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On-site and distance piano teaching: An analysis of verbal and physical behaviours in a teacher, student and parent

ABSTRACT

This study was designed to examine how distance piano teaching might affect the verbal behaviours and physical actions of a teacher, a student and a parent. Weekly 30-minute piano lessons over a year-long period were taught to a 5-and-a-half-year-old on-site student and a 6-year-old distance student. All lessons were delivered by the same teacher who followed the Suzuki programme. All sessions were recorded and then analysed using Simple Computer Recording Interface Behaviour Evaluation (SCRIBE), a video analysis software that provides frequencies and durations of pre-coded events. The observation of recorded lessons showed that distance teaching did not slow down student progress. In addition, behavioural analysis revealed that in most aspects, distance and on-site delivery were remarkably similar. The most striking difference was the interaction between the teacher and the parent. During on-site teaching, most of the teacher's instructions were directed to the student while the parent was listening and observing attentively; during distance teaching, half of the teacher's instructions were addressed to the student and the other half to the parent. The distance student also tended to

KEYWORDS

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relate more to the parent than to the teacher. In the distance environment, when interacting with a young beginner student, the role of the parent becomes very central to the success of the lessons.

Traditionally, piano lessons have been delivered one on one, in a studio set-up, based on the master-to-apprentice model. However, the arrival of high-bandwidth videoconferencing and, more recently, the availability of Skype and Adobe Connect have created new opportunities for distance piano teaching. The most common set-up for distance piano lessons is for a teacher and a student in two different locations to be synchronously connected, allowing for verbal communication and demonstration in real time.

Literature review

Distance music teaching

Distance music teaching has become increasingly popular over the last 25 years, and American researchers have carried out a number of experiments. Rees and Downs (1995) report that in the early 1990s performance masterclasses and harp lessons were conducted via videoconferencing between the music department of the Iowa State University and a group of junior high students. Then, in 1996, under the influence of conductor and string teacher Pinchas Zukerman, the Manhattan School of Music instituted a distance learning programme 'devoted to exploring the use of state-of-the-art videoconference technology for music education and performance'. Through this programme, the Manhattan School has provided

> interactive videoconference master classes, private lessons, clinics, workshops, coaching, sectionals, colloquia, educational and community outreach, tele mentoring, professional development […] Since its inception, the program has connected students, educators, and distinguished artists around the globe for teaching and learning exchanges and currently reaches over 1,700 students each year.
>
> <div align="right">('Distance learning @ Manhattan School of Music:
Project overview' n.d.)</div>

So far, this project has reached music students in more than 25 US states and fifteen countries. In another context, a two-year project exploring teaching and learning via video-conferencing brought pre-service music teachers in the United States in contact with underprivileged elementary school children in Mexico (Riley 2009). A few projects have also experimented specifically with distance piano teaching. In 2007, a demonstration using videoconferencing was presented at the convention of the National Association of Music Merchants (NAMM 2007). A Juilliard student performed on a Yamaha Disklavier in New York City and was simultaneously seen and heard by participants at the convention in California. Since then, Litterst (2009, 2014a, 2014b) has been instrumental in developing software programmes to connect Yamaha Disklavier in different locations (Yamaha 2012). In recent years, a number of research experiments have been done to examine distance music teaching over the Internet (i.e. college-level piano lessons over Skype at the University of North Texas) (Kruse et al. 2013); an eighth-grade trumpet player

over Skype (Dammers 2009); middle school tuba and saxophone students though through videoconference (Orman and Whitaker 2010)). Also, over the last ten years, music lessons and master classes over videoconference have been discussed in music educators' journals and magazines (i.e. Ajero 2010; Snow 2009; Sick 2009).

A large number of distance learning projects have also been initiated in Canada. In the early 1990s, a preschool music teacher in Vancouver established a videoconference connection with a group of preschoolers in Australia, and conducted a series of rhythmic and singing activities. While encountering a number of technical problems and pedagogical challenges, the teachers involved in this project favoured videoconferencing over television programming because of its 'interactive audio-video medium (for) delivering instruction' (Gouzouasis 1994: 229). In June 2003, as part of the MusicPath project, Christoph Both and Jim Diamond at Acadia University (Yamaha 2005) showed how two remote Musical Instrument Digital Interface (MIDI) pianos could be connected through an IP network. Following this successful demonstration, a series of distance masterclasses were started between Marc Durand at the Royal Conservatory of Music in Toronto and 12-year-old piano student Lucas Porter, at Acadia University in Wolfville, Nova Scotia. According to the MusicPath website, distance student Lucas felt that 'he was in the same room with his teacher' (MusicPath n.d.: n.pag.). Since then, MusicPath has linked Yamaha Disklaviers between Acadia University and locations in Maine, Hawaii, Texas, Virginia and Germany (Yamaha 2005). MusicPath's projects were widely featured in the media, showing that distance piano master classes had become an interesting alternative that could eliminate distance barriers between remote teachers and students.

