," which are two-note harmonies that are neither major nor minor; the melodies and bass lines of the piece could be characterized as "minor," but given the style of the piece, they could also be characterized as "aeolian," referring to a medieval mode with the same pitch sequence as the natural minor scale.

He and I needed a way to explore and understand the piece together, but I was concerned that he would lose interest if we spent much time digressing to learn common notation. Since Jeff was familiar with the "piano roll view" in his DAW and already knew the names of the notes within that framework, we decided to use piano roll view as a stand-in for notation. When he submitted work, he sent both an audio file and screen shots of the piano roll view, so that we would have a visual object to "point to" when we discussed it. Piano roll view was an unfamiliar environment for me, but with Jeff's help and some practice studying his submissions, I learned to interpret it fairly quickly.

The basic process for Jeff's activities was to use his ear, DAW, and experimentation to reproduce a small part of the piece he was studying (for example, a few measures of melody, or a progression of open-fifth chords). We would then discuss his reproduction using standard music-theory concepts, and he would follow up with a short original creation that demonstrated his understanding of the unfamiliar concepts. His final two creations were short pieces that successfully used power chords and aeolian melodies to create the desired mood. He stated an

intention to continue with a new goal after that, but his inquiry had always been interrupted by long unannounced absences, and at this point he disappeared and did not return.

Discussions with Jeff tended to be unusually long and involved, as he worked to comprehend each term to his own satisfaction, and explanations often included terms that required further explanation. Here is a sample of the range of concepts we defined and discussed: power chords, scales, modes, aeolian and dorian, consonance and dissonance, syncopation and polyrhythm, intervals, melodic phrase, and harmonics. I tried to point Jeff to relevant online open resources, but he found them too difficult to understand, probably in part because examples are always given in common notation and in part because of other assumptions of "common knowledge" that most musicians pick up in lessons, school bands, or other communities of practice. Eventually he requested that I simply explain things to him myself.

His own voice (in contact #14 of 20):

I think I definitely have used different syncopation and polyrhythm in my music, as I recognize the explanations, without even knowing what I was doing. I think I do this a lot in my compositions as I mostly play it by ear and have learnt what works and what can give different effects and make music sound more "full" by experience. Just not familiar with the theory. That first sample I sent you of my psytrance track has a lot of it in if you listen.
　　　Alright I will listen to the piece again and make another attempt.
　　　I am VERY interested in learning about any and all scales and harmony, mostly which give a twisted, dark, spooky feeling, but also other scales. . . .

Laura

Laura was a 53-year-old living in the United States. She had been taking piano lessons for about a year, using an adult-beginner book. Based on her general preference for approaching a new subject with a "big-picture" understanding of what she would be learning, Laura believed that she would progress more quickly and easily if she understood where the bits of theory information in the book were leading. When signing up for the study, she mentioned trying to

understand the circle of fifths, a diagram that uses the patterns underlying music theory to condense a great deal of information about keys, scales, and chords into a very compact form. We agreed that understanding the circle of fifths would be a good goal for her inquiry.

Beginning instrumentalists rarely want a big-picture understanding of music theory, so appropriate materials are, to my knowledge, not available either as open or as copyrighted resources. She already knew about the pattern that underlies all major scales. I designed a series of exercises that would start with that pattern, extend her knowledge to a new pattern with each exercise, and end with Laura able to reconstruct the circle of fifths from her own understanding of the patterns. I framed each exercise as "how to find" something that a musician might want to find: how to find the notes in an unfamiliar major scale, the notes in a major chord, the notes in a minor chord, the seventh chords in a given key, chord inversions, or the major chords that are most likely to be used in a given key; how to move a tune to a different key; how to find the key that has one more sharp or one more flat than a given key and predict which sharp or flat will be added; and finally, how to show that "very flat" and "very sharp" keys are functionally equivalent to each other. The last revelation creates the circular aspect of music theory as represented in the circle of fifths, just as the circular aspect of the earth means that "very far to the east" is functionally equivalent to "very far to the west."

This was an ambitious program for a pianist who had only played in a couple of keys, but Laura was an unusually conscientious participant who worked steadily on her inquiry. She kept her own notebook of her work, which was eventually useful for constructing her own version of the information in the circle of fifths. Unlike many music-theory students, she took the initiative to play through the written exercises, so that she could hear what they sounded like, and to try to relate the theory to the music that she was practicing for her piano teacher. In less than two

months, Laura and I agreed that she understood the information contained in the circle of fifths.

She then demonstrated that she could use the information by doing one final activity, choosing

appropriate chords and creating her own simple arrangement for piano of "Jingle Bells."

Her own voice (in contact #9 of 27):

Is BFG called the "first inversion" because the B directly follows the G on the keyboard?
Therefore the second inversion is DFGB and third is FGBD?
    I've gone into my Alfred's basic Level 1 book and have been looking at some of
the music that I started with. (For example, When the Saints Go Marching In) The book
starts by showing chords and giving them names, and as I look at the G7 in this piece I
see that the D is in the bass clef and the BFG are in the treble clef - so I'm starting to get
it. Alpine Melody says G rather than G7 and has the same placement of the notes, with D
in the bass clef. Why the difference?

Lee

Lee was a 63-year-old living in Singapore. She played at services in her church, in

rotation with other pianists, and it had been made clear to her that her skills were considered

inadequate in comparison with the other pianists. She reported two main concerns: (1) She could

not immediately transpose music to a new key; and (2) she could not improvise a piano part

when provided only with melody and chord names. These were the goals that she brought to the

study, and I believe that one or both might have been realistic goals if Lee had had either

intensive face-to-face instruction in these skills, or more familiarity with the theory involved, or

effective self-monitoring, problem-solving, piano-practice habits.

Early in the study, Lee demonstrated that she was somewhat capable of transposing

music by writing it in the new key, simply by moving the notes up or down in the staff.

However, her difficulties with key names, key signatures, and "accidental" flats and sharps

revealed that she did not understand the theory involved. Meanwhile several weeks with no

reported progress suggested that she was also not practicing transposing-on-sight in a useful way.

She also had substantially more difficulty than any other participant with using the Moodle site,

music-notation programs, and her own computer equipment, so it did not seem feasible for me to actively oversee her sight-transposition practice.

Lee was, meanwhile, asking for specific help with preparing pieces for upcoming services. When I realized how often she was required to play music that was notated only as melody with chord symbols, I suggested that we switch the focus of the inquiry to improvising a piano part in those circumstances. Besides helping her play those pieces, this approach also provides a practical short-cut to transposition, because she could quickly transpose the names of the chords and then improvise a piano part based on the chord symbols, rather than writing out all of the notes in the new key.

Lee was reluctant to give up the transpose-all-the-notes-on-sight goal, and she also struggled with the chord-based approach. She reported that she regularly practiced major and minor arpeggios (chords played one note at a time), as a finger exercise, but had trouble associating a chord symbol with a specific arpeggio. She also did not know how to interpret some aspects of the symbols, for example G/B meaning "G major chord with a B in the bass," and had forgotten the music theory that would help her decide, for example, what notes are included in a seventh chord. We focused on theory exercises that involved identifying the notes indicated by a chord symbol and on arrangement exercises that involved writing piano parts for church pieces for which she had only melodies and chord symbols. I also introduced a method for using a diagram to quickly transpose chord names.

The piano arrangements that she submitted, and her questions and difficulties concerning them, revealed that Lee had a good ear and good intuition about what makes a piano part work well. However, she remained focused on getting specific, concrete advice about each new piece, and did not seem to be able to generalize suggestions to new pieces. She had difficulty using any

abstract set of rules or principles, even after successfully completing several concrete examples, and was unable to finish exercises when given instructions that involved more than one unfamiliar step. I now believe that the multi-step instructions I offered at the beginning of her inquiry, suggesting useful ways to practice sight-transposition, were also too difficult for her to follow, although she never said so.

Lee often reported being embarrassed about her shortcomings as a student and a musician, and she had a strong tendency to attribute them to innate inability or personality flaws. This contrasted strongly with the attitudes of the other long-term participants, who typically described their difficulties in terms of factors such as lack of prior experience, lack of time, or lack of suitable materials, rather than in terms of personal characteristics. Lee was strongly motivated and determined to improve, however. She stayed with the study until it ended, requesting advice and asking questions about many issues related to her church-playing situation, as well as working conscientiously on the exercises and arrangements. She reported improvements in her confidence and communication with the other musicians, as well as in transposing and improvising piano parts, but she remained likely to forget to employ techniques that she had used successfully earlier in the study, and her positive self-assessment may have been motivated in part by a desire to please me and express her gratitude.

Her own voice (in contact #23 of 81):

> Thank you for your advice and feedback. Sometimes I cant visualise all. . . while you are explaining without the scores in front of me. . . . You can see how poor I am in music writing and changing of keys and so lazy, don't want to use my brain to think. . . . All the other pianists. . . are brilliant, they don't have to think so much in transposition and modulation, they just hear the chords, and that's it.

Michael

Michael was a 57-year-old living in Canada. He had taken fiddle lessons off and on since

he was young, for a total of about seven years, and had also played fiddle with performing groups. At the time of the study, he was not playing with a group or taking face-to-face lessons, but he was an active member of an online site run by a violin teacher. Although Michael described difficulties with learning and remembering enough repertoire to play with performing groups, he decided to use the study inquiry to pursue a different goal. He had already created a software program that played violin scales in equal-temperament tuning. The program was meant to be used as "play-along" audio, to help violinists develop a good ear and practice playing in tune, necessary skills for an instrument in which tuning depends on the precise placement of the player's fingers.

Equal-temperament is the system used to tune pianos, and it therefore dominates most modern Western music traditions. However, Michael was aware that the folk music traditions that feature fiddle often use older tuning systems that are more authentic for those genres, such as Pythagorean or Just intonation. The goal of his inquiry was to determine whether it would be useful to fiddle players to have software with play-along scales in one or both of the alternative tunings, and, if so, what frequencies should be used to create accurate scale sound files in those tunings.

Michael approached the first question from three different perspectives. He made sound files of one scale in each of the three tuning systems and then listened to them to see whether he could hear the difference. He also tested his own pitch perception, for example checking whether he could distinguish between two pitches that were the same distance apart as the third notes in equal-temperament and Pythagorean scales. He also recorded himself playing a tune with a bagpipes player; bagpipes are designed to use Just intonation, just as pianos are designed to use equal temperament.

Michael did not need my suggestions or help in deciding how to approach this question or in finding and using a wide variety of local and online resources in his research. He was the most independent of all of the long-term participants. However, the results of his investigations were ambivalent, and it was at this point that having active assistance was most useful to him. He could easily hear the discrepancies in the tunings of the two instruments playing together, but was having trouble distinguishing them in the scale and pitch tests, and he was not certain what to conclude. I noted that in my experience the musical context determines one's ability to discriminate between pitches, and armed with this idea he soon discovered the relevant concept of *just-noticeable difference*. His research found that my personal experience (that context strongly affects the ability to determine whether a note is in tune) is a well-known, named, and quantified phenomenon.

Armed with this insight, Michael felt ready to move on to the task of creating the scale sound files for his software. Again, he did the research, math, and file creation largely without any help or even suggestions from me, simply reporting on his progress and asking whether his approach and calculations seemed correct. When he was creating the actual audio files, he also asked me to listen to various versions and provide feedback on which ones I felt sounded best and most useful for play-along software. In all, it took him a little over three months to successfully complete the inquiry, and my role was closer to that of experienced-musician-consultant rather than instructor or even inquiry facilitator.

His own voice (in contact #7 of 15):

In order to test this aurally, I constructed a set of C scales in pythagorean, equal, and just temperaments using violin samples. Then I did another set where I added a C drone. They are very mathematically accurate (I checked them again Intonia and Overtone Analyzer for accuracy). To tell you the truth, I really can't tell the differences among them. Perhaps if I isolated the intervals and then compared them aurally, I might get better.

Paul

Paul was a 62-year-old living in the United States. He had extensive experience as a vocalist, but health problems were interfering with his ability to sing. He was using a paid online source to take beginning guitar lessons, and he expressed interest in better understanding the theory involved, particularly in jazz guitar. He was also interested in writing and recording music, so we agreed that for the inquiry he would study some jazz pieces and apply what he learned to create his own recorded guitar works.

In the course of his inquiry, Paul demonstrated considerable prior knowledge of music theory, competence in locating and recognizing useful new information, and a high level of comfort in applying both prior and new knowledge to his activities. Since music theory resources offer abstract definitions or relate only to piano, and guitar resources tend to focus on practice without explaining the theory clearly, many of his questions focused on connecting music theory to the guitar.

Paul analyzed the chord progressions of a popular blues song and a jazz standard, each time responding to the lessons learned by creating a composition of his own. He began working on each composition by creating and recording a chord progression on guitar. He then used the recorded progression along with synthesized drum parts to develop what many musicians would recognize as a "backing track," a background-parts-only recording that can be used to support the practice or performance of a singer, instrumental soloist, or improviser. He then played the backing track and recorded himself improvising suitable solo parts on guitar, finally using the recorded improvisations to construct a finished composition.

Paul sought constructive criticism and suggestions at each stage of composition and responded with multiple revisions of each piece. His revisions focused on two main areas: first,

the design and manipulation of individual parts so that they fit well together and evoked the

desired style, and second, the deliberate use of musical form to organize the entire work so that

the listener can more easily follow and comprehend it.

In addition to improving his theoretical knowledge and practical guitar skills, Paul was

also learning to use the programs and equipment needed to create and manipulate recordings. He

did not need assistance to organize this variety of learning, and he made noticeable progress on

all fronts in the course of the inquiry. When I mentioned that he should let me know if the

process became frustrating, he replied that formal training in the visual arts had given him the

tools to deal effectively with frustration in the creative process. At the beginning of his inquiry,

Paul worked mainly on his own, reading and following up on tangential topics that interested

him, but once he began working on analysis and creation, he kept in touch very regularly,

submitting work and asking for further suggestions until the study ended.

His own voice (in contact #7 of 25):

It's in the key of C and is a progression of major 7ths. I noticed [the composer] uses the relative minor 7 chord at times where I would expect to see the I chord, but the cadence ends with the tonic at those instances, so I'm guessing that's how he gets away with it. :-P . . . . I'm especially enjoying it because I've been working with my barre chords on the 5th and 6th string roots. Good song for practicing them; even if my chord changes are slow, I can still feel the flow. :-) Have just barely touched on the subjects within the link you sent and I'll probably have to read them over a couple times for them to sink in. Maybe I'll be able to further analyze it then.

Sonia

Sonia was a 54-year-old living in the United States. She had taken piano lessons on and

off both as a child and as an adult, including jazz piano lessons. She could also play guitar, and

she sang regularly in a church choir. One of the goals driving her inquiry was to compose

worship music in a jazz style. She had completed a massive open online course (MOOC) course

in songwriting immediately before signing up for this study and began another composition

MOOC as the study was ending. She also wanted to improve her piano jazz improvisation skills, so she had begun a jazz improvisation MOOC, as well as a guitar MOOC, shortly before signing up for the study.

Sonia's immediate goal in signing up for this study was to get additional help so that she could keep up with the fast pace of the improvisation MOOC. The course did have a forum in which learners could discuss the assignments, but she had trouble following the discussions of the more-experienced learners and was reluctant to break in with too many novice-level questions. We began her inquiry with the intention of pursuing questions about improvisation independently of the MOOC, but this proved to be too intense, as she was already having difficulties completing the MOOC assignments on time. We therefore decided that, during the course of the MOOC, those assignments would also serve as her inquiry creations. For each MOOC assignment, she would come to me for extra help with understanding the theory concepts and for suggestions for putting them into practice at her skill level. The assignments always involved submitting a recording of herself improvising over a given "backing track," and my feedback regarding these creations also focused on providing suggestions for improvement that were appropriate to her skill level.

Sonia's self-recordings revealed a high level of proficiency on the piano; in her first assignment she had mistakenly provided the accompaniment with her left hand while improvising with her right, rather than using the backing track, an impressive feat for an inexperienced improviser. Her improvisations lacked fluency and were in general not good examples of the concepts featured in each assignment, but these are shortcomings that are nearly universal among beginning improvisers. In activity-theory terms, skilled improvisation as an action requires that all of the elements needed for the improvisation, including conceptual-

knowledge elements as well as instrument-skills elements, must be operations, and Sonia simply had not had the time to internalize the concepts to an operational level. She clearly had realistic expectations, however, as well as effective practice and study habits, and she was capable of verbalizing her difficulties and asking useful questions. By the end of the 5-week MOOC, she was submitting recordings that showed improvement in fluency, and she had joined a post-MOOC group that formed through the course's student forum and continued to submit recordings to each other at a slower pace.

When the MOOC ended, Sonia took a break of several months from the study, but then returned in order to work on a second inquiry. We agreed that the goal for the new inquiry would be a jazz-style composition. Her creations for this inquiry focused on developing melodic and harmonic ideas for the composition, as well as practicing effective harmony writing, and she submitted a first draft of a complete composition as the study was ending. Although the time frame for this second inquiry was short, her creations demonstrated increasingly sophisticated use of jazz-style harmony, and the books and online courses and communities with which she was continuing could be expected to offer good opportunities for further improvement.

Her own voice (in contact #21 out of 48):

Since I am not playing the left hand chords to tell me where I am in the song, it is really hard for me to follow the chord changes, especially with a song like this that keeps changing harmony every other measure. I wrote out the scales for each chord and tried to circle the notes that are important for each chord (guide tones) and just got frustrated even more. . . . I tried your suggestion to hum the melody but because it keeps changing slightly with each measure and I'm busy improvising, I lose track of what I'm trying to hum. I tried breaking it down to two measures at a time, but because I am not sure where I am, the first measure may be spot on but the next one isn't. My brains are developing blisters from working too hard. Fortunately, I love this song, so I don't mind playing it over and over again. Any help would be greatly appreciated.

Table 1:

Long-term Inquiries

Name	Inquiry Goal(s)	Main Tools Used	Contacts / Inquiry Length
Alex	Read common notation	Guitar, guitar tablature	21 contacts, 50 days
Cole	Compose Baroque-style fugue	Organ, notation program	10 contacts, 194 days
Donald	Compose in specific styles	Piano, digital and recording equipment	18 contacts, 124 days
Glen	Exploratory composition	Guitar, digital and recording equipment	42 contacts, 348 days
James	Distinguish / use seventh chords	Guitar, notation program	20 contacts, 125 days
Jeff	Spooky-mood composition	Digital audio workstation	21 contacts, 243 days
Laura	Understand circle of fifths	Piano, hand-notated music	27 contacts, 58 days
Lee	Transpose / improvise church music	Piano, hand-notated music	81 contacts, 195 days
Michael	Alternative-tunings software	Fiddle, tuning and frequency tools	15 contacts, 105 days
Paul	Use theory in playing / composition	Guitar, recording equipment	25 contacts, 231 days
Sonia	Jazz improvisation / composition	Piano, recording equipment	48 contacts, 279 days

Chapter 5

Music Theory as a Conceptual Tool

My OERs touch on a wide range of topics in music, including music acoustics, notation, history, instruments, and non-Western traditions, but most of the highly visited modules cover some aspect of Western music theory. Most of the long-term inquiries in this study also focused on music theory. Alex, Glen, and Michael conducted inquiries in which Western music theory played only a peripheral role; in the rest of the inquiries, a better conscious understanding or ability to use music theory concepts was central to the inquiry goal.

When I designed the study, I expected that it would attract mainly novice musicians who were having trouble locating or recognizing the specific information that was most relevant to their goals. Basic music theory is well covered on the open Internet, not only in my own OERs, but at other sites as well. I expected to help participants locate and recognize the materials that they needed to pursue their goals, while trying to understand how to change my OERs so that independent learners can more easily locate the information they need.

What I found, however, was that the participants were usually very capable of finding the most relevant materials on the open Internet, but they consistently had trouble making sense or use of the information:

- Still trying to come to grips with notions like major scale modes and the circle of fifths. (James)
- A lot of the material is way above my head at times. (Sonia)
- Some of the articles speak in quite advanced terminology. (Jeff)
- Soooo! much information to absorb but, you're right, I need to start applying it. (Paul)

Paul's comment reveals a significant barrier that many of the participants were experiencing. Information about music theory cannot really be absorbed without applying it; the concepts must be connected to purposeful musical experiences in order to make sense. This is an

example of Leontiev's (1978) observation that characteristics of specific objects only become understood as abstract, generalizable properties through conscious, purposeful activity. For example, the concept *major chord* is an abstract, generalizable property of many instances of Western music, but it is always only one characteristic of many that could be used to describe any given major-chord instance of music. (Other harmony-related characteristics include the function of the chord, the specific notes involved, and the chord voicing, not to mention numerous characteristics such as rhythm and timbre that have nothing to do with harmony.) Anyone who has heard much Western music has experienced, and even comprehended, major chords at an unconscious level. A musician can even learn to play major chords, for example as part of a piano piece, without understanding how that experience relates to the concept of major chords.

Musicians who become self-motivated to learn about theory know that the concepts relate to music that they have heard and played. When a conceptual discussion appears to be "too advanced" or "over their heads," they may therefore assume that the main barrier is a lack of background in the concepts rather than a lack of relevant experience. An activity-theory viewpoint suggests, however, that the only experiences that can help them understand the concept are those in which they consciously recognized the aspect of the experience that was an example of the concept. Even when a conceptual discussion includes audio clips and notated examples, that does not automatically create useful experiences. Without purposeful exploration, the reader may remain unable to determine which specific characteristics of an example are central to the concept and which are irrelevant. The main barrier to understanding may be neither a lack of conceptual background nor a lack of experiential background, but a lack of useful connections between conceptual and experiential ways of knowing about music.

The participants in this study appeared to be experiencing barriers to four useful types of connections between music theory and musical experiences: connections to notating, hearing, playing, and creating music. Notation provided additional challenges for some of the participants, so I will discuss notation separately, in the next chapter. In this chapter, I will discuss the challenges involved in connecting music theory to hearing, to playing musical instruments, and to creative activity.

