Bande à Part: The Development of a Music Application for L2 French Learners

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ABSTRACT

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The goal of this research was to develop a mobile music application for L2 learners of French. Music is able to offer language learners a wealth of benefits such as repetitive exposure to the L2 in an enjoyable way; yet tools that aid learners with music are sparse (Engh, 2013). This research adopts current SLA theory and principles set forth by Doughty and Long (2003) to guide the development of a tool in the form of a web-based music application, *Bande à Part*. Some of these principles suggest that technology can help learners through textual enhancements (e.g., gender highlighting, subtitles and translations) and grading content for proficiency level. For the evaluation of *Bande à Part*, the study adopted Doughty and Long's (2003) principles for developing L2 learning in a CALL environment as well as Nation's (2007) four strands for designing a balanced language curriculum for L2 education. Lastly, some of the future directions for the application and its limitations are highlighted and discussed.

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Contribution of Authors

As first author of the manuscript, the writing and development of the *Bande à Part* was done by Ross Sundberg. Ross was also the major contributor to the original conception, design and content. Walcir Cardoso had a significant role in guiding, organizing and editing throughout the process. He also provided feedback and helped to re-word passages. His contribution is recognized in the co-authorship of the manuscript.

Table of Contents

List of Figures

List of Tables

Chapter 1

When I started learning Spanish, I had convinced myself I liked *all* Spanish music and that, through it, I was going to learn the language. Maybe, my desire to learn Spanish inspired me to take in everything I could from the music given to me by one of my friends from Ecuador. Maybe, I simply liked music. Or, maybe, there was something about music itself that was helpful to language learning. I have returned to these intuitions in more depth because, almost ten years later, I still remember learning phrases like, "estoy enloqueciéndome" (I'm going crazy) while listening to one of Shakira's songs.

Music has been an important source of input for me. Common French expressions like "y'en a marre" (we're fed up) I learned from Stromae and, soon after, integrated into in my French vocabulary repertoire. However, I am not alone in thinking about music as a tool for learning foreign or second languages (L2). Indeed, music has been used by many language learners (Engh, 2013), and I believe incorporating music into one's learning is an excellent complement to other language learning activities. That is why I set out to research and create a mobile music application to help language students learn French.

I begin with this part of my story and walk through some of my struggles as a learner in order to introduce my presumptions and contextualize my interest and, consequently, the goals of this thesis. Spanish was the first foreign language I set out to learn and, as is the case for many learners, my goal was to become fluent in the language. I also had an idea of what fluency meant, a concrete idea. I am speaking generally of the term *fluency* as it is used outside of the field of second language acquisition (SLA), and not of any operationalized form of the concept. To me, whether a person speaking a second language was fluent could be answered through a "yes" or "no" question and was based on somehow achieving native-like ability. After my

experience with Spanish, my understanding of the concept epistemologically evolved from these inert checkboxes to an adumbrated process, not palpable as a goal. I went from a false idea of L2 learning to being lost. This confusion about the learning process and the meaning of fluency has been previously documented in the SLA literature (Hilton, 2008; Jong & Perfetti, 2011) and it can be characterized by self-imposed questions such as "when am I done learning?", "do I know Spanish or not?" I asked these exact questions myself, revealing the overly teleological perspective I had about the process. Learning a language is a dynamic journey (Green, 2012) which, in hindsight, revealed to me just how ephemeral and uninformed my goals were. What I learned while studying Spanish was that, eventually, learning activities have to be integrated into our lifestyles, since learning is never over. My strategy, now, was to figure out how best to scaffold interesting activities that were already a part of my life. I set out with this new strategy when I began learning French, which in turn led me to this project and my own research agenda.

When I started learning my second L2, French, I no longer wanted to wait until my next class to continue improving. Not only that, but I also asked myself what I would do between the end of one course and the beginning of another, or during the times I was not currently enrolled? So, I started looking for answers. Initially, I was in western Canada in what I would classify as a non-immersive learning environment (i.e., in comparison with living in Montreal). Access to French native speakers was limited. Yet, I wanted to find learning activities that adapted to my lifestyle and that did not require me to block out a chunk of time for learning, such as reading in my L2 instead of my L1, since this was an activity that was already a part of my lifestyle. One of the directions to which I turned was the Internet. Since I already consumed information online using my L1 (e.g., via news, social media, music), I wanted to do the same in French in order to improve my comprehension.

When I moved to French-speaking Montréal in 2011, I continued complementing my learning experience with online content. If, for example, I streamed a video online, I would do so through *VLC Player* so that I could "drag and drop" two sets of subtitles onto the video (the L1 English and L2 French) and compare the languages. I used these types of technologies to scaffold my language learning wherever I could in order to interact in French throughout the day in contexts where normally I would use English. It was an arduous process, however. More and more, I realized information and media were available, but the tools I had adapted were slow and inefficient and they did not always do what I wanted them to do (more detail follows in the next discussions). In addition to these technical and usability difficulties, the L2 learner is also confronted with inappropriate pedagogical materials online, particularly at lower proficiency levels, as the input available is not usually created for L2 learners and, accordingly, not filtered to match learners' proficiency levels. In my own experience, I had progressed through much of the available beginner-level material; however, I was not impressed by some of the available tools that did not allow me to search for activities that were appropriate to my proficiency level and own interests. I still could not understand much of the authentic material I wanted to access. I knew I needed practice using language input that allowed me to extend my linguistic knowledge beyond what I already knew. I believe that my slow progress in French can be partly attributed to these limitations.

As a learner, I was primarily interested in harnessing potential L2 input in order to improve my own oral and written comprehension, particularly online, where there are great opportunities for independent (autodidactic) learning (e.g., wherein input related activities can take place at the convenience of the learner). In this environment, there are also interesting opportunities for the development of other skills such as oral and written production. However,

in an effort to narrow my focus, I limited my attention according to my interests at the time as an intermediate-level L2 learner. This is when my focus on intermediate levels started: a stage in which the learner has already gone beyond the basics of the language and is prepared to embark in learning that is more complex. However, what content is the learner ready to learn and how will learning take place without the scaffolding necessary for L2 acquisition? These are among the questions addressed in the development of *Bande à Part*.

Apart from SLA, I am also passionate about music and technology. As alluded to earlier, one of the ways I would try to improve my comprehension was to listen to French music online while looking up lyrics in French alongside an accompanying English translation. This process helped me understand phrases with which I had struggled. If I missed a phrase in the song, I would clumsily switch between tabs on my browser, try to find the section of the song I wanted to repeat, and then hit play—an arduous and tedious process for the average L2 learner. In Chapter 2, I will provide a potential solution to circumvent this and other tedious processes that were just described, within the proposed application.

As I explored what SLA research has to say about learning through music and what CALL research says about transferring principles of language learning to computer and mobile environments, I realized there was potential for the integration of three areas: second language acquisition, music and technology. I also investigated whether the "intermediate-level struggle" and "proficiency plateau" I experienced, described earlier, were valid concepts beyond the anecdotal evidence I gathered firsthand.

So what can music offer learners? Probably one of most recognizable qualities of music is how almost everyone can connect to it. It pulls us in on an emotional level. Fortunately, SLA research has shown that affective activities such as listening to music help people retain what

they learn in the long-term (Henshaw, 2012). In addition, affective activities help learners focus on meaning, which, subsequently, lead well into focus-on-form activities (Macalister, 2011; VanPatten, 1993; 2006). Another important feature of music is repetitive exposure to input features (e.g., via refrains, rhymes). Although repeated exposure is necessary in L2 learning (Ellis & Collins, 2009), it does not usually happen in a natural and authentic way in traditional L2 settings (reminiscent of audiolingual drills). Music has the potential to turn repetitive tasks into meaningful and enjoyable activities and, more importantly, it has the ability to trigger repeated exposure (compare with watching a movie or reading a book, for example). Nowadays, music is most commonly listened to via technology, which is convenient for adapting music related learning activities to technological realms.

There are a number of aspects related to language learning that technology is able to contribute. For the implementation of *Bande à Part*, I have used Doughty and Long's (2003) principles to guide its development, the details of which are outlined in chapter two. Within the guidelines provided by Doughty and Long, I have included Nation's (2007) four strands framework for L2 curriculum development in order to evaluate the application (also referred to as *app*) as a pedagogical tool. Other aspects incorporated into the design and use of the app include a frequency analysis of the songs' lyrics and onscreen textual enhancements. Together, these techniques offer ways of personalizing and grading material for learners so that they can learn independently (Nation, 2013; Stockwell, 2010) and, possibly, notice important features present in the input (Yoshii, 2006; e.g., via the highlighting of liaison phenomena and gender marking). This way, "drip-feed" classrooms environments can be extended into other realms of everyday life.

Concerning the delivery of the application, it was important to ensure that *Bande à Part* could be easily accessed via mobile environments such as smartphones, tablets and portable computers. According to https://schools.duolingo.com, more people in the world are now learning a language through the online platform Duolingo than all the students in primary and secondary classrooms in the United States (over a 100 million online learners worldwide; Protalinski, 2015) and an increasingly high portion of these are mobile users. This suggests a growing market for mobile learning tools, which can have a long reach considering its size, cost and availability. This project takes advantages of this scenario to propose a tool that can be used by any intermediate-level French learner, on any (mobile or stationary) device.

Regarding the target population for this application, I decided to focus on intermediate-level L2 learners for two reasons (beyond the personal ones described earlier): (1) when using music to learn, even the simplest songs expose learners to a significant amount of vocabulary, and, more importantly, (2) intermediate learners need interesting material when they plateau in their progress—a period when motivation usually fades (Hoadley-Maidment, 1977). Research on skill acquisition often shows a curve called the "power law" where improvement in a skill rises sharply at the beginning and starts plateauing shortly thereafter (Dekeyser, 2007).

The remainder of this manuscript-based thesis is organized in the following way: in Chapter 2, I provide the rationale for the development of a mobile application that uses music to assist learning in L2 French education. The chapter starts with a discussion of the relevant literature on processing music in relation to SLA research and how it may assist in language learning. I then introduce the CALL literature that explores best practices and frameworks for integrating technology into L2 learning. Next, the details of the development of the application are explained, followed by an evaluation of the app based on SLA and CALL principles

proposed for the development of pedagogical materials. Lastly, I discuss future directions for the development of the tool and related research, and its theoretical and pedagogical implications. In Chapter 3, I summarize important aspects from the manuscript in chapter two and expand on future directions for the application. There is a lot of potential for using a music application to investigate how music may be able to aid learners' L2 development. I will discuss these possibilities in more detail.