Connecting Theory to Hearing

As discussed in Chapter 2, functional harmony, that is the perception that a piece of music progresses from one chord to another towards a satisfying ending, is fundamental to the form and perception of Western music. Harmony is also often the most complex aspect of pieces in this tradition, and one of the most difficult to classify simply by listening. For those who have grown up listening to it, perceiving functional harmony as part of a holistic musical experience is not difficult. For example, even non-musicians can combine functional-harmony cues with other cues in an unfamiliar piece of music to say whether or not the piece stopped "in the middle" or "at the end." However, they cannot identify, discuss, or think about the specific role of functional harmony in creating the satisfying ending. In Vygotskian terms, they do not have a conceptual tool for thinking about that characteristic of the music.

Musicians can become quite adept at singing or playing within the rules of functional harmony "by ear," without acquiring that conceptual tool. They learn to associate what they do with their voice or instrument directly with the sound of specific pitches, chords, or progressions of chords. They can reproduce a piece, or even improvise or compose similar pieces because they know how to produce the remembered or imagined sounds. This is an extremely useful skill that is perfectly sufficient to meet the goals of many musicians, including many well-respected

professionals (Green, 2002). However, as music becomes more complex, for example involving more performers, longer and more complex forms, or a greater variety of chords, it becomes more difficult to imagine it adequately without a verbal or visual symbol system. A music theory or notation allows musicians to take a higher-mental-function approach rather than a holistic-sound-experience approach to music, permitting, among other things, more deliberate, systematic, and complex exploration and discussion.

However, as discussed above, simply reading about a music concept does not automatically attach it to a musicians' aural experiences of the concept, and recognizing harmony characteristics of musical sound can be particularly challenging. The complexity is not created by the theory; it is inherent in the harmony aspect of Western music. Theory gives musicians conceptual tools for managing the complexity, if they can connect it to what they do as musicians. As with any tool, such connections are created and strengthened gradually, over the course of repeated use. For example, Sonia had an explicit long-term goal of "developing an ear that can recognize and understand what is going on musically," in other words connecting ear to theory.

> My frustration is that I hear a lot of music in my head but don't quite know how to bring it out and express it through the instrument to the level that I want it to. I can play some simple jazz charts but stumblingly because I have to stop at times and figure out how to voice a particular chord. (Sonia, introductory questionnaire)

Sonia expected that being able to connect what she hears in her head to particular chord voicings would help her play more smoothly. Since she could already play some simple jazz charts (which include the names of chords without specifying how to play them), it is likely that this expectation was based on her own prior experience. She wanted to continue down a path that had already proven useful.

Connections between aural and conceptual experiences of music can also be useful to

novice musicians. For example, Alex was a beginning guitarist with minimal formal music education. He wanted to understand how to read common notation, which includes learning theory concepts such as note names and key signatures. He did not want to send me recordings of his attempts to play written music, so in order to determine whether he was reading correctly, I sent him widely-familiar melodies as unnamed "mystery tunes" written in common notation. For each piece, he first had to play the notated music correctly enough to recognize the tune. He could then assess for himself whether or not he was playing all of the notes correctly, by comparing the sounds he played to his expectations of how the tune should sound.

Alex learned the basics of common notation in an unusually short time. After working with me for less than two months, he reported, "I have had no further questions, as I can now work out most things in the notation by playing it (if I know the tune!) or comparing it with the [tablature]." It is reasonable to suspect that one factor contributing to his success was that his activity focused on tying the note names and symbols to familiar aural experiences.

In contrast, as I will discuss in more detail later, Lee experienced considerable difficulty in making progress toward her goal of transposing and improvising familiar pieces when playing piano at church services. I believe Lee could have benefitted from changing the path by which she was trying to reach this goal. If she had been able to make the connection between ear and theory, she might have used her ear for harmony as a useful tool to help her reach her goals. It was clear from the questions and concerns that she expressed during her inquiry that Lee had a "good ear," in that she recognized when something she had played or written sounded "wrong":

- I may not be able to remember [the rules for accidentals] always but when I play it, I would know that it's a wrong accidental. (Lee, contact 71)
- I have changed other [notes in an arrangement she created] as well because when I play I don't like the sound. . . . Measure 6 still doesn't sound good. (Lee, contact 77)

Sometimes she needed help finding alternatives, but often she found the "right" notes by

herself, another indication that her ear was already a useful tool for her piano-based way of knowing about music. A connection between that ear and music theory might have provided a powerful learning tool for Lee, but her inability to think about what she was playing and hearing in terms of chords or music theory was a barrier to establishing the connection.

The connection between ear and theory was also a major stumbling block for Donald. He wanted to understand how composers use the elements of music to create the sound of a particular style, but he began by choosing to study pop-rap pieces for which we had no notated music. When I suggested that an analysis of the pieces would help him understand how the style is created, he became frustrated with his inability to recognize by ear the notes and chords that were used in the pieces. He decided to "test" his ear using a free on-line ear-training program, with the "terrible" results mentioned at the beginning of Chapter 1:

> For example, I can recognize a major third in C Ionian or A Aeolian, or in some other scale that usually being used. But when it comes to scales that are seldom being used (like B major or C# minor), my ear cannot distinguish major or minor third. . . . Maybe it's time to change my goal into smaller one. . . training my ear. (Donald, contact 3)

Donald also noted that it was easier for him to identify chords heard as piano sounds than to identify harmony played by other instruments, such as the sounds in a recording of pop rap. This was also a matter of "more familiar" sounds being easier to classify, a common experience among practicing musicians. Clearly Donald, like Sonia, had already made significant progress in developing an ear-theory connection, and his negative interpretation of his self-assessment was probably harmful rather than helpful. I assured Donald that it is standard practice in studying a piece to understand it by using trial and error in playing it on an instrument. I also suggested that his current aural abilities were fine for the goal of composing a pop rap piece, and that seeking a perfect ear was actually a longer-term, not a "smaller" goal.

We discussed the issue at some length, after which Donald decided to stick with

composition as the focus for his inquiry. Cutting short our discussion of the use of harmony in the pieces he was studying, he submitted a creation that demonstrated that he had learned something about how to create a pop-rap style, but did not demonstrate a deeper understanding of harmony than his pre-study creations had already demonstrated. He then expressed an interest in a new inquiry, choosing for study two pieces for which notated music was available. This made it easier for him to begin analyzing the harmony of the new pieces, which he did, but he dropped out of the study soon afterwards, with no further communication.

Of the long-term participants, Donald is the only one who did not repeatedly express gratitude, pleasure, or satisfaction with the course of the inquiry, so his departure left me with the sense that he was not experiencing a sense of progress or success and so was not motivated to continue. He and Lee are also the only ones whom I believe did not benefit from the study in proportion to the amount of effort they put in. (Lee was, however, profuse with gratitude, coupled with apologies for her inability to learn.) I will discuss their difficulties further later; here it is worth noting that both of the unsatisfactory inquiries featured a failure to establish a connection between an ear-based, directly perceived experience of harmony and a theory of harmony.

Other participants met this particular challenge with more success. James reached a crisis very early in his inquiry, in which he felt overwhelmed and unable to complete an agreed-on creation, due to a variety of challenges:

> I'm having a hard time remembering the chord structures. . . . If I misplace a seventh (such as minor/major), it doesn't always sound wrong to my ears. . . . There isn't a freeware application out there that can just lay out chord progressions, validated by key signature. . . . I think 6th, 9th, and sus chords are a little beyond me at this point. I mean, I know what they are, but how to use them in a progression context is elusive to me right now. (James, contact 6)

I suggested that a key issue seemed to underlie all of the problems: He had some useful

notation, theory, and ear experience, but was not confident of the connections between them. He could not assess, by ear, whether or not he was notating the specific chords that he intended to write; for example, there was not a strong connection in his mind between the 9th chord concept, the notation of a 9th chord using the "freeware" program, and the 9th chord aural experience, to guide his choices in using 9th chords or his evaluations of those choices.

We approached this challenge in two ways. First, we narrowed the inquiry so that it did not feel overwhelming, by focusing entirely on three types of seventh chords. Dominant seventh, major seventh, and minor seventh chords are aurally very distinct from each other, so they have very different functions in harmony. They also play important roles in musical style, for example, being crucial to creating the distinctive harmonies of jazz and blues, the styles that most interested James. Second, we developed skill-focused activities in which he could work on improving theory, notation, and aural skills separately.

For example, I created an ear-training exercise for him, by making an audio recording of a random series of dominant, major, and minor sevenths played on guitar. The recording gave him a moment after each chord sounded, to either name it or try to echo it on his guitar, before the chord was named correctly, giving him immediate feedback on his guess. This exercise allowed him to actively practice connecting his ear-based way of knowing the chords to his guitar-based and theory-based ways of knowing them.

These solutions quickly resolved James' frustration. It is worth noting his immediate response, particularly the hint that his own solution would have been to look for more information rather than to do skill-building activities:

> See, this is where having an experienced instructor makes a difference from looking at endless web pages. Now, I'm inspired to go on rather than give up or set it aside for longer than may be healthy to my musical development (which I've done in the past). (James, contact 7)

Through the rest of his inquiry, James explored seventh chords with enthusiasm and with increasing confidence in his ability to recognize and use them.

The main puzzlement that Michael brought to the study was also a matter of connecting ear to theory, although at the level of tuning rather than the level of functional harmony. For reasons too technical to explain here, tuning harmony is a complex and difficult problem, of which *equal temperament* is only one possible solution. Equal temperament is the accepted solution in Western classical music, because it is the best solution for playing functional harmony on a piano. It is largely an unexamined choice, however, typically taken as an assumption rather than explicitly discussed as a music theory issue. However, many music-making CoPs that do not include piano actually adopt other tuning systems in practice. In my own experience, if the group is playing Western classical music, this is done either without discussion, or with informal discussion that does not make explicit the departure from equal temperament. In other traditions, such as the folk musics that employ fiddle, the departure from equal temperament is a more explicit part of the tradition. Michael wanted to know whether it would be worth the effort to create software that would help fiddle players practice playing in traditional tunings. He understood the theoretical differences between the tuning systems. He also recognized aurally that he could sometimes, but not always, hear the differences between tunings, but was unsure what to make of that information:

> So maybe my research questions would be something like:
> - Determine what temperaments are typically used in string playing and under what circumstances these temperaments work best.
> - Can beginning/intermediate string players aurally distinguish between different temperaments when playing scales?
> - Would beginning/intermediate string players benefit from listening to/playing along with temperaments other than equal? (Michael, contact 3)

Of all of the participants, Michael proved most adept at finding and using a wide variety

of resources without any guidance. The tools that he brought to the inquiry included free online tools for displaying pitch on scrolling graphs, creating micro-tuned scales, making micro-changes to recorded sounds, testing pitch perception, converting between pitch as expressed in cents and frequency as expressed in hertz, and visualizing and analyzing the harmonic spectra of sounds. However, the information he needed about human perceptions of tuning was not available framed as music-theory information, so he had not found it. Once I suggested the likely explanation for his own experiences – that immediate musical context is a major factor in the perception of tuning – he quickly found the relevant information on the internet, framed as information about *pitch perception* and the phenomenon of *just noticeable difference.* With this information in hand, he felt much more confident that the software he proposed should be useful, particularly if it included contextual sounds such as a drone background. Although the context here was not Western harmony, the barrier to understanding was still a difficulty in making the connection between the aural experience and a formal, discussable concept.

Connecting Theory to Playing an Instrument

Among the eleven participants who pursued substantial inquiries, four played keyboard instruments (piano or organ), three played guitar, one created music using a DAW (digital audio workstation), and one played fiddle. Of these, only the fiddle has difficulty producing chords, and harmony theory was not Michael's interest. In contrast, of the 33 participants who dropped out quickly, nine did not play instruments that can easily make a variety of chordal sounds: Three played brass instruments; one each played violin, viola, or harmonica; and three did not play an instrument. In other words, 89% of the long-term participants were using a chord-playing instrument of some type, compared to 73% of those who dropped out. The numbers involved are small, and the study organized to be qualitative rather than quantitative, so I will make no claims

that the difference is statistically significant. However, given that I could find only one other substantial difference between the two groups, it is highly suggestive, considering the importance of harmony to so many of the participants.

As discussed in the literature review, a physical tool such as a piano not only assists the user in taking desired actions in a music-making activity, it also embodies, and makes apparent through its design, the concepts that are in play when it is used. In so doing, it helps the person who uses it to comprehend bodies of knowledge that are based on those concepts. For example, because of the importance to harmony of tuning, many Western musical instruments are designed to make it much easier to produce, identify, and agree on, specific pitches. This is an example of the distributed-knowledge principle described by Norman (2013): The needed knowledge about precise pitches resides in the tool, so the knowledge does not have to reside in the user's head.

For example, pianists with well-tuned pianos can be confident that playing a particular key will produce precisely the pitch that is wanted. Further, in mastering the piano, they have internalized some of the music-theory concepts that are embodied in the design of the instrument. These concepts span the hierarchy of music theory, from basic concepts, such as *notes* that are uninterrupted sounds with a specific unvarying pitch, to complex concepts, such as the rules for creating functional harmony. Pitch and harmony concepts are organized in ways analogous to Western concepts of length. A ruler embodies the concept of length in terms of an unvarying, standard unit size, such as a meter, which represents a specific distance between two points. This idea is so powerful that it can be used as a basis for complex building projects that require multiple interrelated measurements.

Similarly, harmony concepts are understood in terms of an unvarying, standard unit

measurement of pitch, which is the difference in pitch between any note on the piano and the next higher or lower note; it is a measurement of the distance between the perceived sounds of the notes. This is then used as a basis for constructing complex harmony progressions.

A piano is therefore not only useful in the activity of making music; it also can be useful for developing an understanding of music theory. For example, when told that all *major chords* follow a specific pattern, of three notes a certain pitch distance apart, the pianist can visualize that pattern on a piano keyboard, perhaps even checking it against known major chords, and grasp major-chord-as-concept in terms of the piano keyboard. In Vygotskian terms, the piano is a tool that mediates music-making actions, connecting the musician to the physical world of musical sound, through experiences provided within the Western-music culture in which the instrument developed. The internalization of the instrument, then, significantly improves the pianist's ability to think symbolically about the sounds of Western music, while simultaneously making it more difficult to think about music in terms of sounds that are not embodied by a piano, such as sounds with sliding pitches, or pitches "in between" the piano keys.

Piano is, of course, not the only instrument-based way of knowing about Western music theory. An experienced guitarist could receive a similar explanation about major-chord-as-pattern, visualize the pattern, check it against known major chords, and grasp the concept, all in terms of chords played on a guitar fretboard instead of a piano keyboard. In addition, if both the pianist and guitarist have played various major chords, and understood at the time that they were playing major chords, they may also have internalized those experiences as major-chord-as-sound, assisting in the development of a connection between ear and theory. In fact, as I will discuss later, the guitarist may actually have the advantage in this regard, because many guitarists are taught, from the novice stage, to think of music-making in terms of named chords.

Because functional harmony is the most distinctive, and one of the most complex, aspects of Western music, Western music theory tends to privilege knowledge about harmony. This primacy of harmony may be one reason why nearly all of the long-term inquiries in this study involved chord-creating instruments. Standard music theory texts devote most of their chapters to chords and chord-based harmony, and piano keyboard is preferred as the best way to discuss music-theory concepts. In general, both choices are assumed and unexamined, not presented as choices, just as Western music theory is presented simply as "music theory," rather than as a choice to study Western music – as opposed to, say, Indian music – from within its own tradition. A few participants expressed interest in non-Western traditions, but did not pursue lengthy inquiries in this direction. Most dropped out. Glen continued with the study, but changed course when he realized that he would not be able to make significant progress in understanding an unfamiliar tradition within the time frame of the study.

There are good reasons for preferring piano as the instrument for teaching harmony: It is much easier for a novice to play chords, in tune and with good sound quality, on a piano than on any other traditional instrument, and the notes are laid out on a visualization-friendly keyboard. In fact, as computer-based technologies have become standard tools for making and learning music, an electronic version of the piano keyboard has become the primary interface for interacting with new technologies to create or learn about music. Again, this is a choice that could be examined, but is usually presented so ubiquitously as "the way things are done" that few think to challenge it, even as new technologies also make other options more feasible (Beckstead, 2001).

The largely unchallenged assumption that a piano keyboard is the-instrument-for-learning-theory ignores the fact that the keyboard is a familiar, internalized tool for some music-

theory learners but not for others, and also ignores other useful ways of knowing about music that some learners may already have internalized. For some music-theory learners, playing the piano is an automatic operation that does not compete for their attention; they can focus on understanding the concept being played. When playing piano is an unfamiliar action, however, it may become the focus of the learner's attention, to the point that the activity mainly results in learning about piano playing rather than in learning about theory. James provided a good example of the problem:

> I own three different guitar reference books but they are lacking in certain respects. . . .
> I'd rather be able to derive a fretboard pattern on demand, if that's possible. . . . The book
> I own that's taught me the most is . . . not a guitar book. It's a piano-centric theory book,
> although a very good one, in my opinion. (James, contact 5)

In expressing a desire to "derive" the chords himself, James is asking for theory, as opposed to the standard guitar-book approach of simply showing how to play many chords, with too little explanation of how they are derived. This is analogous to a multiplication table that lists many specific multiplication answers but does not explain how to derive one that is not listed. The lack of clear theory explanations for guitarists was a major impetus that led me, as a guitar teacher, to publish my own OERs in the first place. As James hinted, the "piano-centric" theory books require an extra translation step for the guitarist. What exactly is being illustrated using the piano keyboard? How would it be played on the guitar? This is analogous to trying to understand the meaning of a new word by reading its definition in a foreign language. Did you translate the definition correctly? Does the word mean what you think it does in your language?

Meanwhile, since guitar is not considered a tool-for-learning-theory, books and OER sites about guitar chords feature reference-style lists rather than theory. When James was struggling to understand too many different types of chords, his instinct was to turn to a guitar chord site, but he then stated, "I don't see how it's possible to memorize all of that." In my

personal experience as a guitarist, an ability to derive any chord, based on theory, is ultimately more useful. My guitar-specific OERs had attracted James to the study, but he initially also found them "intimidating," a problem I'll discuss later.

The rules and patterns of functional harmony may be easiest to demonstrate and visualize on a piano keyboard, but they are still not obvious, even to pianists. Consider, for example, a C major chord. It consists of the notes C, E, and G, but each of those notes may be played in multiple places on the keyboard. The different combinations look, feel, and sound different, but all have the same function in a chord progression. As a further complication, that function depends on the key. If the key is C major, then a C major chord is the *tonic* chord that brings a piece to a satisfying ending; if the key is F major, an F major chord has the satisfying-ending, tonic function, and any C major chords would have a completely different, *dominant* function in the harmony. The functions themselves follow the same patterns in every key, but in each key the chord that fulfills each function is different. Novice instrumentalists are typically focused on note names such as C or F, so they rarely notice the patterns that emerge due to functional similarities, but the patterns are the main reason that harmony theory is useful. Consider, for example, the benefits to the developing musician of being able to use known patterns to "derive" an unfamiliar chord, to re-derive a temporarily-forgotten major scale, to change the key of a piece, or to improvise pieces that end satisfyingly on a tonic chord.

The patterns are so useful that they tend to become obvious to music instructors. Students are often assigned to practice the patterns, in the form of scales, arpeggios, or chord progressions, as exercises in playing, without explanation of the theory. When Lee reported that she couldn't think of the notes in a named chord fast enough to improvise them on demand, I asked whether she practiced arpeggios. Arpeggios are simply the notes of a chord, played one at

a time rather than all at once. Playing arpeggios is a popular and useful exercise on many instruments, because real music often includes arpeggiated chords. A musician who practices a C major arpeggio regularly should be able to learn to play that arpeggio automatically whenever the chord symbol "C" appears in a piece of music. Lee reported that she practiced arpeggios frequently, but did so without an awareness of which one she was playing. She was not practicing the arpeggio *as a C major arpeggio*, so she could not connect the instrument practice with the chord symbol.

Lee remarked that it had never occurred to her that she could use her arpeggios in this way. If it had, or if some teacher had introduced the idea to her, perhaps she would not have forgotten the theory that she did learn. Unfortunately, explicit ties between music theory and its practical uses are not common. James remarked on this problem when explaining why he liked an OER that I recommended:

> So many other articles I've read just say "learn all 12 major scales" without really explaining WHY you should. . . . Your few sentences on accidentals in the chord progressions (module m11643, top of page 3), made it very clear why this is a good idea. (James, contact 11)

It is rare for novice musicians to become interested, on their own, in the patterns underlying music theory, but Laura noticed the theory information in her beginning-piano book and wanted to know where it was leading:

> I started playing the piano about a year ago and am looking for a full overview of music theory pertaining to the piano. . . . There is some theory in the book, however I feel like I learn better if I glance at the whole book first then begin to work through it. (Laura, introductory questionnaire)

When she volunteered for the study, Laura had already realized that the circle of fifths is an "overview" of music theory in a very condensed format, but she could not make sense of it without help. As a first-year piano student, she had learned only a couple of chord progressions

and had played in only a few different keys. This was not enough practical experience to begin to discern the patterns. Our inquiry therefore focused on pattern-discovery exercises that were essentially piano-playing experiences that were tied tightly to the theory, to allow her to make unusually quick progress in the theory. By the end of the inquiry, she had used these experiences to derive for herself the information contained in the circle of fifths, and she reported that she felt she had gained the desired overview of the theory. As a final activity, she used the knowledge to choose a chord progression for the tune "Jingle Bells," creating her own arrangement of the piece.

Connecting Theory to Creative Activity

As discussed in the literature review, creativity provides a particularly powerful path to knowing about music that is of deep interest to many musicians. Although music theory can be useful in music performance activities, it is most useful in creative activities such as composing, arranging, or improvising music, and a majority of the participants tied their interest in learning about music to a creative goal. Sonia and Paul were interested in improvisation. They were both also interested in composition, along with Cole, Donald, Glen, James, and Jeff. Michael's goal, creating software for musicians, demonstrates that music-theory knowledge can also be crucial for other types of creation, especially creation of tools that are meant to be used by musicians and music-learners. As discussed in the literature review, it is the development of an ability to make use of what is known to envision and create something new that thinkers like Dewey, Greene, and Eisner have argued is the particular power of inquiry in the arts.

Nor is this a one-way matter of using theory knowledge to inform the act of creation. The act of music-theory-informed-creation also provides an exploration-based way of knowing about music, which helps the creator not only to make deep sense of the theory, but also to connect the

theory to aural and instrument-based understandings. If the creation is notated, it also helps the

creator develop a deeper understanding of notation. In addition, as discussed in the literature

review, creation driven by the learner's own interests is particularly powerful, due to intrinsic

motivation and high self-identification with the creative act, but the connection of music-theory

teaching with opportunities for interest-driven creation appears to be rare. The result of this lack

of connection could be a musician who, like Glen, rejects the idea of using music theory to

inform his composition, in part because he views theory as being in opposition to creative self-

expression:

> You wouldn't believe how much contention I had with theory in college. It was a love-hate relationship. Generally speaking I find playing from the heart more rewarding than reaching outside of myself. (Glen, contact 19)

It also could result in a musician such as Jeff incorrectly inferring that, because the music used to

demonstrate the theory doesn't sound like the music that interests him, the concepts are therefore

irrelevant to his interests. Jeff gave the following reason for his interest in this study:

> The problem I've always found in researching online is that all the information and courses start with major and minor scales (for example) and in the music I write I do not use them for the most part. So I will not be able to put what I learn into practice. (Jeff, introductory questionnaire)

As it turned out, the "twisted, spooky" sound that he wanted in practice could in fact be

understood in terms of aeolian mode, which is a type of minor scale. It is not surprising that he

did not realize this, however, since the typical music course provides examples only from

classical music, ignoring music from other styles, such as the one that interested Jeff. Armed

with the knowledge of the scale, Jeff found it possible to construct the types of melodies that

interested him. As Jeff's case demonstrates, creation of good music is possible without the formal

concepts, but the concepts are powerful tools for extending one's creative capabilities.

A lack of explicit connection between theory and creative practice also could result in

Cole's problem. Cole knew the theory well; early in his inquiry, he produced analyses of good

Baroque counterpoint (a particularly complex musical style) that were thorough and correct. He

also believed that the theory could be used to aid expressive composition, but he was so unhappy

with his own attempts to do so that he always destroyed them before they were finished. Cole

owned numerous books about counterpoint but complained about "the theoretical and analytical

bias of all the texts":

> I studied music because I wanted to learn practically how to produce music I liked, not in
> order to become a musicologist. . . . As a self learner, I [want] the smallest steps
> explained and not glossed over or skipped. None of the texts I've used adequately provide
> this, or convincing walkthroughs of how to achieve a pleasing practical result. (Cole,
> contact 7)

James reported a similar problem:

> I read a lot about melodic movement, and I tried to incorporate some of that. I find that it
> sounds like a sterile scale exercise, rather than a melody, and I'm not sure what to change
> to make it sound less "theoretical". (James, contact 19)

> James' puzzlement – *what to change* – is at base a question about connection. For him,

and for Cole, there is a non-obvious step beyond simply using the concept "correctly," a step that

connects the conceptual knowledge to the act of self-expressive creation, rather than connecting

it to a creation that "sounds like a sterile scale exercise." As James had pointed out when we

were discussing what he might do for the inquiry, typical music theory instruction features

highly constrained exercises:

> I was expecting something along the lines of "Compose a bluesy number in E major, 116
> beats per minute, using the I-IV-V7-ii-V7-I progression" (James, contact 2)

The more constrained the exercises, the easier they are for the instructor to assess; their main

purpose is to judge whether a concept is understood, and the results do tend to be "sterile"

exercises rather than creative expressions. In the context of a course, assessment is a more

immediate concern than self-expression, and due to such realities, that final step to self-

expression may never be addressed in the typical theory course. If the subject is never broached, however, it is possible that some of the students do not even realize how the knowledge *might* be used for the types of musical expression that interest them.

This is a weakness of educational approaches that do not include inquiry motivated by the learner's goals. Jeff's misconception, as described above, provides one example of the problem. Paul's inquiry provides another. When I suggested analyzing the chord progression of a favorite song, in order to discover some useful ideas for how to organize a song of his own, he responded, "Great idea, I forgot about doing progression charts in analyzing" (Paul contact 4). Paul was capable of doing such an analysis and understood how it might be used, but when confronted with the idea of composing, he did not think of harmony analysis as a useful tool.

This weakness appears to be as common in face-to-face instruction as it is in online information, which suggests the possibility that not only stand-alone materials such as OERs and books, but also many courses with active instruction, are missing an important ingredient, if the goal is to help music theory learners connect that knowledge with the pursuit of their own music-creation activities. I will return to this issue in the concluding chapter.

Chapter 6

Music Notation as a Conceptual Tool

Literacy is a primary goal of formal education because the written word is such a useful tool for organizing, remembering, communicating, and learning ideas. Music notations serve similar purposes, allowing complex musical-sound "ideas" to be organized, remembered, communicated, and learned.

For an individual who is not literate, written language can be a barrier to understanding. Another reason that formal education emphasizes literacy is that curricula tend to rely on written materials as tools for learning. This is an efficient way to design a curriculum, since the written word is so useful in learning activities, but it can easily lead to an unexamined assumption that literacy is a prerequisite for learning. Many aspects of curriculum order *are* based on natural prerequisites. For example, if a child asks about multiplication, it makes sense to begin the answer by discussing addition, because multiplication-as-a-concept is built on addition-as-a-concept. In contrast, literacy is often only a procedural prerequisite, not a natural, conceptual prerequisite. If a child asks a question about biology, it does not make sense to begin the answer by discussing the spelling of biology terms. Students in school, however, may only be offered the opportunity to learn about biology by reading textbooks. Failure to learn, due to a lack of capability or interest in reading, can easily be misinterpreted as a lack of capability and interest in biology. Even if a field trip to the zoo creates interest and experience-based learning, the experience remains disconnected from the conceptual knowledge that make biology a useful science, if there is no engagement with the literacy-based learning.

Similarly, music notation can be a barrier rather than an avenue to music learning, when music-learning activities rely on notation. This issue was not visible to me before undertaking

this study. This was not because I had never noticed novice musicians struggling to master notation; it is, in fact, the prevalence of such struggles that make them seem natural, inevitable, and ultimately invisible. As in literacy education, the typical response in formal music education is to provide additional support in learning to read notation, while continuing to rely on notation as a required tool for learning theory and composition, as well as for learning new pieces.

Notation, as a tool for learning about music, played at least a minor role in most of the inquiries in this study, and was a central issue in three of them. These three challenged the notation-prerequisite assumption in different ways. The goal of Alex's inquiry was to learn to read *common notation*, the widely familiar notes-on-a-staff typically used in formal music education. Alex had already learned to play guitar using guitar *tablature*, a notation developed specifically for guitar. He was treating common notation as an additional skill, useful as an alternative to tablature, but not fundamental to his music-learning goals. Lee read common notation well, but this did not help her reach her inquiry goals of transposing and improvising music; in fact, specific aspects of common notation appeared to have contributed to her difficulties. Jeff wanted to be able to use music theory as a tool for composition, but did not have an immediate need or desire to learn notation.

Jeff's inquiry raised a fundamental question: Is common notation a natural, conceptual prerequisite to learning Western music theory and composition, or is it simply a procedural prerequisite? In this chapter, I will use Jeff's theory-but-not-notation inquiry to introduce a discussion of the various notations that were used by study participants. I will compare the notations as tools for use in music-learning inquiry activities before describing the solution that Jeff and I developed.

Jeff's Inquiry

A composer who did not "play" any instruments in the traditional sense, Jeff created music using a digital audio workstation (DAW). DAWs allow the user to compose by creating sound files that can be "played" by the same tools (such as mp3 players) that play recorded music. Compositions can be created by manipulating existing recordings or sound files, for example by chopping them into short-duration slices and altering and rearranging the slices. Individual sounds, such as single notes, can also be created, using a digital piano keyboard. A *piano roll* interface then allows the user to alter specific characteristics of each sound, such as pitch, loudness, length, and timing. Figure 1 shows what individual notes might look like on a piano roll interface. (Figures begin on page 211.)

DAWs typically also have notation-based interfaces, but notation is not required to use either the digital keyboard or the piano roll interface, or to manipulate existing audio files. Jeff reported that he composed by ear, without reference to music concepts or notations. The composition that he offered as a sample of his pre-inquiry work featured fast-paced, complex rhythmic elements compellingly organized into an audibly comprehensible overall form. Pitched sounds were mainly used as effects, rather than in traditional melodies or harmonies. Jeff's inquiry goal was to be able to compose a piece with a "spooky" mood similar to that of a favorite anime theme tune, but that mood depended on melodic and harmonic elements:

> I would also like to learn the kinds of "scales, melodies, harmonies and chords" used when trying to give the music a certain kind of feeling and evoke certain emotions, for example sad melodies or twisted melodies. (Jeff, contact 1)

Jeff was explicitly interested in understanding the relevant music theory, so discussing those elements of the anime theme would be a useful activity. This would require some method of "pointing to" specific aspects of the melodies and harmonies. In music theory courses, such pointing is done using a common-notation version of the music, with an implied assumption that

the notation is a necessary tool, and natural prerequisite, for music theory discussions.

Chord Symbols as a Shorthand for Notation or for Aural Understanding

As discussed in the previous chapter, there are significant challenges inherent in connecting music theory to aural (ear-based) understanding. These challenges seem to have led to a widespread assumption among music educators that common notation is a necessary tool for connecting ear-based and theory-based ways of knowing about music. This assumption is demonstrably false. For example, many of the traditional and popular music styles of the United States, such as blues, bluegrass, country, and various rock styles, are passed down through loose-knit communities of practice (CoPs) in which music-notation illiteracy is common and can even be considered a sign of "authenticity" (Green, 2002). Many musicians in these communities develop the ability to use Western music concepts, such as scales and harmony, by ear, with no notation and little conscious conception of what they are doing (Green, 2002; Waldron, 2011). Others learn to conceptualize and discuss their music in terms of theory concepts, but with minimal use of notation.

For example, a particular action of a music-making CoP might be conceived and discussed as "playing a C major chord" or as "playing a one chord" (referring to the tonic chord, often represented with a Roman numeral I). Notated music may not be used at all, or used only as a learning or memory aid. When it is used, it may consist only of chord symbols that indicate the harmony *as a chord progression,* a list of the changes from one chord to the next as the music progresses. The chords are indicated in terms of either note names or harmony function; see Figure 2 for examples. Many instrumentalists learn to directly associate theory concepts, such as *C chord* or *tonic chord*, with their instrument-based understanding of the music. When they "play the concepts," for example consciously playing C chords or tonic chords and hearing

the resulting sounds, they are also developing an aural understanding of chord progressions and becoming knowledgeable members of their CoPs with little or no reference to notated music.

Guitar is a common instrument in most of these CoPs, so it is common for a guitarist to become familiar with chord symbols as a novice. Glen, James, and Paul all entered the study capable of discussing harmony in terms of chord progressions, and thus ready to explore and discuss music theory at the level of functional harmony. In spite of his stated desire not to frame his inquiry goal in music-theory terms, Glen sometimes framed his compositional interests in terms of music-theory concepts:

> I felt it would be worth investigating playing the minor and major in non-exclusive phrases as a trick to brighten up a solo. (Glen, contact 19)

Paul organized his inquiry creations around recordings of himself playing a chord progression that created a particular musical style and mood:

> I started out with a basic idea for a chord progression but soon got caught up more with what sounded good. Kind of like that 'best laid plans' sort of thing. (Paul, contact 13)

Glen and Paul were both capable of reading common notation as well as chord symbols, but their inquiry activities did not rely on notated music. Notating music is a time-consuming process, even for those who are skilled at it. Requiring Glen and Paul to write out their compositions would probably have forced them not only to greatly decrease their creative output, but also to simplify it in order to make it easier to notate (Wiggins, 1999). Because Glen specifically wanted to focus on creative output, such a requirement might have caused him to drop out of the study.

The Relationships of the Various Notations to Music Theory

In contrast to Glen, James was interested in gaining a better understanding of functional harmony:

> I am at a critical juncture in my musical learning process. I want to learn harmony, chord progressions, composition. (James, introductory questionnaire)

James' inquiry demonstrated a weakness of chord symbol notation: It relies heavily on knowledge inside the musician's head, knowledge which is sometimes missing or faulty and often not well connected to music theory. As discussed in the previous chapter, tools such as piano keyboards can act as repositories of knowledge, so that the user does not have to try to store difficult knowledge, such as the precise frequency of an "A," in the head. In some situations, however, it is easier to store the knowledge in the user's head, and use the tool simply as a trigger to activate the most useful knowledge at the most useful time (Norman, 2013). For example, a grocery list does not contain knowledge about how to obtain groceries. That knowledge is already in the user's head; the list is merely a reminder triggering the knowledge at an appropriate time. Chord symbol notation acts in this way, for example triggering knowledge about how to play a C chord at the appropriate time.

Of course, if a certain type of knowledge is not needed, it may not be present in either the tool or the head. Consider, for example, the guitar tablature notation that Alex knew prior to the study. As illustrated in Figure 3, guitar tablature indicates how to play the music on a guitar. It does not rely on the reader's music theory knowledge; the sounds are related directly to the instrument, not to theory concepts such as note names, key signatures, or harmony functions. Novice guitarists generally find common notation harder to learn than tablature, because common notation requires readers to keep, in their heads, music theory concepts such as note names and key signatures, in addition to knowledge about how to play each note.

However, because tablature does not incorporate music theory information, there is no way to use it to explore music theory concepts. This created barriers for Alex when he tried to decipher common notation. Questions that he brought to his inquiry included confusions about where to play named notes on the instrument and misconceptions about the meaning of key

signatures. Some of his confusions and misconceptions were a reasonable result of a tablature-oriented understanding of notation, for example, "Are all the first positions notes in the scale of E?" (Alex, contact 7). They might be shared by other tablature reading guitarists, and they created barriers to understanding generalized introductions to common notation, such as those typically available in OERs.

Another option for Alex would have been guitar-specific introductions to common notation, such as those in guitar method books or my own guitar OERs, but these are created for novice guitarists. The notation information tends to be buried among directions for playing the instrument and multitudes of simple tunes and exercises that are of little interest to someone who can already play competently. Offering Alex such resources would be analogous to offering an adult foreign-language learner kindergarten texts in the unfamiliar language.

Unlike tablature, chord symbol notation relies heavily on music theory concepts such as *C chord*, *tonic chord* or *major seventh chord*. It also relies on knowledge in the reader's head, but the knowledge that a musician uses to interpret the symbols may not be music theory knowledge. For example, many novice guitarists learn, through rote memorization, to associate each chord symbol directly with a way to play the chord on the instrument. Like tablature, this provides a fast track to early success, but it leaves guitarists no clear route to deeper, theory-based understandings that would help them remember forgotten chords, interpret unfamiliar chord symbols, or choose the best chords for a composition. Such tasks are complicated by the fact that there are numerous ways to perform any named note or chord; see Figure 4 for examples. What constitutes a "good" choice depends on many factors, such as the style of the piece and what others are playing. The hallmarks of an accomplished guitarist include the ability to perform a given chord in a wide variety of ways and to quickly choose a way that is appropriate to the

musical situation.

Unlike tablature, chord symbol notation can reveal the theory that underpins it, if explored systematically, but this is not an obvious or efficient route. James' inquiry focused on gaining a theory-based understanding of the differences between dominant seventh, major seventh, and minor seventh chords. He began the inquiry with confidence in his ability to interpret chord symbols correctly by playing them on his guitar. In retrospect, I believe we might have been able to discuss the theory in terms of that knowledge, rather than as notated music, but the possibility did not occur to either of us at the time. James was also familiar with common notation, so we took the standard route, using notated versions of the chords to discuss the theory. As described in the previous chapter, this caused James great stress when he realized that he was not confident in making connections between his chord-symbol-guitar-playing understanding of the chords and his common-notation-music-theory knowledge of them. See Figure 5 for an illustration of the problem. The activities in James' inquiry helped him establish connections between the two types of knowledge. Although the subject of inquiry was narrow, a path was established that James should be able to revisit on his own to make further connections between music theory and his guitar activities:

> This has been immensely beneficial to me, and has fundamentally changed the way I listen to, and learn music. I will continue on my own. . . . I may stumble a lot more than if you were guiding me, but that's part of the learning as well. I definitely want to continue composing, as it's been a completely revelatory experience for me. (James, contact 20)

Sonia's jazz-improvisation inquiry also involved chord symbol notation. Chord symbol notation is commonly used in jazz improvisation for all instruments, including piano, because it is easier than other notations to read at a glance, as can be demonstrated by taking a quick glance at Figure 5. It also represents the music in terms of harmony, rather than in terms of specific notes. An experienced jazz improviser, like an experienced guitar player, can quickly read and

interpret the chord symbol and make personal, creative choices regarding which notes to play, and when. The jazz improviser typically has even more possibilities to choose from than does the chord-playing guitarist.

Sonia entered the study as an experienced pianist who could interpret chord symbol notation, although as noted in the previous chapter, she could not always do so without hesitation. She wanted additional help with a Massive Open Online Course (MOOC) that she was currently taking, which offered "basic concepts" of jazz improvisation. Sonia was a novice at improvisation, but she clearly already had some relevant capabilities. Misinterpreting the first MOOC assignment, she had played the chord progression with her left hand while simultaneously improvising a melody with her right hand, instead of simply improvising a melody while a recording played the chord progression, with results that were impressive for a novice improviser.

Improvisation implies refraining from deciding what notes to play until it is time to play them. Novices struggle to make good choices quickly enough, as demonstrated in the recordings Sonia made, which included noticeable hesitations as well as notes that did not fit the given chord and style. Jazz improvisation is typically performed in the context of the chord progression of a jazz tune, so jazz theory courses such as the MOOC provide theory-based insights into how to make "good" choices based on the harmony and style of the piece. Theory knowledge alone is not much use in performance, however; practice time is required to translate the conscious knowledge into fast-acting, automatic operations. Experienced improvisers can put new concepts into practice more quickly than novices, in part due to prior theory knowledge and useful operations already acquired, but also due to familiarity with the practice habits needed to operationalize new improvisation ideas. The fast pace of the MOOC attracted experienced

improvisers, making it difficult for Sonia and other novices to take advantage of the course's

student discussions:

> The more experienced musicians often talk at the level of their knowledge base. So often
> the things they share go over my head. So it ends up that the top feeders get to hang out
> with each other and discuss things at their level and the bottom feeders stay at the bottom
> scratching their heads trying to figure out what was just explained. Sometimes someone
> with more knowledge will come down to our level of bottom feeders and explain things a
> bit. But it's few and far between. . . . Some have left the course because they found it too
> difficult to navigate on their own. I could have been one of those statistics had I not had
> your help to get me oriented in the right direction. (Sonia, contact 19)

In activity-theory terms, the course was providing conceptual tools to be used in jazz

improvisation actions, but only offering two actions for practicing the use of such tools: peer

discussions that were over the head of a novice, and improvisation assignments that required

operationalized improvisation skills that a novice does not yet have. Sonia reported that the

instructor did say that it would take time and practice to put the knowledge into action, but this

assurance apparently did not stop struggling novices from dropping out.

Of particular interest in the context of activity theory, Sonia actually found it easier to

improvise melodies with her right hand when she was simultaneously playing the chords with

her left hand. Common sense would suggest that the two actions are different enough that it

should be more, rather than less, difficult to do both simultaneously. However, when Sonia did

the MOOC improvise-a-melody-over-recorded-chords assignments, she complained that she

became "lost," meaning that she was no longer consciously aware of where she was in the chord

progression, and so had trouble *automatically* choosing notes that would fit it.

I offer the following as the most likely explanation: Unlike experienced jazz players who

can improvise by ear, Sonia did not yet have an aural understanding of the harmony that

connected automatically to her piano-playing knowledge. Listening to the chords, and translating

them into piano-based ideas of chords, required her conscious attention, so she could not

simultaneously focus on creating a melody that fit them. In contrast, she was capable of playing

the progression on the piano as an automatic operation. It required less of her conscious

attention, while also providing useful harmony information at an unconscious, operational level,

allowing her to focus conscious attention on the action of choosing melody notes that fit the

chords.

Common Notation as a Barrier to Transposition and Improvisation

In spite of her facility in playing from chord symbol notation, Sonia had trouble reversing

that action. When the MOOC was over, she completed a second inquiry with a goal of

composing a piano piece in a jazz style. Choosing a good chord progression that was appropriate

for the style was particularly challenging. Both long-term and dropout participants with

composition goals expressed sentiments similar to Sonia's:

> I hope you can help me unravel this mystery and find a way to do this that makes sense. I
> am getting frustrated with the hunt and peck method of trying to come up with chords
> that work for the melody I came up with. (Sonia, contact 44)

In order to understand how a piano alone might create the style she desired, she chose to

analyze a piano piece in that style. It was written in common notation, as is standard for

composed piano pieces; see Figure 6 for an example. Sonia "bogged down" at the step of

choosing chord symbols to describe what was occurring in the music, and decided eventually to

imitate the style using her aural and piano skills instead. The final version of her composition for

the inquiry made good use of many elements of the style, but we were not able to explore

harmony in depth. Working from a common notation version of the piece, as is standard for

pianists, actually created a barrier to discussing and understanding harmony.