Chapter 2

Bande à Part: The Development of a Music Application for L2 French Learners

An important part of developing proficiency in a second language (L2) comes from repetitive, comprehensible input (Ellis & Collins, 2009; Færch & Kasper, 1986; Krashen, 1982). As Yanguas (2012) states, "it is widely agreed that in the process of L2 acquisition the ability to recognize rather than produce comes first and is a prerequisite to successful learning" (p. 523). Unfortunately, the authentic input available to learners is often inaccessible until their proficiency improves to the point where they can access media, literature, music, and the many other forms of potential input in the target language (Crossley, Louwerse, McCarthy & McNamara, 2007). In addition, while progressing from beginner to advanced stages of L2 acquisition, it can be difficult for intermediate-level learners to find enough interesting material in order to remain engaged in the pursuit without losing motivation (Rivers, 1981). Hoadley-Maidment (1977), for example, notes that beginners appear quite motivated when learning a language, but that motivation wanes in the intermediate stage as learners become cognizant of challenges such as their limited conversational ability, vocabulary, and grammar. Therefore, an important step in helping learners improve in a second language is providing them access to authentic material that is interesting *and* targeted to their level of proficiency.

The goal of this study is to outline the development of *Bande à Part*, an interactive, mobile music application that allows users to select music based on their own proficiency levels and interests. The application also enhances certain French language features (e.g., gender, phonological phenomena such as liaison) in order to promote noticing and make the language used in songs more comprehensible.

Established theories related to current understandings of the relationships between music, second language acquisition (SLA) as well as the pedagogical role of technology provide the framework for the development of the application (to which I will occasionally refer as "app"). By synthesizing established knowledge in the literature from these fields, music processing, SLA (including vocabulary, phonology, morphosyntax), psycholinguistics (cognition), and computer-assisted language learning (CALL), I first analysed and selected level-appropriate content for L2 learners. Following the selection, this research was used to guide the implementation and delivery in an interesting and helpful manner (e.g., facilitating navigation and interaction with the application). The final application is targeted to mobile devices and consists of a list of songs in the form of interactive videos that can be streamed.

Studies have shown that much of the material that is initially impenetrable to learners can be rendered useful through textual enhancements and glosses (Yanguas, 2009; Yoshii, 2006; Smith, 1993), concordancing (Varley, 2009), and corpus analysis (Breyer, 2009), among other pedagogical strategies such as controlling vocabulary exposure (Nation, 2013). One example of this last approach is material that includes a high percentage of highly frequent lexical items (Horst, 2014; Nation, 2013; Stæhr, 2008; Zeeland & Schmitt, 2012), as is common with graded readers. Graded readers make the text more understandable by focusing on a smaller number of (unknown but) important words. As this concept has been highlighted in recent scholarship (though not necessarily in regard to a specific language), the collection of French songs used in the proposed music application is predicated on ensuring songs with high percentages of the most frequent word families in French are delivered to learners. In addition to doing a vocabulary analysis, certain phonological, phonetic, and morphosyntactic features are highlighted in the text that is provided onscreen in order to increase awareness of problematic or

unsalient forms (e.g., liaison; Hardinson, 2004). A simple navigation system (forward and backward arrows) are included to allow learners to repeat phrases that they struggle with, and to allow them to move back and forth through the song at a phrasal level. Furthermore, there has been recent demand for the incorporation of student-centred approaches and new technology into curricula that are capable of effectively guiding learners outside of the classroom (Brandl, 2002; Chapelle, 2003). The proposed tool, *Bande à Part*, is intended to complement learning outside of the classroom in a stimulating way and to address the needs of intermediate French learners.

The following literature review explores the topic of music in relation to SLA theory, cognition, earworms as inner speech, and past research on pedagogical applications of using music for language learning (e.g., its effects on the acquisition of grammar, vocabulary, and pronunciation). This is followed by a review of principles for delivering enriched input in a CALL environment, which is adapted to a music-based mobile-assisted language learning (MALL) environment. Next, the development and use of the app will be described, followed by a discussion of some of its features and relations to theories of SLA and CALL, and how it might serve as a launching pad for future research on the use of mobile music apps such as *Bande à Part* in L2 education.

Literature Review

Music and SLA Research

Vocal popular music (music henceforth) has been used in language classrooms across the world and has long been thought of as a medium for learning (Bartle, 1962; Jolly, 1975; Richards, 1969). Despite our intuitive perception of and interest in music, there is relatively little precedent in research on the interaction of music and language learning (Engh, 2013). Through a survey of literature, Engh argues for “a firm empirical, theoretical and pedagogical basis” (p.

114) for using music in language acquisition. He goes on to ask why, despite "theoretical underpinnings," practical resources available that incorporate music into language learning are so scarce? After all, music inherently contains repetitive language and often times increases saliency (Kilgour, Jakobson & Cuddy, 2000), both of which are known to contribute to L2 learning (Chapelle, 2003; King & East, 2011; Trofimovich & Gatbonton, 2006).

Turning first to repetition, one of the ways music can help learners is through "chunk" learning. After all, lyrics often repeat phrases numerous times. Gatbonton and Segolowitz (2005) have discussed how fluency development can be improved in the classroom through increasing the repetition of formulaic sequences. Though their research did not use music, it does emphasize the need to find stimulating ways of incorporating repetition in the classroom. Most speech, in fact, consists of memorized chunks and formulae (Wray & Perkins, 2000), so it is important for learners to have repeated opportunities to hear common sequences.

Using music as a pedagogical tool has many advantages, one of which is the fact that it introduces a wide variety of accents to the learner (e.g., through exposure to different male and female artists, from different regions). This variation in speaker accent is relevant to the development of learners' phonemic and prosodic competence, as it provides learners with the opportunity to adjust to variations in individuals' speech by expanding (morpho-)phonemic boundaries (Bybee & Torres Cacoullos, 2008; Thompson, 2011). An example of this hypothesis can be seen in the production of the suffix –ait in French *imparfait* (e.g., *parlait* 's/he/it spoke'), which is variably produced as [e] or [ɛ] depending on the regional variety spoken/sung: while the *imparfait* suffix –ait is pronounced [ɛ] in Quebec and in some regions in Southern France, the same form surfaces as [e] in other varieties French; Ostiguy and Tousignant, 2008; Chung, 2015).

Music is also affective in nature, provoking emotion and pulling the listener into the content. It is often presented in a narrative format that more closely resembles conversational patterns, and is transmitted against a culturally rich backdrop (Biber, Conrad, Reppen & Helt, 2002; Candlin, 1992). According to VanPatten (1993; 2006), affective input activities have considerable value alongside activities that focus on language form, and, as demonstrated by Henshaw (2012), they are effective in helping students maintain learning gains long-term.

This affective quality naturally improves learners' motivation. Motivation is an important aspect of a learner's progress in a second language (Ellis, 1997; King, 2010). Bernhard (2005) provides a model that illustrates the variables that account for reading comprehension. What is interesting to note (as this model is constructed for reading and cannot apply directly to listening activities) is the degree to which comprehension relies on non-language related variables, what she calls "unexplained variance". In this study, unexplained variance accounted for 50% of one's comprehension and consisted of variables such as interest, domain knowledge, motivation, and comprehension strategies. Nonetheless, these variables are, unarguably, vital to consider in application even if they are irreducible concepts and difficult to operationalize in research. This "unexplained variance", in particular, provides support for a student-centred model in which students are able to select material according to their interest (e.g. their preferred songs, genre, regional variety). In addition to these implicit aspects of music highlighted above (repetition, variation, emotion, and motivation), the most conspicuous reality to music is that it is, essentially, aural.

Self-evident as the importance of aural input may be, it is critical for SLA research to delimit the effects of aural activities. What is particularly interesting to consider, without undervaluing the role of output, is the value of aural input when measured alongside written

input. Jackson and Nice (1989) compared the production, both oral and written, of students learning French after receiving either aural or written input. Contrary to most research on skill acquisition theory and transfer-appropriate processing, which essentially state that we specifically improve at the tasks we practice (e.g., Anderson, Bothell, Byrne, Douglass, Lebiere, Qin, 2004; Dekeyser, 2007), Jackson and Nice found that students who received only written input performed equally to the students who received only aural input when it came to written production. However, in their oral production, the aural input group outperformed the group who received written input. This suggests that the effects of receiving aural input extend beyond improving aural comprehension to slight gains in oral production. Rather than diminishing the facilitation of writing practice, this study accentuates the proviso that, fundamentally, language is inseparable from its phonic nature. Another study that looked at incidental vocabulary learning (i.e., wherein vocabulary learning is not intentionally a goal of the task) in the context of listening activities was that by Brown, Waring and Donkaewbua (2008), who indicated that there might be ways of improving the benefits of learning through listening. They found a slight advantage to learning vocabulary through reading alongside listening to a text, similar to one of the options provided in *Bande à Part* (however, I discuss potential drawbacks to attending to information presented through multiple modalities in the next section).

In this section, we have shown a few extrinsic qualities of music that are beneficial to L2 learning, that is, its repetitive nature, proclivity towards narration, variation (via accents), affective quality, and aural essence. Next, we will look at a few studies in cognitive science that pertain to language and music processing.

Music and Cognition

As indicated in the previous sections, music has much to offer to L2 learners. But what do we know about the overlap of music and language as they are stored, accessed, and processed in the mind? This is discussed through looking at some studies on aural parsing and lyrical recall within a musical context. After all, correlations have been found between reading and musical discrimination (Douglas & Willatts, 1994), strengthening a hypothesis made by Nicolson (1971) claiming that music may help to develop reading readiness. Since the correlations found by Douglas and Willatts strengthen this hypothesis because of the assumption that musical training aids the development of phonological skills that are essential when learning to parse written texts, then it would be logical to hypothesize that ample exposure to music could also aid one's ability to parse speech, a prerequisite to parsing text.

Schön, Boyer, Moreno, Besson, Peretz and Kolinsky (2008) explored aural parsing through "speech sequences" and "sung sequences" by drawing on previous research demonstrating that word and tone boundaries in both music and speech are learnable in a statistical manner (Saffran, Aslin, & Newport, 1996a, 1996b; Saffran, Johnson, Aslin, & Newport, 1999). They conducted three experiments in which participants had to parse L1 words in a stream of synthesized speech. During the first experiment, the participants heard the stream of syllables by themselves. In the second experiment, the syllables were combined with music and, in the third, they were still combined with music but, in contrast, were structurally misaligned (meaning the tone and word boundaries were offbeat with respect to each other). Understandably, participants performed best during experiment 2, which had music aligned with the speech; yet, interestingly, participants still performed better with misaligned music than with no music whatsoever. Finally, in the same study, Schön and colleagues hypothesized that

utilizing multiple synchronic modalities (musical and linguistic) may aid perception; in other words, music is particularly helpful when learning to separate a stream of language into words. This finding is reminiscent of Nicholson's hypothesis on improving parsing ability through exposure to music.

Fedorenko, Patel, Casasanto, Winawer and Gibson (2009) support further similarities between the structure of language and music. In a study that explored syntactic processing alongside musical processing, evidence was found for the "shared syntactic resource hypothesis," proposed by Patel (2003), which states that while the representation of language (L1) and music patterns may be stored separately, their online processing or activation may overlap. The extent to which this overlap might complement learning remains to be discovered and future research corroborating these findings and investigating their implications should be undertaken, as they would be critical in understanding the benefits from this interaction.