Most formal music instruction, such as piano lessons or school band classes, relies on

common notation. There are good reasons for this preference. Common notation spells out in

detail one specific way to play the music, including precise rhythms, which are often omitted from other notations. This allows unfamiliar music to be learned or recalled very accurately, even without hearing or seeing anyone else perform it. Before the advent of recording technologies, these affordances made common notation a crucial tool in the development and spread of Western music traditions. Common notation also allows large numbers of musicians in bands and orchestras to coordinate performances of complex pieces very precisely; it is difficult to imagine how symphonic music, for example, could have developed without it.

There are some musical actions, however, for which common notation is not an ideal tool. We have already seen that chord symbols are a better tool for the action of improvisation, which is one of the skills that Lee felt that she needed to develop. She reported that the music leaders in her CoP were competent guitarists, accustomed to reading, conceiving, and performing the music as chord progressions. They would sometimes depart from the written music to improvise chord progressions, for example in order to connect the end of one piece seamlessly to the beginning of the next one. They sometimes performed pieces that were available only in chord symbol notation, and they expected Lee to be able to improvise a piano part based on the chord symbols. Lee was not familiar with chord symbols and often had to choose between making many mistakes or dropping out of the performance, either of which caused her embarrassment. Even more frustrating to Lee, the guitarists often decided, without much advanced notice, to move a piece that was available in common notation to a different key.

Moving a piece of music to a different key is called transposition. The piece sounds higher or lower, but other than that is recognizably "the same." Many musicians who are experienced at playing by ear can transpose to a familiar key with little effort. Musicians who are accustomed to thinking of notes as chord progressions also have a distinct advantage; as in jazz

improvisation, the compactness of the symbol and the conception behind it allows them to easily switch to the new key simply, for example, by playing the notes in a D chord, instead of the notes in a C chord.

In contrast, a pianist who is asked to transpose a piece in common notation is faced with reading and changing every single note for both hands. Writing out the transposition is a time-consuming chore. The alternative is "on sight" transposition, which requires enough practice that the specific transposition action – for example, moving to the next pitch higher, as opposed to two pitches higher or one pitch lower – has become an automatic operation. Unable to do either at short notice, Lee might practice an upcoming piece, only to discover at the last minute that it would be performed in a different key. She came to the study with a primary goal of learning to transpose common notation on sight, although from the beginning she also mentioned a second goal of "adding filler." By *filler*, Lee meant choosing specific notes to play when she was given only a chord progression, in the same way that experienced guitarists choose a specific way to perform a chord, based on the chord name and the style of the music.

Transposition is a particularly useful skill for French horn players, due to quirks in the instrument's history, so I have successfully taught the skill to horn players in face-to-face situations many times. Giving Lee instructions and exercises similar to those that I have given my horn students did not seem to have any effect over a period of two months. In the mean time, she also asked for specific help with many of the pieces she was playing in church. Most of the requests involved "adding filler." Lee reported that she had forgotten most of the music theory she had learned, and unlike Sonia she struggled to interpret chord symbols correctly, even when given sufficient time to think about them. In Lee's CoP, there were expectations that pianists should be able to transpose music and should help make the functional harmony audible by

creating a stylistically appropriate piano part based on the chord progression. At the beginning of her inquiry Lee reported strong, psychologically negative pressure to conform to these expectations. She had been "advised not to play" (Lee, contact 2) as part of the rotation for one of the weekly services, although she was still playing at a different weekly service. (Given her description of the situation, I believe that this service had a smaller attendance and fewer pianists in the rotation.)

Lee mentioned several times that the other pianists in the rotation schedule could transpose music to a different key "at the flick of a finger" and had no problem following the guitarist-leaders, even in improvised progressions when there was no written music. Because the pianists played in rotation, the CoP did not offer natural opportunities for Lee to learn from the other pianists. She was especially eager to be able to transpose common notation on sight, as she assumed the other pianists were doing. I cannot say whether the other pianists were transposing common notation note-for-note at sight. It is possible, but this skill is particularly difficult for pianists, since their music usually contains a much higher density of notes than the music of single-note instruments such as French horn. What is certain is that a pianist who can improvise when there is no written music at all must also be capable of improvising transposed music. I would have liked to have her speak to one of the other pianists about their own approaches, to help persuade her that the new goal was actually a better way to meet her needs, but the possibility that the response would be unhelpful and stressful to Lee seemed too high.

When it became clear that Lee was making no headway learning note-for-note transposition, I offered chord-based understanding as a more practical approach to transposition. She could transpose the chord symbols – a small task compared to writing out all of the notes – and then "add filler" based on the chord symbols. In addition, basing her skills on a knowledge

of chords would also address the other challenges, such as reading chord symbol notation and adding filler in improvised progressions.

Lee agreed to this approach, but that may have been an act of "trusting the teacher" to the extent of adopting my goal instead of pursuing her own. Her attitude in inquiry contacts was the most self-deprecating and deferential of any of the long-term participants. Lee never gave up the goal of transposing common notation note-for-note, mentioning it periodically throughout the inquiry. That skill is mainly acquired through individual practice, however, not through discussion with experts, so it did not seem to be a goal that could be addressed within the conditions of the study. Instead, I continued to try to help her understand that harmony theory offered a general rules-based solution to many of her problems.

Whenever I provided rules for solving problems that she brought to the inquiry, however, Lee panicked and reported being too stressed to understand. She brought dozens of specific problems to the inquiry, so I switched to an example-based approach, grouping the problems into categories such as "interpreting slashes in chord symbols." For each category, I wrote out, in common notation, solutions to some of the problems and asked her to write out "similar" solutions to the others. She explicitly preferred this approach to dealing with abstract rules:

> This is good practice for me because these are the songs that I have to deal with two Sundays a month and it's good that I do the practices and learn from there. So it's on-the-job-training. (Lee, contact 14)

At this point in her inquiry, I began to suspect that one reason that Lee had not been able to use my note-for-note-transposition advice was because it was organized as a set of rules for practicing the skill. I did not revisit the issue with Lee, however, because I could not think of a way to use the training/imitation approach, given the limitations of the study, and I believed that discussing the issue would be distressing rather than helpful to her.

Over the course of the study, Lee did improve in her ability to imitate my examples in interpreting chord symbols, transposing chord symbols, and "adding filler" to pieces. However, her ability to apply the knowledge to new problems, outside of the examples/assignment framework, did not appear to improve, and I am not confident that she was capable of further progress on her own after the study ended. In contrast, Alex, Sonia, and James also left the study before the information they were trying to absorb had been translated into automatic operations, but I am more confident that they were capable of continued improvement on their own, because they had demonstrated an ability to apply the music theory concepts to solve new problems.

As discussed in the previous chapter, Lee had a good ear, and she regularly practiced skills, such as playing arpeggios, that could be very useful in creating "filler." Lee also reported that she was actively working on passing Grade VIII of the ABRSM, a widely-used set of graded piano-playing exams that values the ability to play from common notation, not chord symbols. Lee's unusually lengthy and active participation in the study, consisting of 81 contacts over a period of 195 days, suggests an ability to stick to a course of study, but also a heavy reliance on active, direct instruction. I cannot help but wonder how well she might be coping in her CoP if she had been taught, as a matter of course from the novice stage, how to play from chord symbol notation as well as from common notation.

Piano Roll as a Situated Notation

It was probably not feasible to teach Jeff either chord symbol notation or common notation within the time frame of the study, even if he had been interested. Alex learned to decipher common notation significantly more quickly than other instrumentalists that I have taught, probably because his inquiry was characterized by self-discipline, a good ear, a prior ability to play the instrument, and self-motivation to learn that particular knowledge. However,

his inquiry still required 21 contacts, plus significant effort on his own in between contacts. If

Jeff's inquiry had required learning a standard notation, it is likely either that he would have lost

interest in the inquiry, or that the study would have ended, before he could learn the specific

knowledge that he did want.

Instead of dealing with any standard notation system, Jeff and I decided to discuss the

piece that he wanted to study, as well as his own compositions, using screen shots of his DAW

piano roll. This required some unaccustomed effort for both of us. I had not previously used the

piano roll view of a DAW, so Jeff sent me several short audio-examples-with-screen-shots, to

help me learn to connect the piano roll images to the sounds. It also required Jeff to create, by

ear, DAW versions of the parts of the piece that interested him, such as short sections of the

melody or a chord progression or bass line. He struggled with this challenge, sometimes

requiring theory-laden advice from me to make his versions sufficiently similar to the original,

but his typical reaction was enthusiasm and numerous follow-up questions about the theory:

> Thanks a lot for that! It makes a lot of sense to me and is EXTREMELY amazing and
> interesting. This is one of the reasons I want to learn about the magic that is music. I love
> it more than anything else and this explanation just proves how amazing and powerful it
> is. . . . I don't know much about tonality either. If you could maybe explain it in the ways
> best and easiest to understand as well as [answering] my above [specific question about
> the piece]. (Jeff, contact 7)

Jeff was motivated by his desire to understand and imitate a specific aspect of a specific

piece of music, and this challenging activity was helping him connect the relevant theory

concepts to an ear-and-DAW-based understanding of the piece. The result was a clear

demonstration of a change in music-composition ability; Jeff's final inquiry creations were not

mere imitations of the anime-music theme; they were original compositions in which he

consciously used relevant theory concepts to include melodic and harmonic elements that created

a musical mood similar to that of the study piece.

Actions as Paths to the Activity Goal

Bresler (2005) has pointed out that qualitative inquiry shares characteristics with musical improvisation. The improvisatory nature of the inquiries in this study gave the participants a great amount of leeway in choosing preferred paths of actions towards their learning goals, much as a jazz improviser has much leeway in choosing a melodic path through a chord progression.

Many of the participants did not initially express strong preferences between types of actions, such as composition versus analysis; in fact, they appeared to share a common assumption that choosing appropriate types of actions was my role as the teacher. I will discuss my roles in the inquiries in the next chapter. Many participants were also actively interested in a wide variety of musical styles, and several had trouble deciding on a single style and a single piece to take as a starting point. In general, the strongest preferences appeared to involve the tools used in the actions, including notations and communication technologies as well as musical instruments. For example, although Cole and Glen were both highly experienced musicians familiar with common notation and sharing an activity goal of producing finished compositions, Cole and I relied exclusively on common notation to discuss his analyses and creations, while Glen and I relied exclusively on recorded music files.

Requiring Cole, Alex, Laura, or Lee to send recordings might have been as disruptive to their inquiries as asking Glen to notate his compositions, because making a good recording of a piece can also be a time-consuming challenge. Donald, Glen, James, Jeff, Paul, and Sonia provided only recorded versions of some or all of their creations, but even among these participants, struggles to make satisfactory recordings were common. Glen in particular complained about the limitations of his recording equipment, and Paul and James both regularly reported on progress made in mastering aspects of recording:

- It seems so stupid to mess with these amp simulators. But, I don't think it would do much good to record from my amp given the current state of our new place. (Glen, contact 30)
- Still learning how to use Mixcraft. Probably would have made things a lot easier. The solo, after the first two measures, was all one take cause I haven't figured out the cut and splice thing :-) So much still to learn. (Paul, contact 9)
- I'm using a portale recorder and a headphone amp at the moment. I have a proper 50W amp that I could use; it should give a little more space to the sound. Or I could try my acoustic guitar. (James, contact 9)

I suspect that, in general, a preference for this struggle over a struggle to notate the pieces indicated that the participant valued the ability to create good recordings of their music over the ability to create notated versions of it. Recording challenges would then be experienced as leading to additional goal-oriented learning. With self-recording becoming a more accessible activity, notation may now be most useful as a way to formally share a creation with other musicians who wish to perform or study it; none of the participants included such dissemination of their work as a goal.

On the other hand, the lack of a notated version of their preferred study piece was a problem for some participants. Notated music is typically copyrighted, and therefore not available as an open resource, and open notation tools require the user either to "enter" the notes into the program, either by performing them on an instrument connected to the program, or using a computer keyboard. I have already mentioned Donald's and Jeff's difficulties in studying pieces for which we had no notated version. An episode in Lee's inquiry provides another example. At one point, Lee interrupted her main inquiry to ask, "How do I play 'crispy' notes?" (Lee, Contact 48). She reported that she meant "crispy" to describe a specific "dotted rhythm," a reference to common notation. She wanted to include such rhythms in her own written work, but she was unable to write the rhythm, record herself playing it, or find it in her notated hymns, so instead she sent me links to four Youtube recordings of solo piano. She went to a great deal of trouble to list 26 times that the rhythm could be heard:

http://www.youtube.com/watch?v=UMymRn_0As0. . . . see the timing between: 59:12-14; 1:00:51-56; 1:07:05 to 28-32; 1:06:58:1:11:46-50;1:22:46 – 59. . . . (Lee, contact 50)

Despite multiple attempts, I was unable to discern one specific rhythmic element common to the time ranges she listed, so we eventually gave up on answering this question. Even naming the aspect of rhythm and pointing to specific times in the music was not sufficient to create a shared recognition of a specific characteristic or event in a complex musical performance.

Taken together, the inquiries in this study seem to suggest that notation, understood as a formal visual symbol system for pointing to aural events in music, may not be a necessary tool for experienced musicians to learn about music theory and composition. Those who have already developed alternative ways of understanding the music, including instrument-based, ear-based, or theory-based ways, can use those to discuss and learn music concepts. Notation appears to be highly useful, and possibly necessary, for less-experienced music learners, but the usefulness of a notation depends on the specifics of the situation, including characteristics of the learner, the desired knowledge, and the other tools available for the learning activity, such as musical instruments or recording equipment. Common notation may not always be the best notation for discussing theory, and in some music-learning situations, other visual symbol systems, such as a DAW piano roll interface, might be more immediately useful than any formal music notation.

Chapter 7

Interaction with Others

This study was driven by the goal of improving OERs so that they are easier to use independently, when active help in reaching learning goals is not available. In order to attract study participants, however, I offered them my active help. The offer of help gave participants a good reason to make their learning needs known and understood, and I hoped that the resulting insights concerning those needs would suggest ways to change OERs to make active help less necessary. My next step as an action researcher could then be to develop new OERs based on what I have learned in this study.

The process of "translating" active instructional help into useful materials-based help is not straightforward, however. In fact, even if something that I did during an inquiry was helpful to the participant, it does not follow that the same participant, in the same situation, would have benefitted from an OER that "does" the same thing. For example, early in James' inquiry, he mentioned that he had looked through my guitar and music-theory OERs and concluded, "I can see that I'm a little behind the curve on a few subjects" (James, contact 2). When I asked why the materials made him feel "behind," he explained, "What seems intimidating about it is just where to start. It seems so vast" (James, contact 3). However, James had no trouble using those same OERs as sources of information for his inquiry. He did not need me to rephrase the information, as Jeff did. For example, when I replied to a question with a short answer and a suggestion that he read my module on the subject, this was James' response:

> Your harmonic analysis paper is outstanding. I don't know why, but the articles you write are really easy for me to grasp versus the dozens of write-ups I've read online. Again, I think it's the academic approach that wins it for me. . . . I'm still working through the exercises in [the module], but once I complete those, I'll return to [the creative work for the inquiry]. (James, contact 11)

In short, the same person found the same module intimidating in the context of a multitude of

modules, but easy to grasp in the context of a response to a specific question. This means that

evidence about help that participants needed or wanted is relevant to two of my research

questions: It might suggest ways to improve OERs (Research Question 1), but it also might

suggest ways to support learner-motivated inquiry through active instruction (Research Question

2).

The specific assistance that I provided in each inquiry varied greatly, creating the most

complex, varied, and difficult-to-organize set of codes in my analysis. Once I adopted an

activity-theory perspective and viewed my help in terms of actions that made the participants'

desired activities easier, then goal-irrelevant assistance (such as help dealing with the study site)

could be ignored, and I found it easy to organize what remained into five categories:

- additional motivation,
- connections between generalized knowledge and personal experience,
- relevant learning activities,
- focus of attention, and
- feedback.

As will become clear in the following discussion, these categories represent five aspects

of my activity within each inquiry, rather than separate actions. For example, the point of many

of the learning activities was to create connections; and I tried to make my feedback

motivational. The aspects themselves are separable, however; relevant learning activities can

have goals other than making connections, and feedback can be demotivating.

For each of these five aspects of help, I will discuss the evidence of the positive and

negative effects of that aspect on various participants' inquiries, as well as evidence that not

every aspect was needed by every participant. I also discuss evidence related to the feasibility of

offering each aspect by means of OERs as stand-alone help. I did not have time to publish new

OERs during the study, but I am experienced at creating OERs that self-directed learners find useful. I therefore include my own OER-creation plans that have grown out of this study, as evidence that the study suggested to me, as an experienced OER creator, that these may be practical ways to improve OERs.

There was also evidence that a relevant community of practice (CoP) can provide these aspects of active help. In the following section, I will discuss how the CoP issue emerged from the study data. The rest of the chapter consists of five sections, each devoted to one aspect of my active help that appeared to benefit the long-term inquiries.

Communities of Practice

As described in the methodology, I compared study dropouts as a group to long-term participants as a group. I was particularly interested in what motivated participants to stay active in the study. Participation required significant effort, and there were no external motivators such as grades, certifications, credits, or even regular reminders. While strong internal motivation may involve a number of factors, almost certainly one of the factors was that other paths to their learning goals, including independent use of OERs, involved an even greater effort than remaining in the study. Characteristics that were much more common among long-term participants might therefore provide clues as to why OERs did not support their independent learning.

As described, I found that the two groups were quite similar in demographics and in most of the characteristics identified from the introductory questionnaire. I compared the two groups in every way that I could think of, given the questionnaire information, including many that proved uninteresting and are not reported here. In a quantitative study, "fishing" for significant differences invalidates the study, but in a qualitative study, large differences between two groups

that seem otherwise similar is an indication that something interesting may be going on. As discussed above, harmony-playing instruments were more common among the long-term participants than among the dropouts. For that issue, internal motivation would appear to be strengthened by an advantage; those with harmony-playing instruments had more versatile tools available for learning about Western music.

An even larger difference between the two groups, however, appears to indicate motivation caused by a disadvantage. The introductory questionnaire asked about current activity in musical groups. While some also included information about past groups or hopes for future participation, all participants in both groups either described their current participation in a music CoP or stated that they were not currently in such a group. Of the 33 participants who dropped out, 22 reported current activity in music-making CoPs. The reported activities appeared to be well aligned with the reported learning goals, and none of the 22 mentioned difficulties with the CoP.

This contrasted sharply with the long-term participants. Only three of the eleven reported concurrently belonging to music CoPs. Two of these mentioned serious mismatches between their goals and the practices or support available within their CoP. Lee described her CoP situation as providing demands that she could not meet, rather than providing helpful learning experiences; and Sonia mentioned that the group that she sang in did not perform pieces in jazz style. Michael did not mention a mismatch in his questionnaire; at the time, he was also considering an inquiry that would have related more directly to his fiddle activity in CoPs. However, the inquiry that he decided to pursue was less directly related, and he later mentioned a clear separation between the two activities: "[Software development] is my winter activity, fiddling is my summer activity" (Michael, contact 15). In other words, 0% of long-term

participants reported being in a local music-making CoP that was relevant and helpful to their inquiry goals, as opposed to 67% of the dropouts.

It is reasonable to suspect that the lack of a relevant CoP may have been a major reason why long-term participants were more persistent in seeking active help with their inquiries. A relevant CoP can offer similar types of help, for example through opportunities to ask questions, to observe the activities of others who have similar goals, and to receive feedback about individual learning projects that are related to the CoP's activities. A relevant CoP might provide an easier path towards a goal than the path provided by independent OER-based learning, or it might provide the rich context needed to make connections between general, theoretical information in an OER and specific, practical uses of that information.

Before beginning the study, I assumed that learners receiving direct music instruction would be less motivated to participate, but in fact direct instruction did not appear to have the same effect as CoPs. Of the 33 dropouts, eight reported that they were currently taking music lessons, and one was enrolled in a relevant music course; all of these also reported involvement in CoPs. Of the eleven long-term participants, two were taking private face-to-face lessons and a third was taking an online course. In other words, some of the long-term participants had instructors but no CoP, while none of the dropouts were in an instructor-only situation. Lack of a CoP appeared to be a stronger motivation to remain in the study than lack of direct instruction. Although these findings were not quantitatively significant, they did focus my attention on the following questions as I analyzed the long-term inquiries:

- What barriers to independent learning were the long-term participants facing that might have been mitigated by belonging to a CoP?
- Can OERs do anything to specifically address barriers created by not having a relevant CoP?
- Why did Alex and Laura feel that they needed additional instruction to pursue their own learning goals, in spite of already having face-to-face private instructors; and what are the

implications for OERs and for music instructors?
- Was the peer group in Sonia's online course acting as a CoP? If not, why not; and if it was, why was she still motivated to seek additional help?

The answers to these questions appear to revolve around five aspects of the help that I was offering participants, help that might alternatively be available through a CoP. CoP availability can be a serious issue, however, as the study participants demonstrated. Glen reported that he had been in successful bands before, but at the time of the study he could not find compatible musicians to form a group. Lee was playing regularly in a church-music CoP, but since the pianists played in rotation (one at each service) rather than together, she had little opportunity to learn how to be a more capable pianist by observing or working with other pianists. Meanwhile, negative feedback from the CoP may have been interfering with her psychological ability to learn the needed skills.

Inability to meet a CoP's performance standards, combined with intolerance from the group for those who can't "keep up," creates a barrier for many novice musicians, but as Lee's inquiry demonstrates, it can be an issue for musicians at any stage of development. Michael was also an experienced musician who reported CoP-related issues. The groups in which he played fiddle expected members to be able to play a large number of pieces, typically at a very fast pace. Before focusing on his software development project, Michael and I discussed whether an inquiry to gain either better memorization skills or faster notation-reading skills might help him with this performance issue:

> One of [the groups he has played with] had a fairly extensive repertoire of about 200 tunes. With my limited sight reading ability. . . I found that I couldn't keep up to the tempo that they were used to. If I memorized the tunes so that I could play along, I found that my technique went out the door (tension issues, etc). I also joined another group that played at a slower pace, but couldn't find enough time to learn the extensive list of tunes that they were comfortable with. (Michael, introductory questionnaire)

Another common problem is that a CoP, or one's role within it, may not provide

opportunities to learn the desired skill or knowledge. Although Alex, as a novice instrumentalist, did not yet play with any groups, one of his long-term goals was to be capable of playing with his instructor's band. He was already interacting with the group, for example helping them set up equipment at performances, and was no doubt absorbing much through this legitimate peripheral participation. Reading common notation was not a skill that was available in that context, however. Similarly, Sonia was interested in composing church music in a jazz style, but her church-choir CoP did not perform music in that style. Sonia's comments suggest that the group might have been open to performing an appropriate jazz-style hymn if she created one, but it did not afford her the opportunity to work on the necessary skills.

In Western-music traditions, most music-making CoPs focus on performing well-known compositions, affording few or no opportunities to learn or practice music-creation skills, in spite of the intrinsic interest such skills hold for many musicians. Cole, Donald, Glen, James, Jeff, Paul, and Sonia all pursued inquiries featuring improvisation and composition. The novice composers had no CoP or audience through which to gain experience or feedback, while Glen and Jeff, though they had experience and access to audiences, lacked the thoughtful, knowledgeable feedback that best supports learning, because they were not currently working with other musicians.

When an appropriate CoP is not available, alternative learning paths include active, direct instruction and independent learning. Both are common in music, as evidenced by the popularity of private lessons and of teach-yourself-to-play method books. This study provided evidence about five specific aspects of help that learners may be seeking, particularly when they have no relevant CoP: additional motivation; connections between generalized knowledge and personal experience; relevant learning activities; focus of attention; and feedback.

Additional Motivation

One benefit that CoPs provide for learners is the additional motivation that comes from connecting the learner's goals to the goals and expectations of others. In the study, my active involvement in the participants' inquiries appeared to create this type of motivation in two ways: through positive psychological interaction, and through implied expectations of progress within the time frame of the study.

The only real deadline for participants was the end of the data-gathering phase of the study. The sign-up information made this clear, and I reiterated it when necessary, explaining that until the study "ended," participants could work at whatever pace suited them. There was much evidence, however, that participants brought to the study an internalized idea of how fast they should progress, and that they felt obligated to apologize or explain if they could not meet that pace. Some of the participants made such apologies repeatedly, and all but Laura made at least one such comment:

- It will most likely be Monday or Tuesday before I get back to you. (Alex)
- Apologies for the slow progress. (Cole)
- Sorry about no reply in this period. (Donald)
- No progress yet. Sorry. Work hasn't lightened up yet. (Glen)
- I'm just having way too much fun with this, which can cause me to dwell on certain aspects longer than I perhaps should. (James)
- Been very busy and got a new computer so haven't had time. (Jeff)
- Can I do this later in a couple of days time please? (Lee)
- BTW, will be away for about a week. (Michael)
- You probably won't hear from me for a couple days as this bass line thing is slow going. (Paul)
- I took an extended trip out of town and just got back a few days ago. (Sonia)

Some participants explicitly adopted the study deadline as a personal deadline for finishing a project or creation:

- When is the last day I can post here? (Glen)
- Hopefully I'll have something to show you before the forum is shut down. (Paul)

- Thanks for . . . extending the deadline. I am really thrilled to finish this project. (Sonia)
- Are you closing your class soon? (Lee)

As a general rule, I tried not to offer assistance that was neither requested nor needed. Besides avoiding unnecessary effort, this made it easier to tie a participant's progress to the specific aspects of help that I did offer. However, the pace and deadline implied by the study were present in all of the inquiries from the beginning, making it more difficult, in most cases, to assess whether the participant really "needed" this additional motivation. The other type of assistance that I automatically offered every participant was psychological support, mostly in the form of honest positive comments about their learning goals, their creations, and their progress with respect to reasonable norms and expectations. To my mind, such support is a fundamental ingredient of good teaching, as well as of healthy CoPs, so withholding it unless "needed" would not be ethical in an action-research setting. So again, it is not possible to say how crucial this type of support was to most of the inquiries, but again, there is evidence that participants valued it. In particular, even when my feedback focused on suggestions for changes or further study, several of the participants expressed their gratitude in terms of its positive psychological effects:

- Feedback on a project like this is incredibly motivating. (Cole)
- You have helped me continue where I had no encouragement. I thank you. (Glen)
- Thanks a lot :) Glad you liked it. (Jeff)
- Thank you for your encouragement. (Lee)
- Thank you for your complimentary remarks. They were very inspirational. :-) (Paul)
- Thanks for your encouragement; it's what keeps me going. (Sonia)

For two inquiries in particular, deadlines and psychological support appear to have been my main contributions, because I did not provide much else. Both Cole and Glen were already experienced independent music learners. Cole was learning to play organ without an instructor, and Glen had already adopted an exploratory approach to composition. They also both already possessed a level of music knowledge similar to my own: Cole had a degree in music history,

and his analyses of sections of Baroque counterpoint demonstrated a solid background in music

theory. Glen's university experiences included several years of music-major courses and the

creation of a harmony-writing computer program. His analyses of his own compositions

demonstrated formal knowledge of relevant acoustics and music-recording terminology, as well

as music theory. The main type of help Glen wanted was feedback about his compositions. He

sometimes solicited and followed advice about how to solve a specific composition problem, but

he often responded to my feedback with arguments defending his original creative choices. Near

the end of the study, I pointed out that he had probably been capable of creating the compositions

without my input and asked whether he thought the study had had an effect on the process. He

responded by discussing the difficulties of staying motivated without a responsive CoP:

> I am much more productive in a collaborative environment. I don't get much of that from
> the guys I'm currently jammin' with. . . . I'm doing all this complaining to help you
> understand that I see your later involvement as somewhat of a catalyst. I think it has been
> significant. (Glen, contact 26)

Cole similarly emphasized psychological benefits when asked for feedback regarding the study.

Early in his inquiry, Cole had critiqued the how-to-write-counterpoint texts he had been using,

ending with the following:

> In short, there are a great deal of gaps, and a great many places for the self learning
> composer to bruise his confidence, and this, to me, seems to be where a teacher, even if
> it's only to provide encouragement or an alternate critical viewpoint, is very valuable.
> (Cole, contact 7)

Later, in a post-inquiry summary, he singled out the implied deadline as a factor that allowed

him to make the psychological leap from destroying every composition in frustration before it

was finished to completing "a short fugal piece each week for the last 6 weeks":

> Having you there as a mentor has given me an implied deadline, and an implied audience
> to write for, so that I was no longer writing in a bubble, and that has proven very effective
> at channeling my energy into actually creating something, rather than giving up halfway
> because what I was writing wasn't perfect. (Cole, post-inquiry summary)

Deadlines can also have negative effects, if they create unreasonable, demotivating expectations. Sonia often reported that she found the pace of the jazz MOOC to be a significant problem. She found it challenging to record even one good improvisation that was appropriate to the assignment before each deadline, which left little time to explore and grasp the concept that was the focus of the assignment. As demonstrated in the previous chapter, she also speculated that the pace of the MOOC may have been a factor contributing to its dropout rate. Interestingly, Sonia reported that, when the course ended, she and many of the other students continued to work together, but at half the pace. The goal became a new improvisation "assignment" every two weeks, rather than every week. This suggests that the MOOC may have been instrumental in the creation of an online CoP, but that some aspects of the course were not ideal for the fledgling CoP.

I tried to set reasonable expectations for each inquiry in this study, based on my prior experience as a music teacher, but Lee and Donald may both have experienced negative psychological effects, as well as less-successful inquiries, due to unreasonable self-expectations. Both wanted to accomplish their goals by way of a path that included a high-level skill: transposing note-for-note on sight in Lee's case, and analyzing and composing music entirely by ear in Donald's. They may not have been persuaded by my assurances that a more-accessible path was commonly followed by other musicians, or they may have felt that following such a path implied that they were not skilled musicians. James' assertion that OERs can be "intimidating" may be relevant. Without signals indicating to what extent the various parts of the vast body of available information "should" be mastered, and how fast one might expect to master them, a music learner might develop unreasonable self-expectations. Social signals that indicate reasonable expectations are an important feature of music-making CoPs, as well as of

direct music instruction.

Lee did appear to appreciate my positive psychological support, and in addition to asking about music, she took advantage of my experience as a church guitarist to ask for additional advice that appeared to have the goal of reducing friction with her guitar-playing CoP leaders. In her summary of the effects of the study on her inquiry goals, Lee specifically mentioned improvements with respect to her CoP, for example, "I have now a better feel of what to expect [from the] song leader cum guitarist with the tips that you have advised" (Lee, post-inquiry contact).

The study did not imply any useful suggestions for how to create positive deadline motivation through "broadcasting" OERs. The usefulness of a particular pace or deadline depended too much on the participant's specific situation. Broadcasting general reassurances, such as Sonia's MOOC instructor's statement that "this will take time," although well-intentioned, may not have the desired positive effect. One possibility that I plan to try in future OERs is to offer a smaller amount of general information in each module, as an implicit indication that the smaller amounts of information are "enough" to absorb in a single effort.

The psychological motivation that most of the long-term participants seemed to gain from the study appeared to be tied to my active involvement with and interest in their goals. Several asked whether they were supplying enough data for my research; the idea that what they were doing was truly important to me, that I was depending on their progress to reach my own goals, appears to have been a motivating factor. Online CoPs may be able to provide these kinds of motivation when a local CoP is not available, but this appears to be one of the most important benefits that active inquiry-based instruction could provide for self-motivated learners.

Connections between Generalized Knowledge and Personal Experience

Another benefit of music-making CoPs (including the small CoP of a teacher and student playing together) involves the creation of connections between the terminology used by the CoP, such as music-theory terminology, and the kinds of experience-based understandings created through the CoP's activities, such as ear-based, instrument-based, and notation-based ways of knowing about music. For example, music novices in a CoP may find themselves playing *scales* or *chords* before they have much chance to wonder what those terms actually mean. Many appear to develop useful context-oriented meanings for the terms without consciously wondering about definitions. Those who do eventually seek a formal definition have rich contextual experiences through which to understand the definition.

One of the most useful aspects of a contextual framework is the way in which it limits the number of reasonable interpretations of a formal definition, greatly limiting the amount of confusion possible. For example, guitarists who first experience common notation within a CoP learn early how to play in more than one key "in first position." From that point, the possibility that key signature might have something to do with position on the instrument simply will not occur to them. Without such experience, however, it was reasonable for Alex to guess, based on guitar transposition methods, that key signature does depend on position, which caused him significant confusion.

As discussed in the previous two chapters, many of the participants' difficulties involved making connections between the generalized information offered in an OER and the personal understandings they had developed through experiences of hearing, playing, reading, or creating music. Before the study began, I expected that participants would be interested because they had trouble finding relevant OERs for themselves. This type of problem did occasionally arise in the course of some inquiries, usually when the participant did not know how to name a concept

using standard terminology. For example, Alex had to ask me to explain stem direction using descriptive language rather than accepted terminology: "One query, why do some notes have an ascending vertical, and others a descending vertical? I don't know the proper name, so please forgive me" (Alex, contact 5). Had Alex known that part of a note is called the "stem," he might have been able to find the answer on the open Internet. It is explained, for example, in my OERs in a section about "the shape of a note." This type of problem was unusual, however, and was not the driving force behind any of the inquiries.

A much more common difficulty was that participants could find relevant information in OERs, but had difficulty connecting it to practical goals. I became aware of these difficulties because much of my own activity within the inquiries involved trying to help participants create those connections. The help that I provided with this goal in mind included suggesting or offering activities that would help the learner form such connections, as well as using the appropriate music theory terms when answering questions and offering feedback. I have discussed the participants' need for these connections in previous chapters and will discuss activities and feedback in later sections in this chapter, so in this section I will only introduce study data relevant to the issue of how OERs or instructors might support learners in making such connections.

I did not expect the study to attract participants who were taking music lessons, because I assumed that students would take theory questions to their instructors, who could provide an explanation relevant to the context of the music lessons. In fact, this is the type of situation that I imagined supporting when I first began to publish OERs. When asked theory-relevant questions by my own students, I like to connect the specific problem to a general concept in music theory, so that they can begin to use the concept on their own. I wanted to be able to point my students to

a short online explanation of the concept, and imagined that many other instructors might make use of such as teaching resources.

So I asked both Alex and Laura why they chose to bring their questions to the study, rather than to their face-to-face teachers. In answer, Alex described his appreciation and respect for his teacher's methods. His reply also implies reasons why his teacher might not emphasize common notation, which is strongly associated with formal music education and its "qualified" teachers:

> He is very laid back and so patient. So I tried a lesson and we just get on. He is a friend now. . . . John can read common notation [but] I have never seen him do so. Nor does he use tabs. He listens, and plays it. Even complicated solos he can transcribe by ear. Fantastic. He is not a qualified teacher but has several students. He teaches in his own way. I have never asked him to teach me to read common notation. John also is completely self-taught. (Alex, contact 19)

Laura framed her answer in terms of the possibility of taking a music theory course, even though my question was framed in terms of asking her face-to-face teacher for "additional help":

> I just don't have the time to take this course at the college level. Also, it didn't occur to me until you asked, I think it would probably be nearly impossible to just sign up for a music theory class without other prerequisite classes. (Laura, contact 15)

Implicit in Alex's answer is trust in his teacher's methods and a desire not to disrupt them; a request to learn common notation would have been a significant disruption. A trust-the-curriculum attitude is sensible when the goals of the student are likely to be well in line with the goals of the curriculum, as here, where the student's goals include being able to play with the instructor's band.

Pursuit of Laura's curiosity would also no doubt have disrupted her piano lessons, since she wanted an overview of music theory that was out of line with her limited experience as a novice instrumentalist. She may also have been satisfied with her piano instruction and unwilling to disrupt it. However, her assumption that comprehension of music theory is not part of piano

lessons, and must be pursued in a different venue that is not easily available to her, is

problematic. It is also not clear whether the lesson curriculum was well in line with Laura's long-

term goals, since she seemed to place a high value on understanding theory and being able to

create her own piano arrangements. It is unfair to assume that Laura's piano curriculum might

leave her unable to use music theory to solve the piano-playing challenges that interested her, but

Lee's difficulties indicate that such a result is possible. Lee reported that she was preparing for

the eighth level of a widely used piano-playing exam, yet she did not have a theory background

that she could use to solve the challenges presented by the CoP that mattered to her.

Together, these cases suggest that, whether music instruction follows a standard or

personalized curriculum, it can fail to provide access to useful tools, such as music theories and

notations, that would support the learner in making continued progress through self-directed

goals and projects. If the goal of instruction is a learner who is capable of continuing to learn

through real-world problems and situations, then activities that demonstrate the use of such tools

as tools for problem solving and learning should be included in the instruction. This is the

Deweyan imperative introduced in Chapter 2, and it would appear that it is often not satisfied

with regard to music theory, even in face-to-face music instruction.

Regarding the question of whether OERs can help with this challenge, my own

immediate plans for following up on this study include creating OERs featuring specific practical

connections to common notation and music theory. I plan to create new OERs that introduce

common notation using guitar tablature as a point of reference (Alex's inquiry), as well as new

OERs that introduce music theory that use a DAW piano roll, instead of common notation, to

illustrate the concepts (Jeff's inquiry). In both cases, I suspect that there may be a large number

of music learners who might find such OERs very useful, and I can create the new OERs with

relatively little effort, by reusing explanations and materials that I have already created for the inquiries and for previously published OERs. A general lesson here for OER creators is that materials created within a particular CoP (such as common-notation-reading musicians) may not be usable by those outside the CoP, even when the outsiders are capable of understanding the concepts and might find them useful in their own practice. In such cases, OERs that reach out to "nearby" CoPs (such as tablature-reading guitarists) might be unusually useful, and it might be relatively easy to create them by altering existing open materials.

Relevant Learning Activities

Another advantage of learning in a music-making CoP is that the CoP's activities provide both an immediate goal for the learning (such as "preparing a good performance") and a set of activities (such as "tuning" and "rehearsing") that is a well-trodden path to achieving that goal. Direct instruction also features activities that are doable by the learner and are meant to illustrate the practical applications of formal knowledge. Some instructional activities can look and feel very much like a real-world-CoP activity (for example, when a student is expected to create a working computer program), but others can seem far removed from real-world activities (for example, when a student is expected to complete a worksheet of addition problems).

I chose music theory as the focus of my first OERs because I felt that music-theory courses tend not to include enough real-world-type activities. By publishing music theory in individual, open online modules, rather than in a formal textbook, I hoped to make it more available to learners who were trying to use the concepts in real-world activities, such as playing an instrument. The activities I actually included in each module, however, were the same types of worksheet-like practice that would be found in a typical theory book. I assumed that learners or their teachers would supply the real-world activities. As described in previous chapters, this

can create a barrier for independent learners, if they do not recognize the connections between the generalized information and their activities. Further, it can even be a problem when the learner's main goal is to understand the generalized concepts. Consider, for example, two participants who came to the study with an explicit "gaining knowledge" goal.

James originally expressed his inquiry goal as "learn harmony, chord progressions, composition" (James, introductory questionnaire). He relied on me to suggest specific activities that would lead to this learning. In fact, my first suggestion, to analyze the harmony and chords of a favorite piece and compose something using what he learned, surprised him. As quoted in Chapter 5, James had expected the more constrained type of assignment typical of music theory courses, but he took up the analysis-and-composition suggestion with enthusiasm.

Paul similarly expressed his inquiry goal in terms of understanding: "Most of all, I want to better understand the nuts and bolts of melody, harmony and rhythm" (Paul, introductory questionnaire). Like James, he relied on me to suggest doable activities that would lead to that understanding. Paul chose from my list of suggestions, and the inquiry evolved from there, similarly leading towards improvisation and composition.

Laura asked for activity suggestions later in her inquiry, after she felt she understood the circle of fifths:

> I would like to continue learning other theory if you think it is appropriate at the stage that I am at. The reality is that I don't know what I don't know, so I cannot tell you what that might be. (Laura, contact 20)

From the possibilities I suggested, Laura chose to create a piano arrangement that she could play of a simple, popular tune, an activity that was perhaps not as individualistic as improvising or composing, but was developing a creative and useful piano skill.

Both James and Paul also solicited additional suggestions for "what to do next" at later

points in their inquiries, and my suggestions at those points grew out of my feedback concerning

their recent inquiry creations. I tried to always frame such suggestions in terms of choices to

explore, and they typically responded to the choices with enthusiasm:

> I'd like to explore all of the topics you mentioned. Could we incorporate all of them? . . .
> My music knowledge has grown in leaps and bounds since I started this course but, best
> of all, it took me in the direction I wanted to go. . . laugh!. . . even when I didn't know
> where that was. (Paul, contact 11)

This form of help, in which the instructor suggests directions for an inquiry, based on knowledge

both about the learner's creations and about the learning potential of possible activities, may be

of particular use to self-directed learners, by making it more likely that their inquiry activities

will create progress toward the desired goal.

Regarding ways that OERs might provide this aspect of support, my own plans following

the study include creating a set of "learning-by-doing" OERs that introduce music theory in even

smaller chunks than my original OERs, with each module introducing a single concept,

describing a wide variety of activities through which one can explore the concept, and

emphasizing the need for such exploration in order to grasp the concept. Considering the high

interest among independent learners in music creation, I also plan to create a set of music-theory-

for-composition modules, introducing the same concepts by means of music-creation activities.

Four new sets of modules may sound too ambitious, but all four involve reusing material that I

have already created, adding only the material needed to link it to the new contexts. This is a

practical way forward, given that one small qualitative study provides little indication of whether

a specific solution will be interesting to many or few online learners. Rather than committing too

early to one option, I can test all four with small numbers of modules and pursue whichever ones

get the most interested response from real-world users.

Focus of Attention

Focus of attention is another benefit provided by music-making CoPs. The learner's attention is drawn to whatever is holding the attention of the more-experienced musicians. The processes involved in shared attention are so natural that they often go unnoticed; Vygotsky (1981) pointed out that they are an important and natural feature of learning starting in infancy. For example, when musicians work purposefully together on tuning or timing, all other aspects of the music (such as tone quality, loudness, articulation, tempo, and instrument technique, to name just a few) automatically recede into an unconscious background.

Shared attention is also a useful feature of direct music instruction. For example, when a student fails to play a high note on a brass instrument, and the teacher responds by talking about breathing, multiple other less-relevant actions and operations (for example, movements of lips and fingers) automatically fade from the student's immediate attention. In contrast, self-directed learners who are struggling to complete an action successfully must make "uneducated" guesses about what might be a useful focus for their attention. The most useful focus, such as paying attention to breathing in order to play high notes, may be so invisible to them that even diligent practice yields frustration rather than improvement. As described in Chapter 5, James reported that he felt overwhelmed early in his inquiry, to the point that he might have "set it aside" had he not had some direction from me. His lack of confidence with three different tools (ear, notation, and theory) left him uncertain where or how to focus his attention in order to make progress.

Mastery of even a single conceptual tool can require significant effort. When she volunteered for this study, Laura had already noticed that the circle of fifths is widely considered to be a useful tool for "seeing the big picture" of the patterns that underlie Western music theory. She could not make headway in understanding the circle of fifths, however, in part because its usefulness lies in the way it reveals the underlying patterns, by streamlining the relevant

information so that it can be presented in one compact diagram. The streamlined presentation allows knowledgeable musicians to use the circle to quickly "look up" a great deal of practical information, such as the order of sharps or flats in key signatures, the key signature of any major or minor key, the dominant and subdominant chords of a key, and the harmonic relationship between any two keys. However, the circle itself does not explicitly mention terms such as *order of sharps* or *dominant chord*; see Figure 7 for a typical representation. Explanations of how to use the circle, including my own OER on the subject, typically use the relevant terms under the assumption that the concepts they represent are already familiar.