When examining whether music naturally aids the recall of words or text, there is some disparity to be worked out in the evidence collected so far. Of note, though learning the words to a song reinforces language forms, there is no guarantee their connections with meaning are developed or strengthened. They may or may not, and only research that tests for form *and* meaning is able to speak to whether this is the case. Still, it is important to understand memory even in relation to learning language forms so that we can later synthesize our knowledge with other research and draw appropriate conclusions.

Salcedo (2010) tested recall through a cloze test and found that participants who learned an L2 text through song performed significantly better than those who learned through spoken recordings. Although it is important to take note of the modality switch (participants were tested through writing but were learning through aural activities) because this could affect the

performances (Morris, Bransford, & Franks, 1977). Transfer-appropriate processing theory recommends that testing should emulate the learning environment as closely as possible because, otherwise, it cannot account for the skills transferred from the encoded environment to the retrieval environment (Morris et al., 1977). Conversely, Racette and Peretz (2007), who required that participants recall the lyrics (in their L1) to songs in their entirety, found no difference between the participants who learned the lyrics through singing and the ones who learned through speaking. The different outcomes in these two studies might have been methodological. Many questions can be raised at this point, although answers may not be verifiable. For example, in Salcedo's test, did the surrounding text in the cloze test in combination with memory of pitch contours and/or rhythm trigger the observed increase in the participants' ability to recall words? In other words, does having some of the written words present at the time of retrieval offer the participants who listened to songs a disproportionately higher benefit when reconstructing their memories as opposed to participants who listened to spoken recordings? The result of Racette and Peretz's study caused them to suggest that melody and lyrics are learned separately, pointing out that musicians often practice lyrics and melodies separately. However, these results might be because of limited attentional resources (participants attending to lyrics and melodies separately) rather than relating to the storage or access of lexical items and musical forms. This study, though helpful in thinking about the relationship between music and language, does not suggest that music should somehow be separated from the learning of language, a distinction worth noting in order to prevent extrapolating the evidence. Additionally, since both groups were tested on lyrical recall, they were both already memorizing a schema with rhythm and rhyme.

When we look at the overlap of storage, access and processing between language and music, at this point in time, it seems likely that they are both processed similarly (Patel, 2003;

2008), and that music provides a benefit to language processing. However, we are still not certain about how music and language are stored in the brain, as indicated earlier. In addition, it is not clear whether findings in L1 research are relevant to L2 learning contexts.

Unsurprisingly, learning that engages both sides of the brain is generally considered to be ideal (Anton, 1990), a fundamental facet of processing music (Altenmüller, 2001). A multifaceted approach to learning may, however, require more effort to process and store language (e.g., learning language alongside musical patterns, reading and listening simultaneously). Even if research eventually were to recommend against learning through multiple modalities because we are unable to attend to both modes at once, repetition may overcome this sort of limitation through allowing the learner to shift attention back and forth between manners of engagement by having the opportunity to listen as many times as required. Having melody, lyrics, and the ability to rely on help from text when needed, may reinforce the storage in the long-term even if more effortful in the short-term. This leads us to another common phenomenon that results from repetitive listening to music, earworms.

Music and Earworms

A commonly attested occurrence while listening to music is that of having a song stuck in your head, which could have numerous advantages when learning a language. In fact, Murphey (1990) relates the idea of the Din, or "involuntary rehearsal" of language to the oft-experienced earworm phenomenon found in music (usually reported after intensive study). This is sometimes called the "song-stuck-in-my-head" phenomenon (Murphey, 1990, p. 58). To this day, little is known about this phenomenon, though Murphey hypothesized that earworms would have a positive effect on learning L2 suprasegmentals[1], pre-fabricated chunks, and on the brain's process of turning "input into intake". However, this assumption remains largely unresolved.

Returning to the concept of the Din, it is reported to require around a couple of hours of input before this mental rehearsal begins. For example, after being immersed in the L2 during early stages of development, learners often report continuing conversation or repeating syntactic structures in their head for the next couple of hours after being removed from the learning environment. Yet, while listening to songs, sometimes it only takes a few minutes before a song becomes stuck in your head (Murphey, 1990). If a relationship exists between having a song stuck in your head and the Din—as is also described by Barber (1980) and Krashen (1983)—there would be good reason to take advantage of this subconscious behaviour, as in the proposed *Bande à Part*.

So far, we have looked at the nature of music in relation to SLA theory followed by potential musical and linguistic overlaps in relation to human cognition. This theoretical groundwork supports further research on using music to help learners acquire second language. Putting these together, we ask the question: is there pedagogical precedent that can inform the development and delivery of this tool? In the next section, I briefly review some of the pedagogical effects of using music for L2 learning.

Music and the classroom

The pedagogical use of music has been shown to have positive effects on L2 learning in a variety of ways, including pronunciation (Wilcox, 1995), grammar (Oulton, 2010), vocabulary (Li & Brand, 2009; Mori, 2011), oral and reading proficiency (Fisher, 2001), and increasing motivation in the classroom (Kara & Aksel, 2013; Mora, 2000; Rulkholm, 2011). Unfortunately, research in this area remains scarce. Even though this research has found positive results, some of it is less directly applicable (e.g., foci on children) and it does not always report statistically significant findings.

In reviewing the connection between music and SLA theory found in the literature, it is clear that more empirical research on the pedagogical use of music is essential before drawing conclusions. Research findings (and implications) as well as pedagogical applications have been promising. Despite the complexities that exist in understanding the interaction between language and music, the development of practical applications is indeed warranted, and, even more so if they are evaluated and based on empirical research. Furthermore, music is already a part of many peoples' lifestyles making it less of a chore to fit into learners' schedules.

Let us now look at mode of delivery. There is demand for mobile learning applications from researchers, teachers and learners (Stockwell, 2010). Mobile use across the world is soaring, providing for some their *only* access to the Internet. Moreover, in my observations, music is rarely delivered through mobile environments in ways that enhance learning. As research suggests, music inherently exhibits many valuable aspects that are useful to the acquisition of language, and teachers do not always have time in class to provide opportunities for focus on form, repetition, and personalized instruction, pedagogical foci that technology may be able to assist in providing (Liakin, Cardoso & Liakina, 2015). In addition, music is nowadays primarily accessed via different forms of technology (cellphones, computers, etc.) adding to the natural way technology complements music as a mode of delivery. The next section examines research that translates language-learning theory into the technological realm, which provides the theoretical framework for including various features in the *Bande à Part* application.

Technology and CALL/MALL principles

For the reasons stated above, *Bande à Part* was designed primarily for mobile use, since it is important that learners are able to access materials at times suitable to their own needs—one of the opportunities easily afforded by mobile technological developments (Stockwell, 2010).

The commercial success of the iPod and other portable devices attests to this specifically with regard to music because it has changed the access to and distribution of music. Integrating music and mobile technology within the context of SLA theory seems like a natural fit. Although the focus of this project is on the implementation of MALL via *Bande à Part*, it is important to understand that many of the principles used in its development come from an understanding of the CALL literature (e.g., personalized learning, technology as a tool for input enhancement). As such, principles proposed by Doughty and Long (2003) were used in order to guide the development of the *Bande à Part* application as a learning tool. These principles were used for a number of reasons: they are specific to technological environments, they are broad enough to incorporate other pedagogical approaches and theoretical frameworks, and they are flexible (e.g., the sequencing of tasks can be decided on by a teacher or learner; see forthcoming discussions).

Doughty and Long (2003) elaborated 10 methodological principles for implementing technology-enhanced L2 learning and CALL tools, which were also considered in the design of *Bande à Part*. These principles underlie the learning process and, therefore, are crucial to transfer to new situations and environments (i.e., mobile technology). The method of delivery—the technology itself—is not the intrinsically valuable component (Doughty & Long, 2003). This is important to keep in mind in order to avoid viewing technology itself as solving our problems and leaving out what we know about learning processes. The authors provide these principles alongside examples of traditional implementations of the principles and then examples of some possible CALL implementations, which, in this proposal, are adapted to a MALL environment. For instance, under the principle of "provide rich input", they list some traditional methods of implementation and then list corpora and concordancing as examples of ways to accomplish this in a traditional (non-mobile) CALL environment. Under "focus on form", they list "design and

coding features." By "design and coding features", they are referring to the technological facility of providing quick, effective, and personalized enhancements to input that promote noticing. These 10 principles provide a good reference and starting point to the development of the app and, accordingly, they are reviewed in the context of the proposed application. The 10 principles are as follows: (1) use task, not text, as the unit of analysis; (2) promote learning by doing; (3) elaborate input; (4) provide rich input; (5) encourage inductive ("chunk") learning; (6) focus on form; (7) provide negative feedback; (8) respect developmental processes and "learner syllabuses"; (9) promote cooperative/collaborative learning; and (10) individualize instruction. We will now take a closer look at the benefits of "provide rich input," "focus on form," and "respect developmental processes and 'learner syllabuses'" as they contribute substantially to the development and evaluation of the application.

Regarding principle four, "provide rich input," Doughty and Long suggest tagging tasks for complexity and controlling accessibility to tasks in distance learning settings because of the "seemingly infinite" amount of material online. Since *Bande à Part* is a self-contained program, accessibility is controlled automatically (i.e., songs are prepackaged and chosen based on a set of well-defined criteria). The songs in the application are graded (tagged) by vocabulary level in order to allow users to select interesting learner appropriate material without altering the original language or forms. In research that uses corpora, the vocabulary in the learning materials is typically graded by frequency level in the corpus (e.g., the percentage of words that fall into the first 1,000 most frequent words in the language, then 1,000 – 2,000, and so on). These frequencies are derived from other large, previously collected corpora that serve as a baseline for the language as a whole. While vocabulary recognition is not a measure of all-around proficiency, it is the first measure adopted to evaluate the music (more measures are planned in

future versions of *Bande à Part*). There is precedent in graded readers, which use vocabulary levels to correspond to proficiency levels according to frameworks used for language assessment—for example, the Common European Framework of Reference for Languages (CEFR). The discussion section will present a frequency analysis of the collected songs.

Providing a "focus on form" through input enhancement, principle six, is one way of helping learners negotiate meaning because it increases the salience of forms so that input can be processed (Chapelle, 2003; Smith, 1993; Taylor, 2006). Increasing salience is important because the naturally affective nature of music is not conducive to making attention to form essential (VanPatten, 1993). We can take cues from studies that have evaluated using forms of input enhancement. Yanguas (2009), for example, noted that participants recounted noticing words more often when they had glosses than the control group who did not have glosses. In his analysis of vocabulary, Yoshii (2006) was unable to determine whether L1 or L2 glosses were more helpful, but confirmed that "glosses as a whole were useful" (p. 96). Considering recent cross-linguistic research, it seems unlikely that glossing into an L1 inhibits acquisition, and, if anything, aiding acquisition with the use of the L1 may be helpful (Cook, 2003; Horst, White & Bell, 2012).