My OER includes hyperlinks within the text that can be used to quickly look up the definition of a term; this is one of my favorite affordances of OERs, as opposed to hard-copy texts. Like the circle of fifths itself, hyperlinks streamline the presentation in a way that benefits more-experienced learners. Someone familiar with the concepts can read a concise explanation of the circle of fifths that is not buried in extra definitions and asides. Someone who needs to look up only one definition can follow that one link and easily return to the circle-of-fifths module. Someone who is less familiar with the terminology may find it difficult, even impossible, to choose the most useful term or concept on which to focus immediate attention. I can, and do, offer the module within a start-from-the-beginning music theory course, but many learners will not need the entire course. The "best" choice for an individual learner's focus of attention depends on prior knowledge and current goals, and so cannot be included in the module. The resulting lack of cues concerning where to focus attention is another way in which online information can overwhelm self-directed learners.

In Laura's inquiry, we began with a concept that was already familiar, the pattern underlying major scales. She did not know the connection between that pattern and the pattern

illustrated by the circle of fifths, but I did. Because she was a novice musician with little prior experience, I carefully organized her inquiry so that each activity featured the use of a familiar concept to pay attention to a new concept, which then became the familiar concept for the next activity. By the end of a chain of fifteen activities, she had derived for herself the information contained in the circle of fifths. She reported that she had the "big picture" that she had been seeking, and she was able to discuss the relevant concepts and put them into practice, for example, to help her choose appropriate chords for a simple piano arrangement.

In choosing to give extended attention to the circle of fifths, Laura acquired a powerful tool for making and learning about music. In order to help Lee with transposition, I tried to supply her with a different circle tool (a circle of half steps), which is useful for doing transpositions. In use, this circle of half steps draws attention to what transposition actually "means" in music theory terms, making it another powerful tool for understanding, as well as making, music. However, due to her difficulty in dealing with abstract rules, Lee found it difficult to learn and recall the steps for using this tool to transpose chord names. She asked whether she should instead use one of the "transposition charts" that are openly available on the Internet. Such charts allow the user to look up the answer to a specific transposition problem, such as "the note two and a half steps higher than D sharp." While a careful study of the patterns in the charts does reveal the patterns inherent in transposition, the act of looking up the information in the chart may not draw one's attention to the inherent patterns or meanings. In other words, these transposition charts are similar to the reference-style guitar-chord resources discussed in Chapter 5. They provide quick answers, but don't easily reveal where the answers come from. In contrast, activities such as using scales to derive chords, or finding transposed chord names by counting the half steps between the two keys, reveal not only the immediate

answer, but also the music-theory pattern behind the answer, thus helping the learner internalize music theory, first as a conscious, and eventually as an automatic, conceptual tool.

Feedback

Another feature of music-making CoPs is personalized feedback about a learner's projects and progress, when they are related to the CoP's activities. Given a good match between learner and CoP, the CoP as a group benefits greatly when the learner is motivated to learn to perform, improvise, or compose more competently. This creates motivation for other CoP members to provide honest feedback that includes actionable critique (i.e. criticism that is useful because it includes or implies actions that the recipient can take to fix things) but is framed by reasonable expectations that are part of the CoP's self-sustaining traditions. Unfortunately, other members may also be motivated by less-helpful goals, such as competition for prestigious roles within the CoP, or exclusion of musicians who are perceived as "incapable," so a learning-supportive CoP is not easily available to every learner.

An integral feature of good active music instruction is the provision by the instructor of feedback similar to that of an appropriate CoP, feedback that is honest and actionable, but also reasonable and ultimately encouraging. The implied goal is to help the learner become more "capable" of participation in a music-making CoP. However, it is typically the instructor who chooses the type of CoP (for example symphony orchestra, as opposed to rock band) and the learner's participation goal (for example, reading common notation, as opposed to improvising). This appeared to be an issue for all of the participants in the study. Laura and Alex had learning goals that were not shared by their instructors. Lee's piano instruction had not prepared her for a CoP that expected transposition and improvisation skills. Active instruction in improvisation is sometimes available, but Sonia reported that it was not available where she lived. Instruction in

software creation typically focuses on programming skills, but once Michael decided to create his tuning software, his main requests for feedback involved making judgments about his sound files, not about his programming.

The six participants who were interested in composition or in understanding harmony, besides not having CoPs to work with, similarly had few active-instruction opportunities, in part because Western music education focuses on performing the works of approved composers in approved genres, rather than on creating one's own music or understanding popular genres. When courses in theory and composition are available, they typically focus on skills valued in a formal, Western-music curriculum, such as being able to write Baroque-style counterpoint or classical-era piano music, as opposed to contemporary guitar music or DAW-based anime theme music. "Practice" in such courses, like the practice in the books that Cole complained about, focuses on short exercises that are tightly controlled so that an instructor can quickly assess whether or not the student has properly used a specific concept. Such practice is not necessarily incompatible with inquiry. Some of the participants in this study, for example, sought out this type of simple, right/wrong feedback, with conscious understanding of its relevance to their inquiry goals. In particular, Alex, James, Laura, and Lee all completed numerous exercises in practicing a conceptual skill correctly, and checked with me for simple right/wrong feedback.

Most of the participants also sought feedback on more-creative activities. Providing such feedback requires much more effort from the instructor. A large proportion of my time and effort within the inquiries involved analyzing participants' creative work so that I could provide good feedback. In some instances, I struggled to analyze a piece by ear when the participant provided only a recording of it. (I was not exaggerating when I told Donald that it is possible to be a competent musician without being capable of instantly analyzing complex pieces by ear.) In

some instances, such as feedback on improvisation, or on some popular music styles, I was not at all an expert on the subject. As an instructor dedicated to inquiry, I was comfortable with a "let's learn about this together" approach, but instructor discomfort could be another reason why truly creative assignments are avoided in formal music education. Even the most experienced teachers cannot be experts in all the genres and styles of music that interest their students, and lack of immediately-relevant expertise can make teachers uncomfortable, even when they are explicitly trying to adopt constructivist, open-ended teaching methods (see, for example, Abramo & Austin, 2014).

Another issue in the formal environment is that teachers may feel that their role is to provide assessment and grades, rather than actionable feedback. When the main goal of feedback is an assessment or grade for a required assignment, instructors may be uncertain how to respond to creative works without harming the learners (for example by giving a personally-motivated song a "bad" grade). Within a framework of self-motivated inquiry, however, the participants in this study appeared to value actionable critique of their creative work, as well as positive comments about it. Sometimes this was, as with the exercises, a matter of checking whether or not I thought an aspect of the creation was correct, or sounded good:

- I'm trying to do it by ear, and it's not easy. I would appreciate if you could review it before I start adding sevenths. (James)
- I have made the amendments as you corrected me. Is this correct now please? [regarding a piano part she had written] (Lee)
- Using your headphones, do you hear much of a difference among these four files quality wise? (Michael)

In some instances, the participant had already decided it sounded "wrong" and was soliciting help in locating the problem:

- I can't get the notes to sound right, especially the end. Any suggestions or help? (Jeff)
- Would you please help me and see what's wrong . . . ? (Lee)

In some instances, however, the participant was simply open to suggestions that might help improve either the current creation or subsequent works:

- At this point, I'm not sure what to do with it. The ideas I have experimented with don't really seem to capture my attention. (Glen)
- I have attempted as best I could and have added the percussion just for the fun of it. Please advise me more. (Jeff)
- Any suggestions will, as usual, be graciously received. (Paul)
- I'd appreciate any comments to help me do better next time. (Sonia)

Participants sometimes reported that feedback led to a change or "fix" that pleased them:

- It does sound quite different! I've attached a new score. I've also played it on the guitar, and it sounds quite nice. (James)
- Your first suggestion was very helpful. (Jeff)
- You were right about the bass line helping with the harmony. It seems like it pulled everything together. (Paul)

As mentioned above, feedback also sometimes led to a shift of attention, and even a shift in the focus of the participant's activities:

- I must confess that I hadn't even thought about it in terms of harmony yet. (Cole)
- How do you know it is in aeolian A minor? How do you recognise these kinds of things? (Jeff)
- Thank you for your very insightful comments. Your suggestions are very helpful. . . . I will try your "no wrong note" approach. (Sonia)

Other than offering advice on how to provide positive, actionable critique and self-critique, which I already feature in several OERs published before this study, I can see no way to offer this type of support through broadcast OERs. Like motivation, feedback that is truly useful for self-directed inquiry appears to be something that can only be offered through human interaction, either through a CoP or direct instruction. Knowledge about the specific background, goals, and creations of the learner, and willingness to engage deeply with them, are as necessary, and possibly even more necessary, than general knowledge about the subject of study.

Chapter 8

Conclusions

- I would like to improve my playing by learning to read music. (Alex)
- I do want to learn to use not only more complex harmonies in my compositions but also orchestration. (Donald)
- I want to learn as much as I can about music theory. . . . My lack of theory hinders not only my practice, but my [software] development work too. (Michael)
- Although I am following an adult learner book, and am happy to be able to play a bit, I am looking for a visual overview of chords and want to see the bigger picture (Laura)

This study has shown that musicians value music notations and theory concepts as tools for use in various music-learning, music-making, and other creative activities. At any level from novice to advanced, a musician may want to acquire more of these types of tools, at a level of conscious understanding (as did Alex, for example), of automatic operations (Sonia), or of creative use (Cole). Keast (2009) has called online resources "just-in-time and learner-selectable" scaffolding for learning, in the context of online courses in which a knowledgeable instructor is often but not always or instantly available. Similarly, OERs ideally should function as scaffolding for learning, offering useful support as needed by self-directed learners.

An earlier study (Schmidt-Jones, 2012) suggested that this is a main way that my own music-notation and music-theory OERs are used. This study provided evidence that when learners struggle to use the OERs in this way, one important factor may be that knowledgeable others are not available, even for limited times, to actively support the desired learning. Here is a generalized description of what seems to be happening: A musician independently attempts some action, as part of a music-making or music-learning activity, and fails or is unhappy with the result. The failed action interrupts the desired activity before its goal is reached.

This is analogous to the locked-door-missing-key scenario in Chapter 2. Failure to complete an action as planned may not change the long-term goal, but it does change conscious

actions, which become organized around a new sub-goal of finding a way to successfully

complete the interrupted activity. New conceptual tools, new physical tools, or new operations

might fix the failed or unsatisfactory action; or a new path to the long-term goal that bypasses the

difficult action might be found. Internet-based resources include a plethora of tools that might be

useful for music activities, including generalized conceptual information with examples and

practice exercises, advice and suggestions, recorded and notated music to study, and programs

for creating, notating, manipulating, recording, analyzing, and listening to music. However, there

are a number of issues that can prevent the musician from making use of these resources to fix

the interrupted activity, for example:

- Not knowing which information applies to the problem at hand (for example, Michael)
- Lack of familiarity with the concepts or symbol system used to impart the information (for example, Jeff)
- Prior misconceptions that cause confusion about the concepts or symbols (Alex)
- Attachment to completing the difficult action, when an alternative set of actions might create a more feasible path to the activity goal (Lee, Donald)
- Real-world experience that is too limited to support conceptual understanding (Laura)
- Difficulty planning a series of actions that would lead to the desired knowledge (Donald, James, Laura, Lee, Paul)
- Lack of the automatic operations needed in order to focus attention on the desired skills or knowledge (Sonia, James, Lee)
- Lack of social support and motivation to complete the activity (Cole, Glen)
- Need for knowledgeable feedback regarding the new, unfamiliar actions (most participants)

As James pointed out (quoted in Chapter 5), if the path to achieving the sub-goal is not certain,

or too many barriers are encountered, even a self-motivated musician may be tempted to set the

goal aside. The most powerful lesson learned from the extra effort might be the discouraging

conclusion that some characteristic of the learner keeps the goal out of reach:

- It frustrates me and I am so disappointed with myself. I want to do it straightaway in my brain but I just am not good enough. (Lee, contact 5)
- I keep starting again, because it is something I really want to become good at. For whatever reasons, including perhaps some laziness on my part, none of the approaches

I've tried "stick." I am a bear of very little brain. (Cole, contact 1)

This study provided an opportunity for a few OER users to bring me their interrupted activities, and the goals that inspired them, instead of setting them aside or continuing to struggle on their own. As described in the previous chapters, I plan to use the insights gained to design OERs that might help many musicians deal with some of the problems in the above list. Such changes to the specific practice under study are one of the main goals of an action research project.

The other main goal of an action research project is to report useful insights to the research community, in the form of a richer understanding of the issues that can both inform future research initiatives and also make an ethically defensible case for others to consider changes in practice (Noffke, 1995). In this chapter I will try to make a more general case, based on the findings, for changes to certain standard practices in music education as well as in OER creation. Because this was a participatory action research project, I will continue to quote the participants when relevant, to indicate that their perspectives and experiences were central to these conclusions.

I will use the research questions to frame most of the discussion, taking each question in turn in the following three sections. Continuing with the question format, the final sections of the chapter will be presented as answers to two more questions: Did the unusual methodology create any unexpected benefits or drawbacks, and what were the most interesting issues raised that could not be addressed within the scope of this study?

What are the Interactions between Informal Online Learning Processes and the Learner's Local Practice as a Musician and Music Learner?

I begin with this question because it is the one for which this study found the strongest

commonalities among the cases, with implications for both OER providers and teachers. All eleven long-term participants were active musicians who already possessed useful and relevant musical skills and knowledge, yet they were struggling to do some activity, or to gain some skill or knowledge, that they valued as relevant to their own long-term goals. Unlike many of the study dropouts, none of them had currently-active ties to local, knowledgeable others who were helping them gain the desired skill or knowledge:

- I live in a remote geographical area and have no access to quality education. (Sonia)
- I hate to say it, but these guys have been wearing me out. It is discouraging playing with people that don't really contribute, and have a hard time keeping up. (Glen)

 Some of the long-term participants had no local music CoP or instructor. Michael, Sonia, and Lee were participating in local music-making CoPs, but those CoPs did not provide opportunities to learn the desired skill or knowledge. Alex and Laura were taking private, face-to-face music lessons, but they treated the teacher's knowledge as a resource only for the teacher's curriculum, not for their self-motivated projects.

Implications for OER providers. This suggests that equal access must include access for those who do not have opportunities to learn through participation in local CoPs. Among other disadvantages, such learners may lack implicit knowledges and behaviors that are picked up, often unconsciously, through observation and imitation rather than through verbal instruction (see, for example, Lave & Wenger, 2002). Like Alex, they may develop confusing misconceptions that would make no sense in the context of CoP practices. Like James, they may not have picked up standard practices that organize activities so that learners do not get overwhelmed or discouraged. Like Lee, they may not have been exposed to habits of thought and practice that systematically tie practical skills to the most useful concepts and symbol systems.

Like me, OER creators may reproduce the formal, verbal parts of instruction, without

including information that is vital for making sense of the instruction, because such information is traditionally picked up through observation and imitation. For example, Alex's query about whether a measure represents a fixed period of time would not arise in a CoP. In the context of making music with a music-making CoP, it quickly becomes obvious that tempo is variable and depends on many things, including the preferences and current capabilities of the performers. However, fixed-tempo misconceptions seem to be common among online music learners. Shortly after publishing my original module on tempo, I altered it repeatedly, in response to numerous emailed questions, in order to try to clarify the issue.

It is possible that numerous self-taught guitarists also have misconceptions about key signatures. Alex' misunderstanding was based on a deduction from common methods of transposing guitar music; it was erroneous, but not at all unreasonable. I was unaware of the possibility of this misconception, however, just as I was unaware that self-directing learners might not know what types of guitar-based activities would help them learn more about harmony theory. Because my own practice as a musician and music teacher is so deeply immersed in CoP-based experiences, it is difficult for me even to become consciously aware of knowledge that is "obvious" within the context of those CoPs. Nor is it sufficient to simply be aware of possible problems; developing stand-alone resources that adequately address these types of knowledge is an additional challenge.

It is reasonable to assume that most OER providers similarly speak from expertise developed within a CoP and will similarly find it challenging to offer the extra supports needed by self-directed learners who do not have access to relevant CoPs. Nevertheless, this is the high bar that OER providers should strive to attain if they wish to claim that the goal is promoting equal access to education, as opposed to simply providing free materials for already-advantaged

learners. This study provided evidence that the following may be particularly helpful:

- *Explicitly promote and support study of the materials within CoPs.* This study provided evidence that the lack of a relevant CoP creates extra barriers to OER-based learning. Because CoPs can be composed entirely of peers learning together (see, for example, Green, 2002, p. 16), efforts to address this issue could be organized as OER-based projects, allowing learner needs to take precedence over the needs of institutions and instructors. For some learning goals (such as playing a musical instrument), encouraging local CoPs may make the most sense; for others (such as composing), it may be more helpful to provide online spaces where peers can interact to encourage and help each other.

- *Consider "ignorant" questions as opportunities to adjust or add to OERs.* Questions that clearly come from outside a knowledge-using CoP provide clues about what keeps outsiders from joining the community. Communities that actively seek new members know this and try to support newcomers, for example with online "FAQ" pages (see for example http://freemusicarchive.org/faq). In contrast, academic CoPs sometimes appear to insist that a standard course of instruction is the only entryway to the community. Such narrow gateways can give insiders power and prestige as experts, but they risk harming the community and the knowledge it values. For example, when music theory is presented as if it applies only to classical music, this actually cuts off one pathway that might eventually lead music learners to understand and value classical music, by way of using the theory to pursue their activities in other music styles and genres.

- *Try to address the information that is implicit in the practices of the CoPs that use the knowledge presented in the OER.* It may be useful to consider the details of the heuristic

dynamic in which real-world activity helps make sense of the formal knowledge, while at the same time the knowledge helps make sense of real-world activity, and to try to include supports for those who have not experienced this dynamic. As well as trying to anticipate (or respond to) points of confusion, it may be useful to actually state that the knowledge will not make sense until it is put to use, and to emphasize that concepts and skills are typically absorbed, one at a time, over many sessions of practical use. Practical suggestions for educational activities that look like, or actually are, real-world activities, might provide an extra boost for those who do not have the advantage of prior relevant experience. Learners may be particularly engaged by activities that are perceived as creative and personally expressive (such as composing or improvising their own music); intrinsically interesting (such as studying their favorite music); open-ended and flexible enough to include unusual goals (such as creating software that supports their musical practices); or valued by a favorite CoP (such as being able to transpose the piano part when a choir wants to sing in a different key). Unlike hard-copy texts, OERs could provide these extra supports without inconveniencing more-traditional learners, for example by interlinking generalized, formal information with a wide variety of suggested activities, as well as with audiovisual and interactive experiences that provide opportunities for learning through observation, imitation, and hands-on practice.

Implications for teachers. The local-CoP question also raised an issue relevant to direct instruction. The two participants who concurrently took face-to-face private lessons did not bring their inquiries to their teachers, even though the teachers were probably capable of answering their questions. Those inquiries probably also made Alex and Laura easier to teach in the long run. Laura's belief, that the extra knowledge would make her a better piano student, was well

aligned with the assumptions that underlie most music theory courses, while Alex's ability to decipher common notation should make him a more resourceful guitar student. However, Alex stated that he was reluctant to disrupt his teacher's preferred pedagogy, while Laura assumed that "big-picture" questions about theory could only be addressed in the context of a formal theory course. Her assumption might have been reasonable if she had been learning an instrument that is typically not used to understand music theory, but she was taking piano lessons.

Traditional, teacher-centered pedagogies implicitly (and sometimes explicitly) discourage learners from raising questions that divert attention from the planned curriculum. Given the strong social expectations that this creates when peers may be anxious to master the curriculum, it is unsurprising that students in a classroom acquiesce to the passive role of receiving the approved knowledge. However, the smaller the number of fellow students, and the less restricted the course is by institutional requirements, the more reasonable it is for learners to expect some flexibility to respond to their individual needs and goals.

A reticence to disrupt the teacher's preferred curriculum with relevant inquiries, even in private music lessons, would seem to indicate that the learner has internalized the role of passive student to the point that there is no expectation that formal education activities will directly connect to real-world experiences and curiosities. Many educators have pointed out that such learned passivity is an unsurprising result of teacher-centric pedagogies and is deeply problematic, whether one takes Dewey's pragmatic stance on the value of inquiry, Freire's critical stance, or a Vygotskian view of the relationship between education and development.

Meanwhile, self-directed learners such as the composers in this study may believe that formal education is irrelevant or even inimical to their learning goals. Consider, for example, the effects of Glen's "love-hate relationship" with music theory:

> I dust off the books, or occasionally learn other works when I'm feeling uninspired. Again, (put another way) I want to focus on how I react to musical ideas as the basis for new compositions. (Glen, contact 19)

Glen often used theory concepts to discuss his composition process; the problem appeared to be not theory so much as an "educational" approach. Jeff's assumption that basic music theory concepts were not relevant to his musical interests, Coles' frustration with how-to-write-counterpoint methods, and Paul's difficulties in translating piano-based explanations to guitar, also suggest learners who have not found that formal music education is very helpful for reaching their goals. Nor are they alone; in my earlier study, 13% of the respondents who described themselves as self-teaching reported that they were not interested in formal music education, with typical reasons citing curriculum inflexibility or personal goals that lay outside of the curriculum (Schmidt-Jones, 2012).

As argued in Chapter 2, inquiry in the arts may be a particularly powerful form of education. Given the current social climate regarding schooling, it may also be more widely acceptable than inquiry in "core" subject areas. In subjects such as reading and math, high-paying jobs may be reserved for those who master traditional tools and skills. Therefore, offering basic knowledge by means of explorations with non-traditional tools, skills and contexts can too easily be framed as a way to perpetuate educational inequalities. In contrast, musicians can make a very good living using tools and skills that are not valued in traditional music education. It should be easier to persuade communities that teaching basic music knowledge through different musical instruments, skills, and contexts multiplies rather than restricts the opportunities available to learners, enriching society while also responding to learners' personal interests.