Including written transcriptions or subtitles alongside audio is another way of enhancing the input, as suggested by Grgurovic and Hegelheimer (2007), who found that students were more apt to use subtitles than transcriptions when given the choice. For these reasons, *Bande à Part* includes L1 (English) subtitles as an optional feature, thus allowing students both the opportunity for mental search and to select their preferred form of delivery. In fact, Talamas, Kroll, and Dufour (1999) have provided evidence that learners begin in a second language by accessing concepts through the L1 form. As illustrated in Figure 1, the L2 form is first associated

with the L1 form and then with a concept. It is only after time and experience that learners begin to "conceptually mediate" through their L2. Students ought to move along this path towards "conceptual mediation" in order to avoid continually relying on L1 forms for reasons of comfort, rather than need.

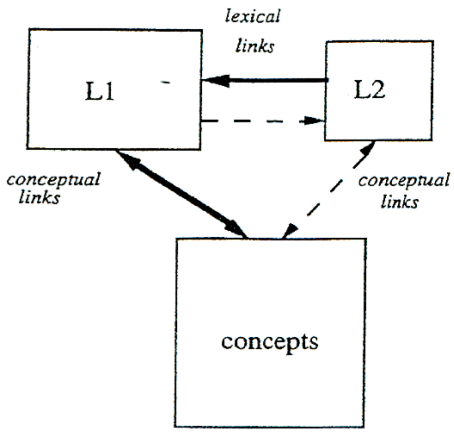


Figure 1. "Revised Hierarchical Model" for L2 Processing (Kroll & Stewart, 1994).

In terms of input enhancement, *Bande à Part* also includes L2 (French) subtitles in order to help learners connect orthographic form to the aural input and, in addition, to increase the saliency of the forms being sung[2]. The various forms of input enhancement are outlined throughout the forthcoming section describing the application.

Lastly, principle eight, "respect developmental processes and 'learner syllabuses'", is important for understanding the strengths of a tool and for aligning materials to existing curricula. Using a framework based on principles of teaching and learning, Nation (2007) proposed four strands so that teachers can design and present a balanced program for their students and thus address individual 'learner syllabuses', as prescribed by Doughty and Long. The four strands emphasize the following components of language learning and teaching: (1) meaning-focused input, (2) meaning-focused output, (3) language focus, and (4) fluency

development. These four aspects will also be used as part of the evaluation of *Bande à Part* (see forthcoming discussion) for its potential as a pedagogical tool.

Research Goal

As indicated earlier, the goal of this study is to develop *Bande à Part*, an interactive, mobile music application that enhances French language features (e.g., via repetition, textual enhancements, aural and visual input) in order to promote noticing and thus make the language used in songs more comprehensible. As such, the development of the app is grounded on current SLA and CALL research, framed within Doughty and Long's (2003) methodological principles for developing L2 tools and materials in a CALL environment, and Nation's (2007) four strands for designing a balanced language curriculum for L2 education.

The next section outlines the creation and use of *Bande à Part* pertaining to the first completed version of the application. As the application exists in its current state, prior issues that existed in previous prototypes have been resolved, such as moving away from developing in FLASH, since iPhones, which are used by a large portion of the population, do not easily play these types of files. The version of *Bande à Part* described below uses JavaScript, instead.

Description of *Bande à Part*

Bande à Part is a web database application currently consisting of 23 songs in French. The songs were gathered along with metadata such as the lyrics, artist, genre, etc. The metadata allow users to filter songs by a variety of parameters including artist, genre of music, the artist's country of origin, gender of singer, and the vocabulary level. When choosing songs, initially, I started with a long list of songs that were familiar to me, recommended by friends, or popular on internet billboard charts in Canada or France. After the songs were analysed on lextutor.com, the songs with more infrequent words were then eliminated. As a cut-off point, only songs with

greater than 85% of their lyrics among the 1000 most frequent words in French were included. This cut-off was chosen based on Nation's (2013) categories and analysis. Below, I first describe vocabulary bands and the structure of the application, followed by a detailed guide to using the app.

Vocabulary bands and application structure

As mentioned above, the songs selected for inclusion in *Bande à Part* can be filtered by vocabulary level. This selection based on vocabulary level (labeled more generally as "Vocabulary Difficulty" on the website so that users can more easily understand) is possible because each song in the corpus of music has been analysed (via lextutor.ca, *French v.5 1-25k corpus*) for the percentage of the 1,000, 2,000 and 3,000 most frequent lemmas contained in the lyrics. Lemmas were used in the analysis rather than word families given the available tools (*Lextutor* calculates French vocabulary levels by lemma rather than word family; e.g., *want*, *wants*, and *wanted* are counted as one lemma). A lemma is the form included in dictionaries when words are catalogued, without its derivations and inflections.

By filtering music according to vocabulary level, the participant is able to listen to music based on the amount of frequent vocabulary present in the song, thus aiding comprehensibility. The vocabulary emphasis encourages repetition because only songs with high percentages of the most frequent words are included in the application, and relieves the pressure of having a large amount of unknown vocabulary to guess at with each subsequent song. Teachers and students can use this feature to optimize the level of the user's target language, thus making the material learner-appropriate.

Research suggests that one must recognize and understand at least 90% of the words in an utterance to comprehend it (although at 90% there is still a high standard deviation, 95% is

more reliable; Zeeland & Schmitt, 2012), less than with reading which is closer to 98% (Nation, 2013). With regards to music, the research has not been carried out yet, but it could be more or less depending on a variety of factors (individual musicality, speed/tempo, rhyme, word repetition, etc.). I would hypothesize that when one can adjust the speed and review translations (among other features), it may even require less known vocabulary to be understandable. Since the app is targeted to intermediate students, only the songs with the highest percentages of frequent vocabulary were kept in the corpus for further development. This way, the application provides a stronger focus on frequent vocabulary in French. Moreover, having fewer vocabulary items to understand lowers the cognitive load required to process meaning and allows the learner freedom to shift attentional resources back and forth between focusing on form and meaning (Ellis, 2006).

The vocabulary is organised and categorized into groups of 1,000 lemmas, called bands. To provide an example of the range and level of vocabulary included in the corpus, consider the song that has the most limited vocabulary—the song "Est-que tu le sais" by Les Chats Sauvages— 97% of the vocabulary falls into the 1,000 most frequent lemma band (e.g., *un, moi, tu, peu* are some examples of the words in this band). In this case, the most frequent lemma band also includes anglicisms because they have been recategorized. This way, anglicisms are not eliminated but included as real and likely comprehensible parts of authentic language use. The percentages were also analysed for the 2,000 and 3,000 lemma bands, and with this particular song, 98% and 99% of the lyrics fall into the 2,000 and 3,000 most frequent lemma bands, respectively. This yields a 1% increase of coverage through knowing the next vocabulary band beyond the first 1,000 and another 1% increase through knowing the 3,000 most frequent

lemmas in French. For the sake of clarity, knowing 1% more of the vocabulary in a passage does not correspond to a 1% increase in comprehension of input, but far more (Nation, 2013).

On the other end of the spectrum, with reference to the song "Si" by ZAZ, 76%, 83%, and 92% of the lyrics fall into the 1,000, 2,000, and 3,000 most frequent lemma categories, respectively. This is the only song that has less than 85% of the words falling into the 2,000 most frequent word band. See Table 1 below for a list of all the songs and the frequency profiles, in percentages (all songs listed are fully functional on the app). When the information in Table 1 was transferred online, the "Vocabulary Bands" column was renamed "Vocabulary Difficulty." Songs with 95% of their lyrics and above among the most frequent 1,000 lemmas were labeled as "easy," 90-94% as "medium," 85-89% as "hard" and under 85% as "advanced." Users will be able to access the material entirely online via a mobile device or computer. The songs are available to play on iOS, Android devices, and any computer browser.

Table 1

Songs and Metadata

Songs	**Artist**	**Vocabulary Bands**		
		1,000	2,000	3,000
Est-que tu le sais?	Les Chats Sauvages	97%	98%	99%
Je Le Savais	Julie Doiron	96%	97%	100%
Si Tu Es Un Homme	Alizee	93%	97%	97%
Tous Les Mêmes	Stromae	93%	95%	96%
Lassie Tomber Les Filles	France Gall	92%	96%	98%
Parlez-moi de lui	Dalida	92%	94%	95%
Je Veux	ZAZ	91%	94%	96%
Adieu	Coeur De Pirate	90%	93%	94%
La Terre Est Ronde	OrelSan	90%	93%	96%
Je Vais Au Cinéma	Arnaud Fleurent-Didier	89%	94%	94%
Tout Le Monde En Meme Temps	Louis-Jean Cormier	89%	92%	93%
Hymne à L'amour	Edith Piaf	88%	91%	93%

Jersey	Granville	88%	95%	99%
Papaoutai	Stromae	88%	93%	94%
J'me Tire	Maitre Gims	87%	90%	93%
Le Slow	Granville	87%	89%	97%
Printemps	Coeur de Pirate	87%	94%	97%
La Lessive	ZAZ	86%	91%	96%
Les Champs-Elysées	Joe Dassin	86%	90%	95%
Elle me dit	Mika	84%	88%	93%
Les Passants	ZAZ	84%	87%	91%
Jeans Troués	Granville	78%	85%	91%
Si	ZAZ	77%	83%	92%

Following the creation of the database and uploading the data related to each of the songs (categorized in terms of genre, origin, etc.), videos were created for each song using the Camtasia® 2 software. This has been chosen in order to take advantage of the speed and subtitle adjustment features and, most importantly, phrase level bookmarking for navigation purposes. All videos were then posted online at pathwaystofluency.com (a website created for this project) under a password-protected page. This way, quantitative data could be gathered via the analytical tools provided by the hosting company (whc.ca) and Google Analytics. Some of the variables the analytical tools could provide in future studies are the most commonly accessed songs, the lengths of study sessions, and the preferred platforms and browsers. This will help me to make sure the application is optimized for the tools used most often and to fine-tune the application.

Use

From the website, users can access a list of songs (see Figures 2 and 3) by first entering a password. This will help future studies gathering information on a user basis because I will be able to review the web statistics and filter out users without a password for the website and better understand the patterns of use. Once the user has chosen a song, they are taken to an interactive

video. The video uses the "Techsmith Smart Player" application if accessed via an iPhone, an application that can be downloaded onto their mobile device; the video is played in the browser on other devices. Screenshots displaying various stages of the process on different systems (mobile and desktop computer) are shown in Figures 2 through 6, as will be described below.

Figure 2 shows the list of songs as viewed on a mobile device. It contains the same content as the table of songs viewed on larger screen (Figure 3), but is turned into a vertical table so that scrolling is unidirectional. The horizontal black cells are the song names. In the grey cells underneath a song name, the rest of the information related to the song follows (artist, origin, gender of singer, genre, and vocabulary difficulty level). The red circle highlights how to save the list of songs to the dashboard on an iPhone.

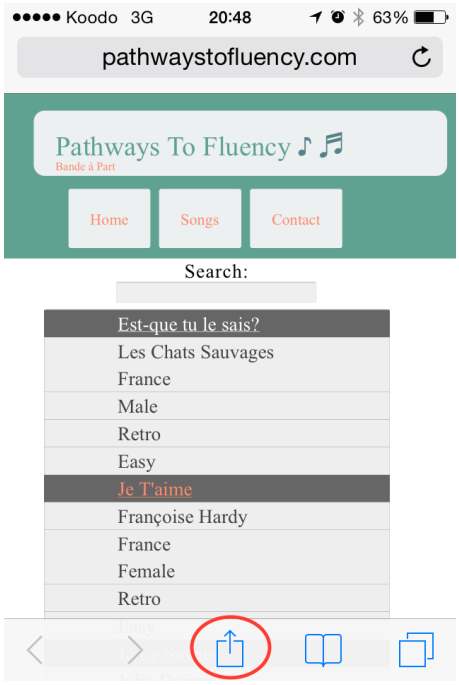
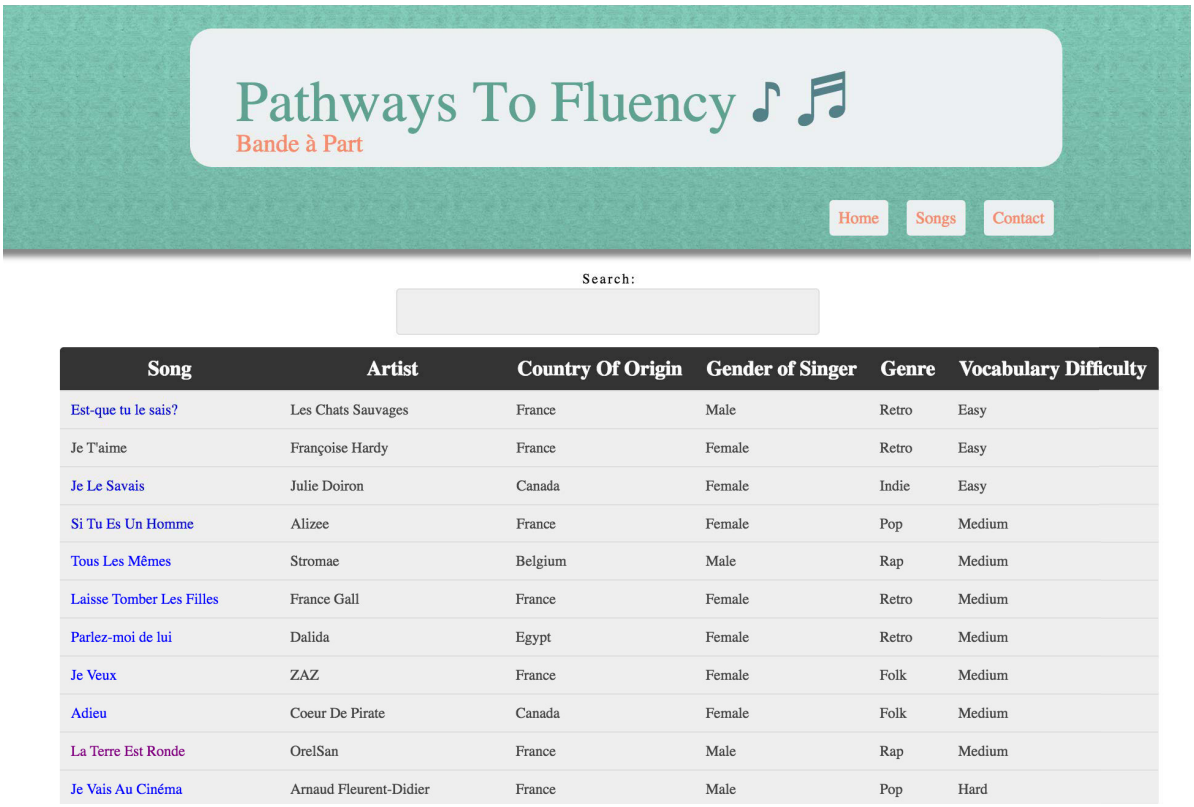


Figure 2. Song list on mobile.

Figure 3 shows the part of the song list as seen on a desktop/laptop computer. The blue song titles are the songs that have not yet played, the purple represents songs that have been previously played, and the black are not yet available (they are still in development).



Song	Artist	Country Of Origin	Gender of Singer	Genre	Vocabulary Difficulty
Est-que tu le sais?	Les Chats Sauvages	France	Male	Retro	Easy
Je T'aime	Françoise Hardy	France	Female	Retro	Easy
Je Le Savais	Julie Doiron	Canada	Female	Indie	Easy
Si Tu Es Un Homme	Alizee	France	Female	Pop	Medium
Tous Les Mêmes	Stromae	Belgium	Male	Rap	Medium
Laisse Tomber Les Filles	France Gall	France	Female	Retro	Medium
Parlez-moi de lui	Dalida	Egypt	Female	Retro	Medium
Je Veux	ZAZ	France	Female	Folk	Medium
Adieu	Coeur De Pirate	Canada	Female	Folk	Medium
La Terre Est Ronde	OrelSan	France	Male	Rap	Medium
Je Vais Au Cinéma	Arnaud Fleurent-Didier	France	Male	Pop	Hard

Figure 3. Song list as accessed via desktop/laptop.

An important point to note is that the music, which is streamed online via the provided Camtasia® widget, requires that listeners have an Internet connection. While this limitation hinders the use of the app (i.e., it cannot be played anywhere without the internet), it certainly limits the spread of copyrighted material and, more importantly, it allows us to record participants' use and access via web analytics.

Once a song has started playing, users have the option of viewing an English translation (Figure 4) or adjusting the speed of the song (Figure 5). While the song is playing, they can

pause, play, navigate backwards or return to the beginning. The navigation is set up at the phrase level so by clicking the back button, the participant would hear the previous phrase once again. Clicking back twice brings users back to the previous phrase, which facilitates navigation at the phrase level in comparison to traditional timeline "scrubbing," which requires one to adjust the song according to minutes and seconds by dragging one's finger along the timeline. The phrase level navigation is set up in order to promote chunk learning of short, contextualized utterances and facilitate repeating problematic phrases in context (i.e., in their own phonological units). If one was to repeat certain difficult phrases enough times, it may even result in an earworm and practice may continue later on in the form of inner speech. As seen in Figure 4, phonological information such as the liaison in French is highlighted. Figure 6 illustrates how gender is coded by colour. As discussed earlier, these two types of textual/input enhancement are likely to promote noticing and consequently intake. The interface is identical on all platforms.

The screenshots below (Figure 4–6) show some of the most common features that can be used while listening to a song. For example, the liaison arrow, lyrics, translation, navigation, highlighted gender, and the process of changing the song speed. The history button in the top left corner takes the user back to the song list (only on the "Smart Player" app on the iPhone). The song displayed in Figure 4 and 5 is "La Lessive" by ZAZ and "La Terre Est Ronde" by Orelsan in Figure 6.

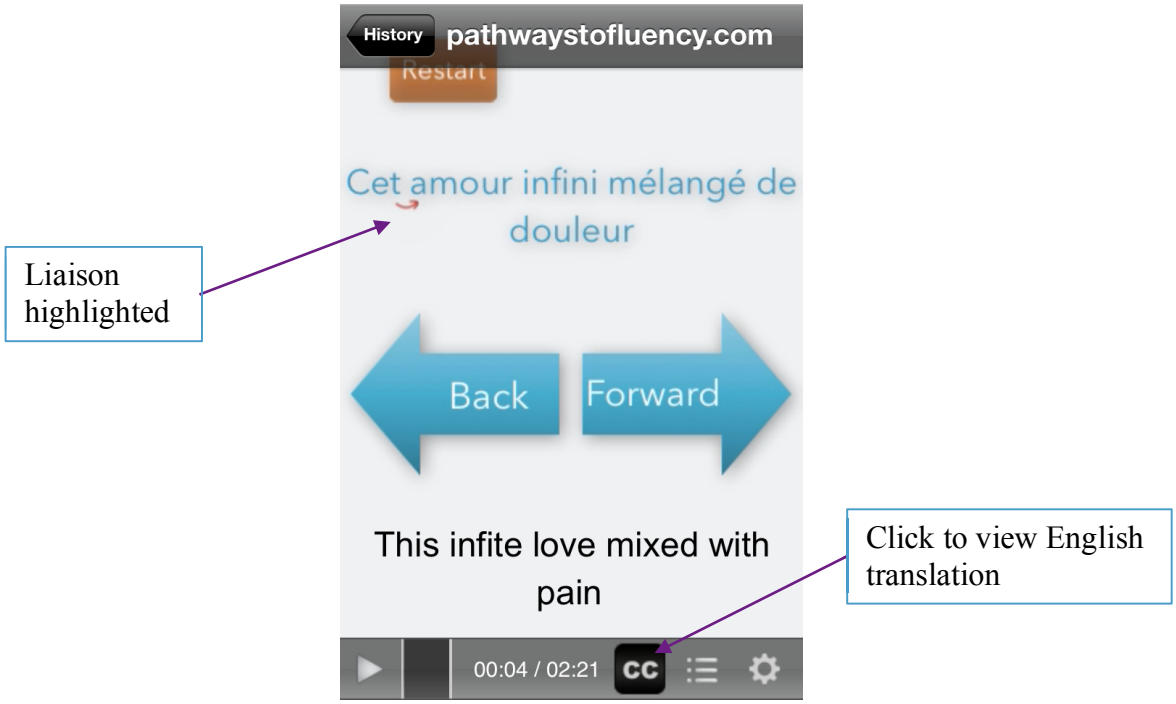


Figure 4. The Bande à Part interface.

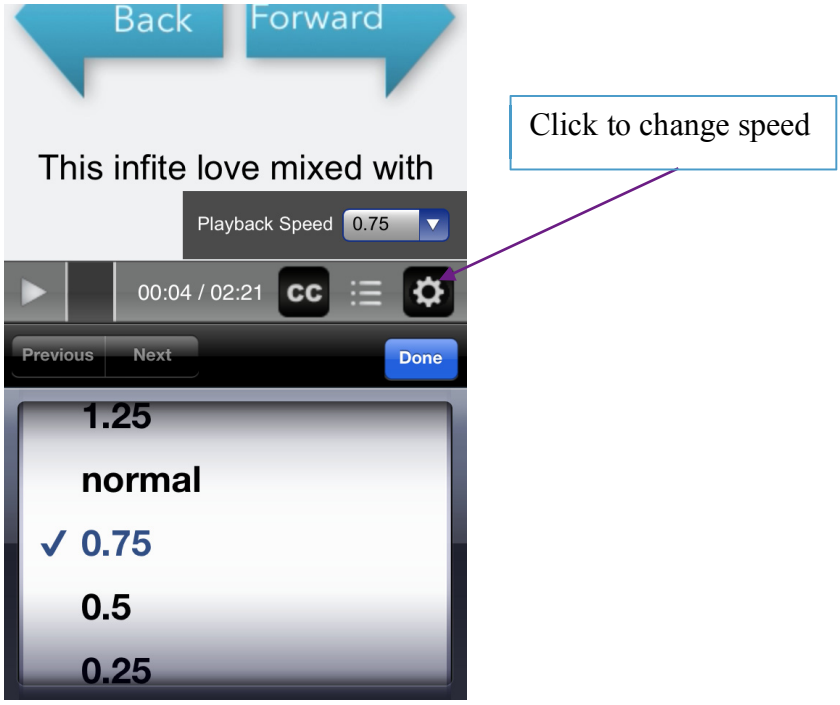


Figure 5. Playback speed adjustment.