That music education appears to be failing some highly motivated music learners in this regard should cause concern, not only on behalf of the learners, but also on behalf of music

education as a social institution. Truly open-ended, flexible-goal inquiry may not only help students become better independent learners; it might also provide intrinsic motivation to enter or remain in formal education, or to engage with the curriculum rather than resisting or rejecting it. Instructors should understand, however, that this motivation appears to arise not so much from the *process* of inquiry as from its clear *connections* to real-world activities that they value. When students in a course share the goal of the instruction and understand how it is connected to the course activities (for example, when students in a band class work towards a good group performance), then the course itself is acting much like a CoP, and individual inquiry may be an unnecessary distraction. However, if it is likely that many students do not share or understand the specific goals of the course (as in the music theory course described in Bresler, 1993), instructors may want to consider adding a personally motivated inquiry component. Certainly individual instruction, such as private music lessons, should take into account the learner's long-term goals. As Alex's and Laura's inquiries demonstrated, this may require actively encouraging reticent students to give voice to personal goals.

When relevant open materials are easily available to students, open-ended inquiry need not displace the teacher's preferred curriculum; it could take up a relatively small proportion of active teaching time. Motivated students could be expected to provide the majority of the effort, at their own pace, with teachers taking on only key roles, such as those discussed in the following section. Sonia's description of the peer CoP that persisted following the MOOC course suggests that some large courses could be organized so that peers take on these active-instruction-roles, allowing the course to explicitly support creative, student-motivated inquiry without making unreasonable demands on the instructor's time. However, the difficulties Sonia reported in following the discussions of her more experienced peers, and the fact that she sought

additional support and feedback from me, suggest that peer groups do not automatically produce sufficiently useful and encouraging feedback.

Given an Abundance of Online Resources and a Self-Motivated Learner, What are the Most Useful Functions of a Teacher/Guide/Facilitator?

There were three active-teaching roles that appeared to be critical to the success of the inquiries. As I will argue below, in an inquiry context, two of them, motivation and feedback, depend deeply on human interaction. They may be filled by appropriate CoPs or peer groups, when these are available, but they cannot be adequately filled by stand-alone technologies such as OERs. This is in contrast to rote motivation and feedback in standardized curricula, which can easily be automated. Thus it is not only reasonable for inquiry facilitators to focus on filling these roles well; it is also rational, given the current trend towards automation, for instructors to adopt open-ended inquiry as a method that is not only better for learners, but that also places a high value on teaching as a professional service.

The third important role was knowledgeable suggestions regarding the path of the inquiry. This role might eventually be played, at least in part, by information technologies, and it is a role that well-educated inquiry learners eventually take on for themselves. However, for the foreseeable future it remains a key role that is too complex for stand-alone technologies to fill well and is crucial for becoming an independent, continuously learning practitioners in a knowledge domain.

Social motivation and knowledgeable feedback on open-ended projects. There were two roles that participants appeared to value that cannot be provided by OERs alone: social motivation to complete self-directed learning projects, and useful feedback on those projects. According to sociocultural frameworks such as activity theory and communities of practice,

interactions with other people provide crucial cues about the purpose and meaning of the

knowledge that a learner is acquiring, as well as motivation to learn it. Unlike tools and

technologies, people can comprehend, relate to, and negotiate the meanings and goals of a

learner's self-motivated activity. They can be pleased if a personal project turns out well,

disappointed if it does not, critical if it is not in line with the goals of the community, or intrigued

if it seems to offer the community something new and interesting. They can also provide

actionable critiques that are meaningful because they reflect the interests and values of the

community, as expressed by members of that community, rather than as codified into

standardized curricula or automated programs.

This last point was particularly important to some of the participants. Glen and Cole, and

to a lesser extent Paul, were already capable of analyzing their own work, for example by

determining whether a composition followed a specified chord progression. However,

correctness is not sufficient to produce a compelling, interesting piece of music:

> In the book "What Makes Music Work", I read a lot about melodic movement, and I tried to incorporate some of that. I find that it sounds like a sterile scale exercise, rather than a melody, and I'm not sure what to change to make it sound less "theoretical." (James, contact 19)

> I think a large part of the change I had lies in that I . . . was taking my time much more, and playing with the material rather than treating it as something academic. While I was diligent before about doing exercises, I had never sought to make music out of them; I was essentially "teaching myself to the test" before. (Cole, post-inquiry summary)

> A week ago I decided to dust off my theory book. I wasn't really getting anything significant out of it. . . just a bunch of uninspiring rules. They were fun the first time around. But, I haven't had much practical application for most of them. The one thing I really took from theory is you can break all the rules if you can resolve your chords. (Glen, contact 18)

What participants appeared to value in my feedback was not formal analysis of their

compositions so much as a culturally-informed human reaction to their creative work. Similarly,

when Michael requested my feedback regarding the sound files he created for his software, he had already used a variety of tools to analyze various aspects of the files, and had also evaluated them "by ear"; what he wanted from me was an independent evaluation of the sounds by another human musician.

Offering flexible curricula. Some participants, such as James, Jeff, and Sonia, did focus on gaining knowledge that would allow them to better analyze their work for themselves, but they were enthusiastic about the opportunity to do so within a flexible, inquiry-style program. Like correct-answer exercises, a predetermined curriculum is based on a community's values, reified to the point of inflexibility. In deciding that a course will take 30 (or 30,000) students from point A to point B, a curriculum assumes not only that all of the students are ready to start at point A, but also that point B is a worthy goal for all of them. As this study demonstrates, both assumptions can be problematic. Many of the participants preferred a point B that involved goals that were not typical of formal music curricula, such as designing music-practice software or understanding harmony concepts as they relate to guitar or to composition in popular genres. These goals involved the participants' legitimate interests in developing their preferred areas of musical expertise. Expertise by definition involves the development of specialized operational skills and conceptual tools, which means that learners may come to a course from somewhere other than point A, not because they are "ahead" or "behind" in some absolute sense, but because their nascent expertise is or is not well aligned with the assumptions of the course.

This study provided several examples. Jeff had enough composition experience to make sense of music theory but did not have the common-notation prerequisite. Alex wanted to learn common notation from a more advanced point than the beginner-guitar methods that were available. Laura wanted a big-picture level of comprehension that is not offered to novice

instrumentalists. James and Paul brought guitars rather than pianos to the study of harmony. All of them provided evidence of successful learning during their inquiries, in the form of more-knowledgeable questions and discussion as well as completed exercises and creations, but their successes relied on a personalized curriculum comprised of activities tailored to their goals and questions.

Providing knowledgeable guidance regarding an inquiry path in which the learner's point A and point B are very different from those in standard courses was a third instruction role that was crucial to the success of the inquiries. Taking their interests seriously did not imply "dumbing down" the curriculum. Some participants explicitly wanted to master concepts that are covered, although probably not mastered by all students, in a standard music-theory courses, for example seventh chords, the circle of fifths, minor-mode scales, and transposition. Others wanted to focus on skills that are often treated as too advanced for most students, for example improvising, comparing tuning systems, or using harmony, counterpoint, or specific stylistic elements in original compositions.

However, taking their personal goals seriously did require treating other widely valued skills and knowledge as attention-stealing distractions rather than as curriculum requirements. Many instructors may not be comfortable with paring down the curriculum, but this study provided several examples of the value of doing so. James' inquiry demonstrated that tasks that rely on learners to use multiple concepts and skills that are not yet automatic operations can lead to attention overload and feelings of frustration. In contrast, tasks that limited the number of new concepts and skills reduced James' frustration and led to well-connected understandings that he could later use on his own, to pick up related skills and concepts as needed:

> I will continue on my own, sporadic as it may be. . . . I may stumble a lot more than if you were guiding me, but that's part of the learning as well. I definitely want to continue

composing, as it's been a completely revelatory experience for me. (James, contact 20)

Sonia mentioned repeatedly that the pace of the jazz MOOC was daunting and overwhelming, always moving on to a new concept before she could reliably use previous ones in actual improvisations. In several instances, she asked for help just to get to the point of beginning to understand the concept before the relevant assignment was due. Although it is true that putting concepts to use in improvisation takes significant practice time, it appeared that the course alone was not providing Sonia with sufficient understanding to be able to do that independently. This may be another case of formal knowledge implicitly relying on knowledge that is usually picked up in a relevant CoP. *How to practice jazz ideas* is knowledge typically absorbed by watching and imitating more-experienced improvisers in practice and rehearsal contexts, an activity that was not available to Sonia.

Lee's frustration with her inquiry was at base caused by the overwhelming number of new concepts and skills needed in order to achieve success in the context of her CoP. In her final assessment of her inquiry, she wrote that the amount of practice and discipline needed to "get it right" was the main barrier to continued improvement. Donald expressed his frustration as disappointment in his ear, a distraction that appeared to cut short his exploration of musical style, although that subject can be explored without the "100% perfect ears" that he wanted.

Rourke & Kanuka (2009) argue that the literature on deep and meaningful learning (i.e., learning that is well-understood and well-connected to experience) suggests that teachers can actively support it in three ways: by reducing content, confronting learner misconceptions, and assessing tasks that actually require deep and meaningful learning. Although the goal of my study was not to investigate their contention, my analysis did raise all three issues as crucial for providing good support for the goal-directed inquiries.

Practical guidance to keep inquiries moving towards the desired goals. OERs do not currently provide these types of support for self-directed inquiry. As already discussed, they cannot provide adequately meaningful assessment of creative learning projects, and they may ignore misconceptions that arise because the learner has insufficient CoP-based experience. As I will discuss below, their open nature also appears to invite learners to take on too much content at once. There is currently research being done on open, distance-learning environments that better support self-directed learning (see, for example, Jézégou, 2012), but the problem is complex enough that generally useful solutions are not imminent.

The role of inquiry guide is therefore a third important active-teaching role that may become even more important as the amount of available materials increases. In this study, the role of guide called for me to integrate my knowledge of the subject area, the tools and materials available, inquiry processes, and the learner's background and goals to offer practical advice regarding the path of the inquiry. Participants sought and expressed appreciation for advice and suggestions regarding the following: feasible short-term goals; specific skills and knowledge required to reach the goal; relevant, doable activities that would help them attain the skills and knowledge; and tools that would be useful in the activities, including the participant's prior knowledge and local resources as well as open online resources.

Laura and Alex, as novice-level learners, also relied on me to suggest a specific order for the activities, so that each one was feasible given their current knowledge. Although they might have learned more if given time to explore, the instructor-organized personal curricula allowed the inquiries to proceed quickly and smoothly, so that their goals could be reached within the time frame of the study.

The more experienced musicians generally seemed to prefer choosing activities from a

list of suggestions and ordering the activities themselves. For example, once we had agreed to use a variety of activities to study seventh chords, James took the lead in deciding when and how to do each of the activities. In contrast, Paul responded to one list of suggestions by asking whether we could incorporate all of them into a single creation. Cole, Glen, and Michael each worked very independently once an activity goal was established, simply including a "what I did" report whenever they submitted a creation or partial creation. Lee and Donald may have been less satisfied than other long-term participants because they were unwilling to commit to the more-doable activities that might have permitted them to reach their desired goals within the time frame of the study.

Offering flexibility regarding learning tools and activities. Many learning activities feature actions that are undertaken in order to learn how to do such actions; practicing piano is a good example. In the context of goal-oriented inquiry, however, specific learning activities often feature actions undertaken in order to gain a learning goal that does not intrinsically require that action. For example, the activity *composing music* may feature the action of playing the piano, but the *composing music* goal can also be reached without playing the piano at all.

The results of this study suggest that goal-oriented inquiry may be most satisfying when it includes an attitude of flexibility regarding the actions taken and the tools used. Inquiry tools and actions can be chosen as most-useful-in-this-situation, unlike the tools and actions used in predetermined curricula, so this may be one of the most important strengths of open-ended inquiry. This study provided several examples. Guitar can be used, instead of piano, to study music theory (James and Paul); chord symbols (Sonia) or DAW screen shots (Jeff) can be used, instead of common notation. Guitar tablature and "mystery tunes" can be used, instead of beginner-guitarist exercises, to learn common notation (Alex). A focused exploration of key

signatures can reveal the meanings in the circle of fifths to a novice pianist (Laura). For these

participants, choosing inquiry tools and actions based on prior knowledge and current goals,

rather than on standard practices, seemed to support fast progress in learning, as well as high

learner satisfaction. In contrast, focusing on a difficult skill that was valuable but not truly

necessary to reach the goal, such as recognizing harmony by ear (Donald) or transposing piano

parts note-for-note (Lee), seems to have contributed to slow progress and learner dissatisfaction.

There were, however, indications that some tools may be better than others for inquiry

based music learning, because (in Deweyan terms) they more easily reveal themselves as tools

for gaining the desired skills or knowledge. For example, piano is widely understood as being

more useful than fiddle for learning about functional harmony, because the design of the piano

keyboard reveals information about harmony in ways that afford purposeful exploration, even for

those who lack skill in playing the instrument.

However, this capacity for revelation depends not only on the tool itself, but also on

specifics of the learner's use of the tool, such as familiarity with the tool, the goal of activities

that employ it, and focus of attention during tool-using actions. For example, Lee had difficulty

using the piano as a tool for understanding, exploring, improvising, or transposing harmony,

because she was not accustomed to using it to "play harmony." She used it to play written notes.

The notes created harmony, of course, but her attention was not focused on that aspect of her

activity. Even when she practiced playing arpeggiated chords, her attention was on finger agility

and piano technique; she was not aware of the arpeggios as examples of named chords that are

useful in functional harmony. In contrast, James and Paul found it easy, already an automatic

operation, to think about what they played on the guitar as progressions of chords. The

instrument was thus revealed to them as a tool for exploring and understanding functional

harmony.

Music notations presented similar issues. Although common notation is the standard tool for music analysis, other notations or symbol systems might offer more accessible tools for some musicians who are interested in, and capable of, understanding music theory. In fact, as demonstrated in the contrast between Lee and Sonia, common notation may sometimes get in the way of developing a practical understanding of functional harmony; chord symbol notation appeared to be a better tool for exploring and learning improvisation. Guitar tablature and DAW piano roll may not reveal themselves as tools for learning about music theory quite as naturally as chord symbols, but these two systems for visualizing music are familiar to so many active, engaged musicians, that it would seem to be worth exploring them as alternative music-education paths.

On this practical level, it is worth noting that self-recording appeared to be a particularly useful tool for self-directed learning about music. It allowed Donald, Jeff, Paul, Sonia, and Glen to use ear and musical judgment as tools in a separate act of self-critical listening, after using other tools to actually make the music, thus greatly reducing the attention-overload that can result from using too many tools at once. The playback function of the music-notation program performed a similar function for James once the program became a familiar tool, and may also have been used by Cole. Recording and notation-playback certainly made it much easier for me to study the work of all of these participants and to provide useful feedback. Teaching musicians how to use technologies that allow them to share or to assess their own work may be a particularly useful goal for music education. This also suggests an additional reason to consider using DAW as a tool for exploring, and therefore truly understanding, music theory. Because DAW, unlike traditional instruments, separates the act of creating sounds from the act of

listening to what one has created, it reduces attention-overload for learners who cannot play

piano at the level of automatic operations.

What Makes an OER More or Less Useful for Self-Directed, Informal Learning,

Particularly for Those with Limited Formal Music Education?

Because I was actively working with the participants, this study provided only indirect

evidence regarding what self-directing learners might find most useful in a stand-alone OER.

Although they came to the study by looking at OERs, Cole, Glen, Michael, Paul, and Sonia made

little use of OERs during the study. Because of their extensive prior knowledge and experience,

they required only small amounts of the types of generic information featured in textbooks and

OERs. Alex, James, and Laura appeared to find some of my OERs helpful, in the context of the

guided inquiry, but needed substantial additional information or materials in order to make sense

of them. Donald made extensive use of OERs and other online open resources, but they did not

appear to help him make progress towards his goal. Jeff and Lee relied heavily on explanations

tailored for them; they appeared to find it difficult to make sense or use of the information in

OERs, even with my support:

- Some of the [basic music theory] articles speak in quite advanced terminology which I am not familiar with :/ (Jeff, contact 16)
- I don't quite understand and it just freezes me up, i.e. I get stressed because I have to learn and remember it. So you can see how frightened I have to learn all these or is it because I am too lazy to learn? (Lee, contact 10)

When my own published materials were not adequate, I could not find other OERs that

were more appropriate to the inquiries; much of my research time was therefore devoted to

creating individualized explanations and exercises for the participants. As discussed above, I

plan to use those materials as the basis for some new OERs. It was not feasible to polish and

publish the new materials within the time frame of the study, however, so there was no chance to

address technology issues that some OER studies have found to be important, such as site design and media capabilities.

The findings of this study are well aligned with some previous OER research, including Ellis, Marcus, and Taylor's (2005) finding that learners' approaches to online materials are crucial and Cameron and Tanti's (2011) assertion that students need scaffolding as they learn the process of designing their own learning. This study also provides support for Lam and Ratto's (2012) focus on exploring the music-learning trajectories of novice learners before trying to build technology-based supports for them.

Connecting generalized knowledge to culturally situated practices. This study also provides an unusual perspective on the issue of OERs and culture. It is a common contention that OERs do not currently support equity in education because they overwhelmingly offer knowledge from within the dominant, Westernized-global culture. This is understood as problematic not only because learners situated outside of that culture struggle to make sense of the materials, but also because it implies that the dominant culture is the main or only source of accepted and valued ways of knowing about a subject.

The findings of this study support these contentions, but offer a note of caution regarding interpreting them too narrowly. All of the long-term participants in this study were part of "first-world" communities that highly value certain aspects of the globally dominant Western culture, including the functional-harmony tradition that dominates Western classical and global popular music, as well as Western music theory. Glen initially expressed interest in learning about Indian music theory, but after making little progress gave up that goal, stating "I want to focus on being creative and generating music" (contact 18). Other than his short foray into Indian music theory, the long-term inquiries were all situated well within the global-Western music tradition, in terms

of both their goals and participants' backgrounds.

In spite of this, several of the inquiries illuminated tensions between dominant and non-dominant ways of knowing about music. These different ways of knowing coexist within the overarching global-Western tradition as it is interpreted by a variety of music-making and music-knowledge CoPs. For example, equal temperament is so dominant that many musicians are unaware that alternatives exist, but Michael's interest in other tuning systems arose because they are valued in folk music traditions of European origin, such as American fiddle. Lee struggled because her piano training within the dominant, common-notation-reading tradition did not prepare her to fit into a CoP that values improvisation and the ability to interpret chord symbols. James and Paul wanted to ignore norms that suggest that piano is the instrument-based way of knowing about music theory, while Jeff wanted to ignore norms that dictate that common notation is the visual-symbolic way of knowing about music theory. Alex was happy to remain situated within the community of guitarists for whom guitar tablature is the main visual-symbolic way of knowing about music, but he still valued access to knowledge (such as a vast repertoire of written music) that is offered by means of common notation.

Each of these instances can be framed as barriers raised because a dominant music-education culture privileges some ways of knowing about music, but the solutions are not as simple as supporting an opposing, non-dominant cultural group. The problem can be better framed as an example of the *funds of knowledge* that students bring to formal education from their culturally-situated personal experiences. Gonzales and Moll (2002, p. 629) point out that funds of knowledge, rather than being characteristic of cultural groups, are specific to learners' individual experiences. The context for their study was individual home-life experiences, but individual music-making experiences are analogous. For example, a folk-music fiddle-player, a

church pianist, and a rock guitarist, even if they are all part of some overarching Western-music "culture" that shares a common music theory, still bring different funds of knowledge to a music theory course, based on their individual experiences as musicians.

Connecting abstract knowledge to experiential understandings. Adding to the complexity of the problem, two guitarists with similar backgrounds may have very different goals. One might be genuinely interested in dominant-culture knowledge such as common notation, while the other is more interested in exploring a non-dominant music tradition. In its current form, the open Internet does not provide sufficient scaffolding for individualized, inquiry-based music learning, in part because the number of reasonable learning paths is too great. OERs that are organized to present the information in a sense-making order typically reproduce standard curricula. Any other path depends on learners judging for themselves the relative usefulness or necessity of all of the offered knowledge, when they often do not have the experience to make such judgments:

- I don't really have any particular questions. I can tell by your response that you understand what I am looking for and pleased that there may be hope to grasp the ideas before spending 10 years playing scales (Laura)
- Should I say for composing I don't really need a 100% perfect ears? And is there any statistic about how long it will take to train ears to be very precise? (Donald)

Like textbooks, OERs tend to provide abstract, generalized information, with few clues that one skill or bit of knowledge is more immediately relevant than another to any specific practical goal. Insufficient discussion about how a concept is related to real-world actions can also leave the learner uninformed as to what types of action help make sense of the knowledge. It may even give the false and discouraging impression that the reader ought to be able to make sense of the concept simply by reading about it, without engaging in any sense-making activity. When OERs do include sufficient examples and activities, these may support one group of

learners, such as those who play piano or read common notation, while excluding other learners, such as those who play guitar and read tablature. Such barriers may be reasonable when caused by a lack of truly-prerequisite knowledge, but ways around the barriers should be offered when they represent "prerequisites" that are not really necessary for understanding the concept.

Connecting to other resources. Other resources that are available on the open Internet exacerbate these problems and illustrate the complexity involved in creating solutions. For example, the inquiries in this study relied heavily on the open Internet for musical examples to study. The wealth of freely available music afforded all the participants the ability to choose specific pieces that deeply interested them. However, some of the music chosen was available in common notation, some in chord symbol notation, and some as recordings, creating various advantages or disadvantages that depended on the learner's background and goals.

In addition, the copyright status of most of these resources was not obvious. Within this study, referring to and analyzing small sections for educational purposes in a private setting was clearly a "fair use" of copyrighted materials, but this approach might be difficult to replicate in a published OER or public course without provoking copyright-based challenges. Because the ability to study music that interested the learners was a crucial aspect of the goal-oriented inquiries, this study provides support for the many calls that have been made to clarify and simplify copyright rules so that they do not create unreasonable barriers to learning and creativity (see, for example, Boyle, 2008; Lessig, 2004).