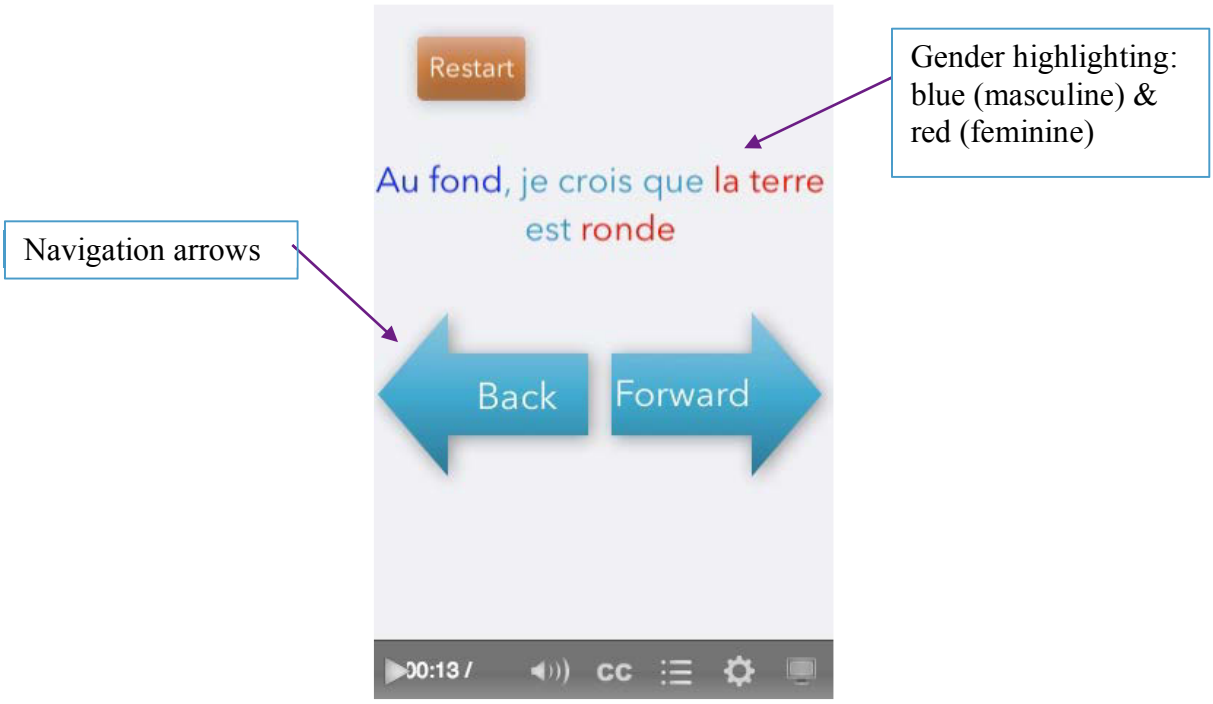


Figure 6. Gender highlighting.

Discussion

The goal of this research project was to develop an interactive, mobile music application that helped organize music content by vocabulary level in order to deliver it to learners according to their proficiency levels. In addition, the proposed application highlights features of the French language in the lyrical content of songs (on-screen) as an aid to learners of French. These features were selected and implemented based on established SLA and CALL research, as will be discussed in the following sections. First, I illustrate how Doughty and Long's (2003) principles for implementing a technology-enhanced L2 learning environment and CALL tools were used to guide the development of *Bande à Part.* Second, I present and discuss an analysis that evaluates the app based on the frequency distribution of lemmas in the songs. The goal of this analysis is to determine whether the input provided by the songs is rich, as prescribed by Doughty and Long. Lastly, the application is evaluated in relation to Nation's (2007) four strands for developing L2 materials and teaching in order to promote alignment with various curricula.

Bande à Part and Doughty and Long's Ten Principles

Table 2 illustrates Doughty and Long's (2003) 10 principles for delivering enriched input in a CALL/MALL environment, as discussed earlier. In the second column, the table illustrates how seven out of the ten principles were incorporated into *Bande à Part.* Consider "promote learning by doing," for example. Under this principle, when a user chooses music, slows it down, views subtitles and/or translations, or uses the navigation to repeat phrases, they are interacting with the application in a self-directed way. The remaining principles and their implementation in *Bande à Part* are self-explanatory, as illustrated in the second column in Table 2.

Table 2

Ten Principles from Doughty & Long (2003)

	Principles	**Incorporation in Application**
1.	use task, not text, as the unit of analysis	None. Future aligning with curriculum could provide this
2.	promote learning by doing	Interactive, self-directed
3.	elaborate input	Textual enhancements, translation
4.	provide rich input	Repetition, high-frequency words, emotive language (lyrical/musical)
5.	encourage inductive ("chunk") learning	phrase-level navigation
6.	focus on form	Textual enhancements, slow-down & speed up
7.	provide negative feedback	None
8.	respect developmental processes and "learner syllabuses"	Focus on high-frequency vocabulary, evaluation via "four strands"
9.	promote cooperative/collaborative learning	None
10.	individualize instruction	Self-directed (genre of music, vocabulary level)

There are three obvious concessions to observe in Table 2, which relate to principles one, seven and nine. Principle one is concerned with task-based language teaching. Constructing contextualized tasks for learners to complete and sequencing them in relation to the application is an example of what would be required to incorporate this principle. Principles seven and nine require feedback and collaboration. Some sort of text-to-speech and automatic speech recognition software could be examples of how to incorporate these. Another option could be gamifying the application so that users collect point and compete with each other. Alternatively, if used alongside a class, these aspects could be coordinated by a teacher. All three of these currently missing components could be avenues for future improvements.

Bande à Part: An Analysis of Songs by Word Frequency

Gathering the lyrics from all of the songs included in *Bande à Part* into a corpus allows for an analysis of the lexical frequency profile. Using the "vocabprofile" tool on lextutor.ca, we are able to examine the vocabulary content of the songs according to proportions of frequent and infrequent words. This helps to make sense of where strengths and weaknesses lie in terms of the percentage distribution of words in the corpus. An analysis of the lyrical corpus showed that there are currently 6,361 tokens (words) and 768 lemmas in the corpus, with a token per lemma ratio of 8.24.

Table 3 shows the lemma bands (1K–25K) in column one, represented by K-n, where *n* stands for the different levels: one (1–1000), two (1001–2000), three (2001–3000), etc. In column two are the percentage of tokens in the corpus that fall into any given lemma band (88.15% in the case of K-1). Column three shows the cumulative percentage. So, if approximately 88% of the tokens fall in the K-1 band and 4% fall in the K-2 band, the cumulative percentage shows that knowing the 2000 most frequent lemmas in French provides

one with 92% coverage of the lyrics in the app. The cumulative percentage is helpful for teachers and learners looking to ensure they use material with a certain amount of known vocabulary; for example, Nation (2013) recommends 98%. Note that a small number of words were not recognized by the program and therefore they are not included in the tables.

Table 3

Token % by vocabulary band

Lemma Band	Token % per freq. level	Token % (cumulative)	Lemma Band	Token % per freq. level	Token % (cumulative)
K-1	(88.15)	88.15	K-14	(0.06)	99.06
K-2	(3.99)	92.14	K-15	(0.06)	99.12
K-3	(3.36)	95.5	K-16	(0.03)	99.15
K-4	(1.05)	96.55	K-17	(0.05)	99.2
K-5	(0.79)	97.34	K-19	(0.00)	99.2
K-6	(0.24)	97.58	K-18	(0.03)	99.23
K-7	(0.25)	97.83	K-20	(0.02)	99.25
K-8	(0.35)	98.18	K-21	(0.02)	99.27
K-9	(0.28)	98.46	K-22	(0.11)	99.38
K-10	(0.16)	98.62	K-23	(0.02)	99.4
K-11	(0.16)	98.78	K-24	(0.02)	99.42
K-12	(0.08)	98.86	K-25	(0.02)	99.44
K-13	(0.14)	99	OFF-LIST	0.49	100%

Table 4 shows that 389 of the lemmas in the corpus belong to the 1,000 most frequent band (about half of the lemmas in the corpus). The value in parenthesis beside the number of lemmas in each band is the percentage that that number makes up out of the total number of lemmas present in the corpus (389 lemmas in the K-1 band of 768 makes ~51%, 127 of 768 makes ~17% in K-2, and so on).

Since small portions of the most frequent lemma bands are covered (i.e., about 39% of the 1st 1,000 and 13% of the 2nd 1,000), one could not rely on the songs currently available on *Bande à Part* to learn or reinforce their vocabulary without supplementary materials. This should

be taken into account when setting goals and expanding the corpus. Future versions of the app will seek to close the gap and ensure a large portion of the most frequent words are covered by the songs. Additionally, one can see more evidence for recommending the application to intermediate level learners given the amount of relatively infrequent vocabulary learners would be exposed to in the app.

Table 4

Lemmas by vocabulary band

Lemma Band	Lemma Coverage (% of total)	Lemma Band	Lemma Coverage (% of total)
K-1	389 (50.65)	K-14	4 (0.52)
K-2	127 (16.54)	K-15	4 (0.52)
K-3	95 (12.37)	K-16	2 (0.26)
K-4	42 (5.47)	K-17	3 (0.39)
K-5	20 (2.60)	K-19	2 (0.26)
K-6	13 (1.69)	K-18	0
K-7	13 (1.69)	K-20	1 (0.13)
K-8	13 (1.69)	K-21	1 (0.13)
K-9	7 (0.91)	K-22	2 (0.26)
K-10	7 (0.91)	K-23	1 (0.13)
K-11	9 (1.17)	K-24	1 (0.13)
K-12	5 (0.65)	K-25	1 (0.13)
K-13	6 (0.78)	OFF-LIST	N/A
		Total (unrounded)	**768+off-list items**

More information can be collected from the corpus by looking at how many times high-frequency words repeat. There are, on average, 8.2 instances of each lemma. The range is so large, however, going from one instance of a lemma with a word like *armée* to almost 400 with prepositions like *de*, that the average alone is not particularly insightful. Since learners usually require meeting a word around 10 times in order to learn it (Nation, 2013), a more discerning

way of looking at repetition of lemmas is to look at the number of words that occur over 10 times and those that occur under 10 times within the first 1,000-word band. We can assume the words that occur over 10 times in the corpus are likely to be learned even if the learner only listens to each song once. The "vocabprofile" analysis indicates that there are 88 lemmas that occur more than 10 times in the corpus and 301 that occur fewer than 10 times. The lemmas from the K-1 band that appear fewer than 10 times are illustrated in Figure 7, which provides a snapshot of the app in terms of their occurrence in its current state. This snapshot helps in understanding where the app stands in relation to future goals. As songs are added, more of these less frequent lemmas will occur more than 10 times, providing a variety of opportunities for learners to solidify their comprehension of the most frequent words in French.

Along the x-axis, the graph shows the number of times a lemma occurs in the corpus from one to nine times. The y-axis illustrates the number of lemmas. For example, 148 lemmas occur once whereas eight lemmas occur nine times.

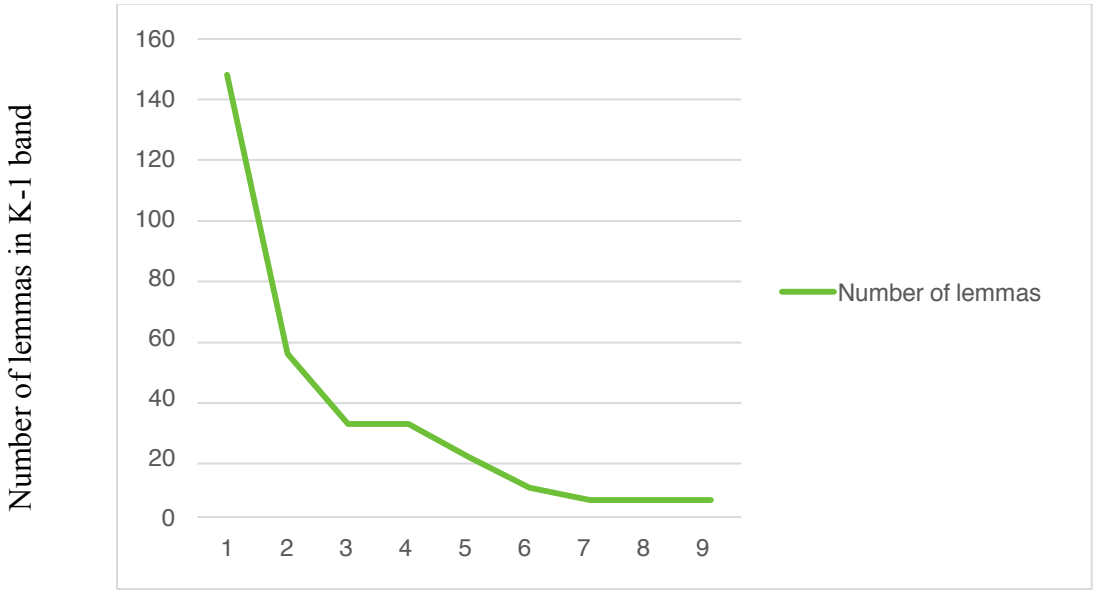


Figure 7. The number of lemmas that occur from 1 to 9 times in the K-1 band.

Bande à Part and Nation's Four Strands

Table 5 outlines some of the ways in which *Bande à Part* addresses the four strands for the design and teaching of a language course, as recommended by Nation (2007). Aligning the app's features with Nation's recommendations reveals its strengths and weaknesses. The most developed strands in the application are the presence of features that promote meaning-focused input, language focus, and fluency development in relation to comprehension, as will be discussed next.

Meaning-focused input is achieved by limiting exposure to infrequent vocabulary and providing subtitles, ensuring the learner can use attentional resources towards understanding the input. Highlighting the liaison feature and the gender of nouns provides a language focus, while singing along and repetitive use aids the development of fluency. Potentially, singing along could fall under meaning-focused output or language focus as well, depending on the learners' conscious attention toward meaning or form. As mentioned, the tool is substantially stronger at providing input than encouraging output. As such, oral production practice only occurs if the user chooses to sing along and engage in learning both mentally and kinaesthetically. Even then, the app cannot accommodate *free-form* output. However, *Bande à Part* could incorporate activities that can be completed in an interactive way in which, for example, two or more users are required to interact by discussing unknown vocabulary, grammar, culture, etc. This would address both Nation's recommendation for a focus on the output and Doughty and Long's (2003) suggestion for a focus on learning that is cooperative/collaborative (principle nine).

Table 5

Aligning the music application with Nation's (2007) four strands

Meaning focused input	Meaning focused output	Language focus	Fluency development
• Graded listening (through vocabulary bands) • Translation	• Earworms and self-talk • Singing along	• Textual enhancements (liaison, gender, etc.) • Noticing (e.g., written to aural form connections) • New words	• Repetition (repeated listening & internal repetition) • Cultural knowledge (e.g., slang, idioms, references) • Earworms and self-talk • Singing along

Future Considerations

Since the initial development of the application, I have discovered additional software that could be more efficient for the app developer. For one, subtitling can be an arduous and time-consuming to implement. A possible solution is the use of the amara.org website, a non-profit enterprise that provides a widget for overlaying captions on videos (YouTube, Vimeo, etc.) quickly and effectively (similar to musixmatch.com, the lyric catalog used on Spotify, the popular internet music streaming software). The idea is to circumvent having users modify online videos and re-upload content that belongs to someone else only to have it taken down for copyright infringement. An additional benefit is that the subtitle files are subsequently easily downloadable after creation. In the case of this application, it would vastly improve production to use amara.org for setting the timing of the lyrics to music and then export the resulting .srt file for use with Camtasia®.

A study analysing usability and learners' perceptions is currently underway. This will open up opportunities to improve the application through understanding the strengths and weaknesses (e.g., technical ease of use and its potential use as a learning tool) before we can research the effectiveness of the tool in helping learners with a variety of linguistic skills (e.g., to notice and develop specific L2 features). Preliminary results from the usability study suggest that students enjoy using *Bande à Part*, believe it to be helpful for language learning, and that the textual enhancements increase noticing of certain French features. In addition, participants suggest that some of the features should be improved (e.g., gender highlighting on more songs) and that the database should include more songs. I foresee possible improvements in terms of ease of use (e.g., an online guide) and to its ability to aid learning (e.g., more songs and possibly some teaching/learning guidelines to guide the learner and/or instructor on the use of the proposed music app as a pedagogical tool).

Unsurprisingly, the preliminary results of the usability study also show that mobile learning is different from classroom learning in that the "study" sessions are more learner-controlled and noticeably shorter. Participants typically use the application for between 2 to 30 minutes, with most of the sessions falling between 5 and 15 minutes. Only 6% of the usage was over one hour, and even then, this does not rule out someone haphazardly leaving the application running in the background (albeit less likely on a mobile phone than a computer because of the faster drain on battery life). Further analysis will help to confirm whether these shorter sessions are also more frequent (whether users use the tool multiple times spread throughout the day).

There are many possible routes to explore in the future including further corpus analysis (e.g., POS tagging, speech-rate analysis, etc.), cognition (e.g., syntactic priming, episodic memory, etc.), exemplar-based learning (e.g., phonological development, chunking), fluency

development, and comparing groups of learners (e.g., classroom vs. autodidactic learning, foreign vs. immersive language contexts). In conjunction with further studies that use the tool is the possibility of aligning music to current curricula and expanding it into other L2s.

Conclusion

This study aimed to develop a music application to help learners improve their French language skills. First, the literature review brought together relevant theory for the development of the tool, including its foundation in SLA theory as it pertains to music, cognition, the potential benefits of earworms, the pedagogical precedent of music as a motivating learning medium, and, finally, principles in developing and assessing CALL materials. There is consensus that interesting, self-directed technologies to help learners need to be created and that music is an effective medium to accomplish these goals. *Bande à Part* was developed following the principles outlined by Doughty and Long (2003) and Nation's (2007) four strands for selecting and developing language materials. After working through several prototypes to determine how to provide a music learning app to language students, *Bande à Part* was born.

The proposed use of *Bande à Part* as a music app is able to incorporate SLA principles and deliver enhanced material to learners according to their needs. Thus, as opposed to teacher-centred practices, learners can use material most interesting to them and take part in activities more suited to their individual learning styles. This corresponds with research that has long recognized the need to consider learner differences (Sawyer & Ranta, 2001; Wesche, 1981). For our tool, this is evident in the fact that students can choose songs according to genres they prefer and proceed through less difficult songs to more difficult ones at a rate at which they are comfortable and capable.

Implications

Since *Bande à Part* is presented as a response to the call for the development of more stimulating learner-centred tools that enhance input for L2 learning purposes, this tool could be helpful in extending the reach of the classroom and helping teachers improve the efficiency of the classroom. For example, a teacher could suggest songs for students to listen to outside of class time based on phonological struggles a student has or a feature presented in class (e.g., to notice and practice in singing the alternations found in the suffixation for the *passé compose* and the *imparfait* in Québec French, as in *il a parlé* [e] and *il parlait* [ɛ] 'he/it spoke', respectively).

Limitations

Some of the limitations of *Bande à Part* have already been mentioned in previous discussions of how it fulfills the demands of CALL research and its usability (e.g., that it includes no feedback for learners' incorrect forms—positive input enhancement is used exclusively; and that it requires internet access—an intentional concession). In an effort to prepare for future studies, one of which that will gather perceptions on a number of features included in *Bande à Part* (e.g., textual enhancement, translations), several features were included during the development despite the fact that their use was not obligatory and, consequently, hard to control. For one, ideally, students would be encouraged or guided when to use, or not use, the L1 translations according to their level of proficiency. A student can easily rely on L1 translations long past the appropriate level of scaffolding they provide (for additional commentary and analysis of this topic regarding L1 glossing, see Taylor, 2006). Developing a method for guiding users in this way is challenging; nevertheless, it was determined that including the feature was worthwhile despite the limitation. In addition, some of the features provided, like highlighting of gender, French subjunctive or the *participes passés* (in French

orthography, “e” and/or “s” is added to verbs according to gender and number), were only included for one song, for testing purposes. This was due to the project timeline and technical feasibility conflicting with, as mentioned above, an effort to include a variety of features for testing purposes. Although his can be perceived as a limitation because users will not have had the opportunity to encounter these features in several environments, there are interesting benefits. I was able to include more features for testing purposes without overwhelming learners by having too much information onscreen at once. In future versions of the application, it would be beneficial to include a function where the user could have checked off which features they would have liked to have for each song. To sum, the manner in which one engages with the input (including textual enhancements) and subsequent processing thereof is put to the user on a voluntary basis: it is up to them to use the available features and engage with the material in an intentional way. As Smith (1993) points out, input enhancement does not assume any alteration to the learners’ system. Future versions of the application will seek to expand on the textual enhancements in a way that does not distract or overwhelm the user from the content.