In the mean time, OERs might help to reveal the learner's own favorite music as a tool for learning, by referring to good examples of basic concepts drawn from a variety of popular genres. Simple references to copyrighted works would require the learner to make the actual connection between concept and example, because visual-symbolic illustrations could not be

used to point to actual instances of the concept in the music. Even if done carefully, with as much support as is reasonable, the learner may refuse to do the work necessary to make the connection. On the positive side, such examples would be an indication that such work is necessary to truly understand the concept; and when learners do successfully make the connections for themselves, an abundance of research on active learning indicates that this is a better exercise than passively listening to the music while studying a provided illustration.

Other freely available tools, such as downloadable music-notation programs and tools on the open Internet that analyze sounds, also played key roles in several of the inquiries, but, like the music examples, they were not published specifically as resources for learning. Experienced, independent learners such as Michael may recognize them as potential tools for learning about music, but less-experienced and less-independent learners may not. On the other hand, reference-list resources, such as the guitar-chord site that James found and the transposition sites that Lee found, may appear to be tools for learning about music, but the approach that they encourage, of looking up rather than deriving answers, does not reveal the power of music theory as a conceptual tool for understanding, exploring, and making music. As James pointed out, it is not possible to memorize all of the information provided. Like multiplication tables in math, the specific information provides the learner with a useful background. However, without an accompanying focus on understanding what the tables mean and how they are derived, reliance on memorizing the specific information may eventually impede the learner's progress.

Summary for OER creators. In summary, this study cannot provide specific suggestions for making OERs more useful for independent learners, because it did not gather the types of data needed to support such suggestions. However, it does provide evidence from learner perspectives that might help guide the design of OERs for educational equity. From the

perspectives of the self-motivated learners in this study, an OER is potentially a tool that will help them take the actions needed to reach their individual goals. However, it is only one possible tool among many, including other OERs, other open offerings such as primary sources (such as notated or recorded music) and reference sites (such as lists of chords), sites and programs that afford self-directed exploration and experimentation (such as sound-manipulation tools and notation programs), locally-available resources (such as teachers, CoPs, and books), and their own prior knowledge and skills. Learners may not know which of the many possible tools and actions are most useful for reaching their goals, nor how to organize them into a practical inquiry. Novice learners are particularly likely to have trouble recognizing and organizing useful tools and actions, but more-experienced learners who have not learned inquiry practices or are not active in a relevant CoP may also struggle with this.

However, self-directed learners also appear to value flexible learning paths that allow them to choose favorite tools, resources, and activities, as well as personally-meaningful goals. Supporting such flexible, learner-centered pathways not only engages learners, it also provides them with valuable practice in making such choices and in making connections between learning and real-world activities and goals. It is also possible that the ability to choose between a wide variety of online and local resources is one of the reasons that students in formal education appear to do better in blended classrooms than in strictly online or strictly face-to-face classrooms (see, for example, Bakia, Shear, Toyama, & Lasseter, 2012).

OERs can take advantage of the strengths of openness by making the most useful connections and choices more visible to learners. Stated using the Deweyan "standard" introduced in Chapter 2, and including the findings discussed in the previous section, the following questions provide a framework for assessing whether an OER represents a strong

attempt to provide equitable support for independent learning:

- How does the OER reveal itself to independent learners as a tool that is useful in combination with the other tools and concepts that are available to them?
- How does the OER reveal the relationship between the knowledge it offers and real-world activities that interest and make sense to independent learners?
- How does the OER reveal the types of relationships (such as CoPs, online learning networks, or instructor-guided inquiry) that might help learners benefit from interactions with others while maintaining the autonomy needed to pursue their own learning goals.

Did the Unusual Methodology Create any Unexpected Benefits or Drawbacks?

Because the methodology was unusual, it is worth asking whether any aspects, or combinations of aspects, of the methodology strengthened or weakened the study in unanticipated ways. The feature of the methodology that most stands out as unusual is the choice to work with the participants and gather all of the data for a participatory action research study entirely online, with neither face-to-face nor video-based communication. Most of the associated benefits and drawbacks could easily be anticipated by anyone accustomed to asynchronous, text-based, online communications, but one important benefit was unanticipated, and in fact only became clear during the post-data-gathering analysis, when I used activity theory to organize and interpret the data.

One of the key issues presented in this dissertation is the issue of learner attention as it related to the various tools, actions, and operations that were, or were not, available to the participants. The fact that this issue came to my attention was an unanticipated benefit that arose because the study relied on asynchronous, text-based interactions. I have done much face-to-face teaching with self-motivated music-learners. In those interactions, my attention, as well as that of the student, switches quickly and unconsciously between numerous tools, operations, and actions. In these face-to-face situations, I am able to quickly and automatically assess the learner's comfort level with a variety of music tools, concepts, and operations, even when I do

not know the learner well.

In the online situation, assessing the participant's knowledge and capabilities was a deliberate process in which I often erred, for example causing James frustration and anxiety by overestimating his ability to put his conceptual knowledge to practical use, or causing Laura confusion by overestimating her piano-playing experience. Because shared attention was mediated by text-based interactions, switching attention between various concepts, tools, operations, and actions happened slowly and purposefully. I believe this allowed me to analyze the source of a participant's difficulties, using activity theory, in ways that I could not have done had we been working face-to-face. Even assessing video of the process probably would not have led to the useful insights, because attention-switching would have been happening faster and more naturally. Leontiev described activity theory analysis as follows:

> Analysis isolates separate (specific) activities in the first place according to the criterion of motives that elicit them. Then actions are isolated – processes that are subordinated to conscious goals, finally, operations that directly depend on the conditions of attaining concrete goals. . . . The special feature of the analysis that serves to isolate them is that it does so not by means of breaking human activity up into elements but by disclosing its characteristic internal relations. These are the relations that conceal transformations that occur as activity develops. (1978, p. 103)

This process of isolating actions was significantly easier because shared attention to the actions switched slowly and somewhat awkwardly, serendipitously introducing the barrier-to-normal-processes that Vygotsky (1978) considered a good method for creating activity-theory insights about learning. In seeking to learn more about music, the participants were seeking the kinds of transformations that occur in music lessons, specifically the internalization or operationalization of music concepts so that they could be used in other music activities such as playing, improvising or composing, but they were encountering obstacles to that transformation. I did not need activity theory to locate the obstacles and help remove them; these were actions

familiar to me as an experienced music teacher. What activity theory allowed me to do was to later specify what had happened in an inquiry, in terms of activities, actions, tools, attention, and goals, in ways that illuminated the themes and issues shared by very dissimilar cases. Thus the combination of action research, online text-based interaction, and activity theory unexpectedly afforded a key insight offered in this dissertation.

What Were the Most Interesting Issues Raised that Could Not be Addressed within the Scope of this Study?

All studies are limited, or bounded, by their situatedness in specific disciplines and epistemologies as well as in time, place, and society. I have already discussed the further research that is suggested by the answers to my research questions; these are the issues that were central to the study. Because this study covered relatively unexplored research territory, it is also worthwhile to mention the issues that were raised at the many boundaries of the study, as being potentially rich areas for exploration.

Gender, age and culture issues. This study raised all three as issues but provided no opportunities to pursue them. The gender gap appeared in between signing up for the study and filling out the introductory questionnaire. This suggests that women were equally interested in getting help with self-determined music-learning goals, but for unknown reasons did not pursue that interest within the study.

The emails from people who volunteered, in spite of knowing they were past the study's upper age limit, are also highly intriguing. People in the highest age brackets may have significant amounts of time to devote to self-determined pursuits. They may even have a need for meaningful pursuits to fill their time, particularly if their mobility has become limited. There appear to be few studies on creativity or learning that include older adults, and studies of

educational technologies tend to frame older adults only in terms of deficiencies in skills and knowledge. In short, older adults are a rapidly growing population that may be significantly underserved in terms of opportunities for meaningful, self-determined learning.

Learners whose prior experience or music-learning goals were outside of the globalized Western tradition might have brought a very different set of needs, perspectives, and insights to the study, but there were few participants in this category, and no long-term ones. One likely reason is that, at multiple levels of language, vocabulary, and assumptions, my OERs and myself (as the only instructor in the study) were not speaking in ways that encouraged the understanding, trust and commitment of those outside my own tradition. It is also relevant to note here that Glen initially expressed an interest in learning to use Indian ragas and rhythms, but found online explications to be difficult to "decode," which probably influenced his decision to drop that line of inquiry. It is also worth noting that Donald, as a resident of Taiwan, was the only long-term participant who expressed concern about his English-language skills: "Is my English writing comprehensible?" (Donald, contact 12). He and Lee, the only other long-term participant who resided in Asia, were also the only long-term participants who appeared to have difficulty making good progress in their inquiries. Differences in local music education traditions, as well as language differences, may have been a factor, but Donald dropped out before we could explore this possibility, and Lee's persistence in framing her difficulties entirely in terms of her own inadequacies made it difficult to gather useful insights about her prior instruction.

Research that discerns culture-based inequities in OERs is typically done in collaboration with researchers and teachers who are deeply familiar with the languages, education traditions, and subject-area practices in the learners' cultural milieu. Given the premise and findings of this

study, I offer cross-cultural collaborations that study the use of OERs for self-directed learning and open-ended inquiry as a possible source of rich results.

Social elements of activity theory. As discussed in Chapter 2, challenging the goals, objects, and beliefs of learners and teachers can be a central aspect of critical inquiry and is also currently a common focus of activity-theory studies. In this study, challenging participant's long-term goals and objects was not appropriate, given the promise to help them reach their own goals. When inquiries implied challenges to prior attitudes, beliefs and short-term goals, they were usually minor and well within the comfort zones of the successful long-term participants. For example, Cole joined the study with a stated goal of overcoming attitudes that were barriers to composition; Jeff expressed intense interest on finding that minor-mode scales were in fact quite useful for his purposes; and Paul repeatedly expressed pleasure with his newly-adopted, applied-understanding approach to studying harmony.

In a few cases, I tried to directly challenge beliefs and short-term goals that appeared to be creating barriers to reaching the stated long-term goals. For example, Lee's low self-esteem, her panic when presented with problem-solving approaches, her passivity in her CoP, and her attachment to common-notation-based solutions, all appeared to be barriers rooted specifically in socio-historical aspects of her situation, including internalized rules about how music is learned and understood and beliefs about the roles of teachers, learners, and CoP members. I tried to challenge unhelpful approaches as much as reasonably possible, not only directly but through scaffolding small successes with other approaches, but there was little evidence of change in her own attitudes or approach to the problems.

It is also possible that my own biases regarding how to teach and learn music caused me to be less effective in some inquiries than I might have been, but those biases were not

significantly challenged by the study. The insights I gathered were about creating OERs that are better aligned with my music-instruction beliefs and goals, rather than about changing those beliefs and goals.

It is possible that the design of the study was not conducive to changes in deeply-rooted attitudes, in either myself or the other participants. In my experience as a music teacher, a certain intensity of involvement, personal trust, and understanding must develop between teacher and learner before either is willing to consider making fundamental changes in beliefs about "how music is learned," and in my judgment the sporadic, asynchronous, online-only interactions did not seem sufficient to create those conditions within the time frame of the study.

Communities of practice. The study data suggested that CoPs may provide crucial support for OER-based music learning. However, there were no opportunities to set up CoPs based in the study, due to the small number of long-term participants and disparities in the timing and goals of their inquiries; and the study design did not include gathering data on other CoPs. Given the level of interest in composition among the participants, and the difficulty novice composers have in finding a relevant, supportive CoP, composition CoPs could be a particularly rich and productive focus for action research in music education.

Subject domains other than music. Finally, although the participants brought a great variety of music inquiries to the study, in a larger sense, this was a case study of one OER provider seeking insights in a single subject domain. As discussed in Chapter 2, self-directed inquiry may be more common in music than in other subjects, but OER accessibility for self-directed learning is an issue that is certainly not limited to the area of music. In fact, there is no reason to believe that music theory is especially prone to the types of problems and issues discussed above. It is more likely that these issues are specific examples of failings that also

occur in other subject domains. Gee (2008) has asserted that texts that do not connect to ordinary understandings are the norm:

> The vast majority of texts in the modern world, though, are not written in the vernacular but in some specialist variety of language. . . . It is obvious that once we talk about learning to read and speak specialist varieties of language, it is hard to separate learning to read and speak this way from learning the sorts of content or information that the specialist language is typically used to convey. (pp 95-96)

In other words, this is a perennial problem, but one for which OERs might be in a position to contribute interesting new solutions, particularly if combined inventively with other open and local resources.

Stake (1995, 2000) advised that providing a sufficiently detailed description of a case can be more valuable than trying to draw generalizations, because the rich description permits readers to make their own useful conclusions regarding ways that the case is similar to other situations. I have tried to provide such a description, with enough detail about the cases, and enough simplification of the musical aspects, that educators, researchers, and OER providers in other subject domains might see possible parallels and pursue the issues raised here. It should be relatively easy to apply to other situations the findings regarding teachers' roles, the importance of CoPs, and the challenges involved in making connections between online presentations of generalized knowledge and the local, individual projects of learners. The discussion of tools for learning may be more difficult to apply to other subjects, due to the technical nature of music notation and theory, so I offer the following as examples of possibly interesting parallels:

- The analysis above suggested that, within a specific category such as musical instrument or notation, some tools may be more immediately useful for reaching learners' goals, or may more easily reveal themselves as useful for self-directed, exploratory learning. In other tool categories, such as science laboratory equipment, computer programs, math

processes, or social-studies concepts, are some of the available tools more likely to be useful to learners, either for reaching their own real-world goals, or for enabling long-term, self-directed, interest-driven learning? Is the curriculum designed to prefer the more useful tools in a category, and does it reveal those tools to the learners as useful for real-world situations or for self-directed exploration?

- Are there tools, technologies or techniques that, like music-recording technologies, break down challenging activities into a *doing* step and an *evaluation* step, allowing learners to practice self-evaluation without overwhelming their attention? Are such technologies made available to learners, and are the self-evaluations revealed as useful for reaching the learners' own goals? In particular, activities that do not automatically create a persistent record, such as reading aloud or doing physical therapy exercises, might be more easily learned with technologies that make self-evaluation easier.

- Are learners required to practice a desired tool or concept using other unfamiliar tools or concepts that are not natural prerequisites, resulting either in attention-overload or significant detours to master otherwise-unnecessary knowledge? For example, are there populations of learners who, like guitar players, tablature-readers, and DAW composers who want to learn music theory, could benefit from a set of concepts, and are capable of mastering them if presented using familiar tools, symbol systems, and contexts? The most obvious parallel is students who might master important concepts in social studies and science if offered some path to understanding other than studying written texts, but there are likely other parallels.

Questions such as these not only suggest further areas for research; they also suggest opportunities for educators and OER providers. Wertsch notes that, because familiar tools are

often put to new uses, "most of the cultural tools we employ were not designed for the purposes to which they are being put. . . . In many cases, we may be trying to speak, think, or otherwise act by employing a cultural tool that, unbeknownst to us, actually *impedes* our performance" (1998, p. 59). There are likely many cases in which the standard teaching tools are not ideal and may even impede student "performance." As high-quality open materials become more available online, it becomes harder for instructors and sites to establish credentials or develop a following by creating yet another version of standard curriculum offerings such as "music theory" or "first-year calculus." If there is good reason to believe that a specific alteration in an OER might remove an impediment to its use by many students, teachers, or self-directed learners, then publishing that variation might lead to significant positive attention for the provider.

Final Words

Intrigued by the possibilities of taking a very unusual direction with my future OERs, I asked Jeff whether he thought there might be many DAW composers who would be interested in taking an approach to theory similar to his inquiry. His reply was characteristically enthusiastic:

> Yes there most definitely is a large music making community that could benefit from a new form of "theory." (Jeff, final contact)

At this point, it is impossible to predict how other OER users might respond to the explanations and approaches that I developed for the study participants, and I expect and hope that many more lessons about "what makes an OER useful" lie in the future of my continuing action research. The long-term inquiries in this study have, however, given me a set of particularly powerful tools to bring to that work: the perspectives of a diverse group of real-world online music learners.

One can never truly view the world from someone else's perspective, but it is possible, and powerful, to learn enough about the aspirations and frustrations of another to be able to step

away from one's own perspective in the direction of the other's perspective. Thanks to the patience and persistence of the study participants and their willingness to ask questions and answer my questions until useful mutual understandings were created, I now have a new set of lenses through which to view music OERs. Would Jeff be able to make sense of an explanation? Would James or Sonia be inspired to try an activity? Would Michael be able to locate the information he needed? Would Alex or Laura be able to connect it to what they have learned in their instrument lessons? Previously hidden from the discourse on open education, the viewpoints of these real-world online music learners suggest that music education in general may be failing to connect to the needs and understandings of some highly motivated learners, and they also suggest some intriguing ways in which music OERs that focus on supporting self-directed inquiry might help close the gaps.
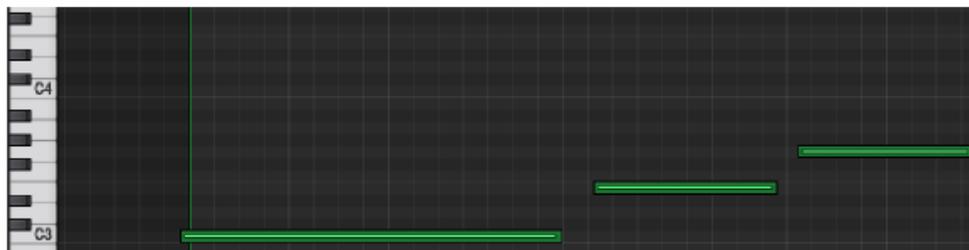
Figures

Figure 1. This screen shot of a piano roll interface shows three notes that appear as horizontal green bars. The pitch of each note is represented by the height of the bar on the screen, so the lowest note on the screen sounds the lowest. The beginning and ending points of a bar represent the beginning and ending points of the note in time as the music is played, with time unfolding from left to right, so the lowest note in the example begins first, ends before the second note begins, and sounds longer than the second note. The piano keyboard outlined at the far left indicates indicates the pitch of all of the notes at that height; for example, the first note is a "third octave" C.

C – F – G7 – C   I – IV – V – I

Figure 2a. Chord progression symbols   *Figure 2b.* Chord progression
indicating note names   symbols indicating chord function

Figure 2. Chord symbols list only the changes in the harmony as the piece progresses. The performer has considerable leeway in deciding how to perform the named chord. Given a short stretch of time marked "C," an instrumentalist might play the notes as indicated in Figure 1, or might, for example, play the notes simultaneously, or more than once, in a different order or different octaves, or using a different rhythm.

Figure 3. This example of guitar tablature indicates the same three notes shown in Figure 1. It instructs the guitarist to play the first note at fret 1 of the second string, the second note at fret 0 of the first string, and the third note at fret 3 of the first string. There are no indications of the pitch names of functions of the notes.
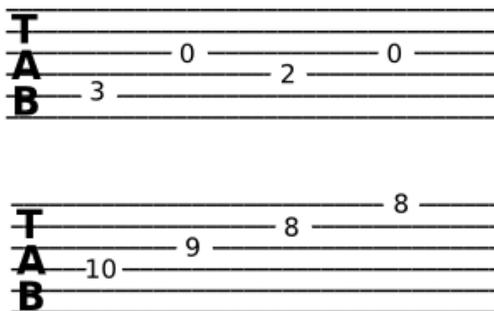
Figure 4. One possible way for a guitarist to play a C chord was illustrated in Figure 3. Here are examples of two other equally good ways. In terms of harmony function, they are "the same" and so are interchangeable. However, they sound noticeably different, and an experienced guitarist will choose one over the other based on considerations such as the style of the music and the notes being played on other instruments.
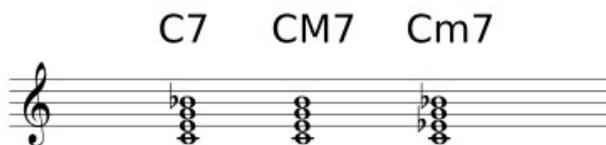

Figure 5. Three seventh chords are written here as stacks of notes in common notation, with the appropriate chord symbol above each one. Music theory connects these two notations, but the connection is not obvious.

Figure 6. Here are the same three notes as in Figures 1 and 3 written in common notation. Inclusion of chord symbols, as in Figure 5, is very common in guitar music. Chord symbols are much less common in piano music, so a pianist may be quite capable of playing the written notes while having no idea of the name or harmonic function of the chords created.
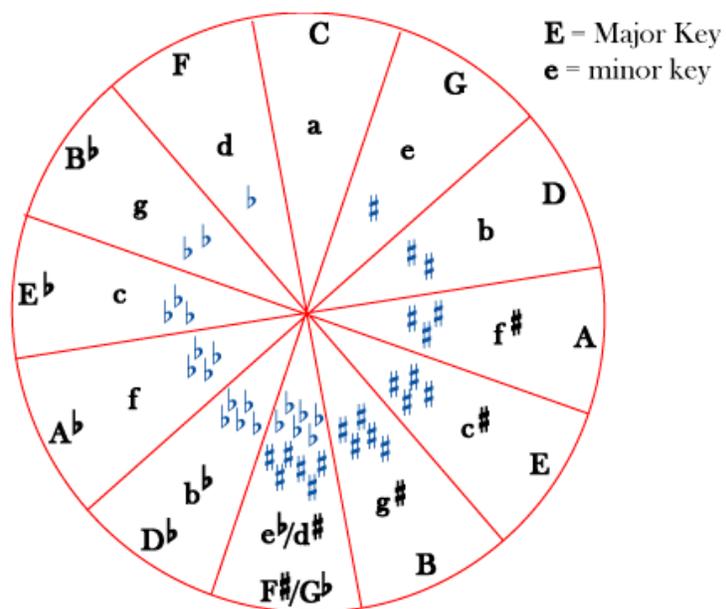
Figure 7. The circle of fifths displays a great deal of information in a compact form. For musicians who understand the information, it is a useful reference guide to keys and key signatures. However, it does not reveal the information to those who do not already understand it.

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