Chapter 3

Retracing the steps leading up to the question of "What is next?", recall in chapter one that I began with some intuitions about how listening to music may be a helpful way of improving one's comprehension in an L2 because it is enjoyable and already a part of many people's lives. I wondered which factors were involved when one learns through music. Is it something to do with music itself that makes it worthwhile to incorporate it as a learning activity, or was it because music is interesting and provides input that is initiated by the learner? As an intermediate learner of French, I was surprised to find out that learning an L2 is a dynamic and continuous process, not the finite yes/no process as I had anticipated, which sent me on a journey of learning how to incorporate learning into my lifestyle. I suspected that the large amount of material freely available online and, specifically, the large collection of foreign music available along with lyrics, hyperlinks to definitions, etc. were able to propel me forward. More than that, to some degree, they would allow me, through the scaffolding provided by technology, to take part in a foreign culture and language and thus interact with people the way I did in my own L1.

Overtime, I turned to academia in order to place my story in a broader frame of SLA research. As I found success and enjoyment in my pursuit of Spanish and French and spawning discussions with colleagues about creating a music application for language learning, it was time to synthesize research on the relationships between language and music as well as how to use technology for language learning. First, I found that some complications existed in understanding the relationships between language and music in the context of learning an L2. For instance, whether or not music aided long-term memory (storage) given that music added another layer of input for learners to process (tones, rhythm, etc.). Drawing conclusions at this point, however,

suggest that the complications that arise are minor and that there certainly is evidence in favour of including music as part of one's language learning strategy (see, for example, Engh, 2013).

For the design and the assessment of the app developed in this thesis, I turned mainly to Doughty and Long's (2003) principles for adapting SLA research to a technological medium and Nation's (2007) four strands for developing and evaluating L2 curricula. I also adapted other research practices into Doughty and Long's framework in manners they suggested. Examples of these include: a frequency analysis of vocabulary to establish "proficiency levels" (e.g., based on frequency bands), and textual enhancements to a set of morpho-phonological features such as liaison and gender marking. This research led to the development of *Bande à Part,* the full description of which can be found in chapter two.

As discussed in Chapter 2, *Bande à Part* fulfills seven of the ten principles provided by Doughty and Long (2003): promote learning by doing, elaborate input, provide rich input, encourage inductive ("chunk") learning, focus on form, respect developmental processes and "learner syllabuses", and individualize instruction. In addition, it complies with Nation's four strands for the design and assessment of L2 curricula (meaning-focused input, meaning-focused output, language focus, and fluency development), thus constituting a framework to evaluate the application by pointing out where its strengths and weaknesses lay. Through this framework, one can see that *Bande à Part* has potential to provide interesting content in a repetitive and meaningful manner. Equally, a strong language focus is present through the use of textual enhancements. What remains to be evaluated is the application's actual use among learners interested in improving their French through music.

The complications between language learning and music that have not yet been sorted out (i.e., understanding aspects of language learning that music may be able to benefit: the

development of L2 pronunciation and other linguistic features, the learning of formulaic sequences, etc.) serve as gateways for future research using *Bande à Part*. For the remainder of the chapter, I will discuss a variety of directions that have been considered so far, some of them already underway.

Some of the future considerations include partially finished research that has not yet been included in this version of the application. This involves a grammatical analysis of the songs so that teachers and students can align the application with their own curricula, similar to what was done for vocabulary. For instance, if a student or teacher wants to focus on the use of past tense marking, they could search the database for songs that emphasize this morphological unit. To determine the grammatical categories most used in each song, I compared individual songs to the lyrical corpus as a whole using morphological and part of speech analyzers. I will provide two examples. Consider the song, "Je le savais" by Julie Doiron, where 13% of the words (tokens) are adjectives, in comparison to 5% in the entire corpus. This means that users will have significantly more exposure to adjectives in this song compared to the average song, which renders it a good candidate for teaching adjectival use in French. Also in this song, 15 % of the words are $1^{st}/2^{nd}$ person pronouns (cf. 9% in the corpus) and 15% of the words are verbs conjugated in the $1^{st}/2^{nd}$ person (cf. 5% in the corpus). The second example is the song, "Si" by ZAZ. Twelve percent of the words are plural nouns (cf. 3% in the corpus), *de* (used as the preposition, as opposed to the partitive articles: *du* [de le]*, de la*, and *des* [de les]) makes up 9% of the words in the song (cf. 4% in the corpus), and 8% of the words are verbs conjugated in the conditional (cf. 1% in the corpus). This song, "Si" (*if* in English), as can be inferred in the name, is indeed an excellent choice for a user wanting to focus on the use of the conditional in French.

Another aspect of the application that is underway is adapting the idea to an English version of the app (see Sundberg & Cardoso, 2015). This has been started as a prototype primarily aimed at highlighting non-salient but regular morpho-phonological features of English (e.g., the allomorphy that characterizes simple plural –s and past tense –ed marking).

Moving toward new avenues, a possible addition to the *Bande à Part* application is to incorporate one of the missing principles from Doughty and Long's (2003) list, which recommends that pedagogical materials promote cooperative/collaborative learning. This could take the form of using automated speech recognition (ASR) software to include a karaoke aspect in the application. I believe this could also develop the least accentuated strand in Nation's four strands, meaning-focused output. One idea is to have learners sing along and other learners provide feedback on their pronunciation, based on the assumptions that listening to one's recordings may be beneficial to improving one's pronunciation and that humans are perceptive enough to find some of their own mistakes when engaged in self-listening activities (Case, 2010).

After discussing viable additions to *Bande à Part*, which could build upon its current limitations, I would like to turn to possible research that could be undertaken using the app. As mentioned in chapter two, I am currently conducting a study that investigates users' perceptions of *Bande à Part* as an L2 learning tool. This will serve to improve the technical usability of the application. For example, refining the placement of lyrics and arrows onscreen.

Given that we know the importance of input in the L2, complementing classroom study with the app by making it available to students would be one way of increasing (and possibly enhancing) the input that students receive outside of the classroom. This, of course, says nothing about the potential learning gains of using *Bande à Part* as a pedagogical tool. Further studies

could be designed to test various learning opportunities related to users' improvements in comprehension, in the accurate production of certain linguistic forms (e.g., gender marking, the passé composé versus imparfait distinction), in establishing form–meaning relationships, and in the development of exemplars, to list a few examples.

One important study to undertake is to measure the transferability of recent implicitly acquired features in French to other environments using *Bande à Part* (e.g., oral and/or written production, oral and/or written comprehension). To illustrate using a morphosyntactic example, consider the learning of pronoun plus verb agreements such as *j'ai pensé* (I thought) and *vous avez pensé* (you thought), both of which are passé composé forms. My prediction is that, if the form has greater overlap with the L1, there would be more potential for implicit learning of the form via priming. So, learning the passé composé pronoun and verb agreements could be primed because the tense-aspect-mood have greater overlap in French and English, whereas *je pensais* and *vous pensiez,* both imparfait forms, would not without prior understanding of aspectual differences (for an example of the Spanish passive construction priming the English passive, see Hartsuiker, Pickering, & Veltkamp, 2004; for an example of unfamiliar constructions not being primed, see McDonough, 2006).

I hypothesize that one of the features found in music, repetition, and consequently the promotion of imitation, will have a strong effect in L2 learning. As described by Sfard (2008), in a Vygotskian manner, imitation may well be the first step in learning. Singing along and having songs stuck in your head, as examples of imitation, may provide the first step towards productive ability in the language (albeit if it happens in one's head it would be without the development of motor skills needed for comprehensible pronunciation, a skill that would need practice). Sfard argues, through both mathematical and linguistic discourse, that imitation exposes learners to

exemplars from which patterns can be extracted later. From a skill acquisition perspective, if comprehension is concerned with retrieving meaning from form (a skill in itself that requires moving along the declarative through automated trajectory), one will presumably have some declarative knowledge that can begin to be used productively. As a simple example, after hearing enough people say "bonjour" upon meeting someone, I may try it myself. Imitation might be the best first step outwards, moving from meaning *to* form in the mind. Therefore, I would expect groups engaged in music app-based learning to outperform groups that do not make use of the tool over an extended period of music-engaged learning.

Clearly, many aspects of *Bande à Part* still require improvement. There is a need for more songs in the database in order to provide better coverage of the most frequent words in French. There is also a need for a more ubiquitous way of incorporating all of the possible textual enhancements without overwhelming the user with excessive information. Notwithstanding, *Bande à Part* version 1.0 is ready to be tested and critiqued for further improvements. Given that there is a dearth of learner-centered, interesting and helpful tools for learning in a mobile environment, I believe that the proposed app accommodates some of the needs of the 21st century language learner.

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Footnotes

[1] In terms of phonology, one could initially doubt the advantages of learning suprasegmentals through music, as the intonation and rhythm are often adjusted to fit a tune; but in some cases, such as with questions, intonation contours must be preserved, otherwise an intended question may sound like a statement or a command.

[2] By drawing on two of Nation's four strands, namely meaning-focused input and language-focused learning, Macalister (2011) elaborates on how teaching reading strategies can be accomplished through tasks that promote language acquisition (e.g., guessing the meaning of unknown words and recognizing conjunctions). First, concerning meaning-focused input, he recommends it to be meaningful, interesting, new, understandable, and stress-free. It should cause learners to ask their own questions about the content. In other words, this type of input should have a self-directed aspect. Learners interested in using the *Bande à Part* application will do so likely because it *is* "interesting," "new" and "stress-free." The other two facets are incorporated through its design. Second, language-focused learning, which can incorporate both input and/or output, progresses well from meaning-focused input activities and provides opportunities for noticing, receptive retrieval of form, and productive retrieval of form. Receptive retrieval of form relates to when a speaker hears or reads a form and, following a mental search, is able to come up with the corresponding concept. Conversely, productive retrieval of form is when one first has a concept in mind and searches for the related form.

Bande à Part addresses a combination of these meaning- and language-focused concerns. The table below, borrowed from Macalister (2011), provides a framework for what task goals might include. These goals, easily remembered with the acronym "LIST" (Language, Ideas,

Skills, Text), have been referenced in order to provide another way of evaluating the *Bande à Part* application; for example, "reading for literal understanding" is encouraged through the English translation provided. Once a learner stops using the English subtitles, they will be reading the French lyrics in order to "infer meaning." I provide below some examples of LIST goals:

Goal Names	Examples	Included in App
Language goals may include	New vocabulary	✔
	Letter-sound relationships	✔
	A grammatical structure	✔
Ideas goals may include	Content that needs to be learnt	✔
	Content required for other activities	X
Skills goals may include	Reading for literal understanding	✔
	Reading to infer meaning	✔
Text goals may include	Genre structure	✔
	Cohesion and coherence	✔