In the early 2000s, Masum and colleagues from the National Research Council (NRC) and the Center for Research in Communication (CRC), developed MusicGrid, a large-scale Canadian distance music programme that involved 'elementary, secondary, university and conservatory students, professional music teachers, musicians, and technical and pedagogical researchers' (Murphy 2005: 526). Participating schools were located in Buckingham, Quebec; Gander and St. John's, in Newfoundland; Ottawa, Ontario; Iqualuit, Nunavut; and Kangiqsualujjuag, Northern Quebec (Masum et al. 2005). The leaders of the project identified a few challenges, including the need to spend time learning how to use this new technology in a productive and efficient way for their particular environment, but they also stressed the positive outcomes on student motivation, teachers' willingness to collaborate and a decreasing sense of isolation for remote communities. In many ways, MusicGrid was able to show the videoconference's usefulness as a medium to conduct music teaching.

MusicGrid contributed to the creation of many offspring and the Inuit Keyboarding Project (2003–07) was one of them. Initiated by the National Research Council (NRC), the project involved a music teacher at the Piano Pedagogy Research Laboratory, University of Ottawa, delivering a Yamaha Junior Music Course to a group of eight 5- and 6-year-old children at the Ulluriaq School in Kangiqsualujjuag, Northern Quebec (Parkes and Comeau 2015). The technical problems encountered were the usual: time delays, poor camera capture causing blurred screen images and on-screen ambiguity resulting from camera positioning. This project also faced numerous pedagogical challenges starting with the cultural and the linguistic barrier; the children spoke mostly Inuktituk, and so this made it difficult for the teacher to

establish a relationship with the children, and the need for English to Inuktitut translation slowed down the pace of the lesson considerably. However, the project worked well enough to keep it going, with the same group of children, for four years.

For 25 years videoconferencing has offered new opportunities to students and teachers. However, although a number of projects have been explored, only a limited amount of research has been done to examine the context of videoconferencing music teaching. Some qualitative studies have begun measuring its effectiveness (Murphy 2005) and other studies have focused on the videoconferencing technology settings (Giuliani 2001; McGinnis 2001). So far, most studies have been conducted with older and/or more advanced students (i.e. college-level for Kruse et al. 2013; eighth grader for Dammers 2009); most analyses have been interested in testing the feasibility of videoconference music lessons (Kruse et al. 2013; Shoemaker and van Stam 2010) and in identifying the benefits, challenges and the outcomes of teaching music remotely (Brändström et al. 2012; Dammers 2009; Orman and Whitaker 2010; Sherbon and Kish 2005; Shepard 2000; Shepard et al. 2008). However, the need for a different kind of study has been expressed. Rees (2002) has suggested that instead of focusing on the usability of the technology, we should study how technology can enhance music teaching and the learning experience. Murphy (2005) has recommended that future studies should focus more on how these technologies affect behaviour and interactions in teaching and learning. This was precisely the goal of this study: to observe what kind of impact distance teaching might have on the interactions occurring between the participants involved in a music lesson.

Observing verbal and physical behaviours

A number of researchers have focused on measuring teachers' and students' behaviours during applied music lessons (see Schmidt 1992). The results of these observational studies have provided considerable information on the frequencies of specific behaviours and allocation of lesson time associated with each behaviour. These studies have found students' performance and teachers' verbal communication to be the most frequently observed behavioural categories (Gipson 1978; Hepler 1986; Kostka 1984; Duke 1999; Schmidt 1989; Siebenaler 1997; Speer 1994). Benson's (1989) investigation of three violin teachers revealed that most of the lesson time is occupied by teachers' presentations (43–59%), followed by students' performance (24–37%) and students' verbal response (5–6%). Kostka (1984) examined childrens' and adults' piano lessons and found students to be on-task 85% of the lesson time, with performing comprising 57% of the lesson. Speer (1994) investigated lessons of twenty-five piano teachers and found that 47% of the lesson time was spent on student response, primarily performance. Teachers' intervention accounted for 42% divided among talking (65%), modelling (16%) and coaching (19%). Off-task occupied about 3% of lesson time. Colprit (2000) observed a number of Suzuki string lessons of children aged 5–7 years and reported that, on average, students played for 45% of the lesson time and teachers played for 20%. In general, studies found that very little lesson time was spent in off-task behaviours (Duke 1999; Siebenaler 1997; Speer 1994). These studies on behaviours during applied music lessons provide insightful knowledge useful for the design of our methodological approach in this study.

Research questions

The purpose of this descriptive study was to quantify, analyse and compare the types of verbal behaviours and actions of all participants involved in on-site piano lessons and distance videoconferencing piano lessons. A series of behaviours were used as a basis for first identifying and then comparing the verbal behaviours and the physical actions of a teacher, a student and a parent in a series of private Suzuki piano lessons occurring in two different environments: one on-site and one at a distance.

This study addressed the following research questions:

• What verbal and physical behaviours can be observed during a series of Suzuki beginner piano lessons taught on-site and via videoconferencing?
• What similarities and what differences can be observed in the teacher's, student's and parent's verbal and physical behaviours between the on-site and the distance teaching environment?

Ruippo suggests that the 'interactive restrictions (of synchronous distance teaching) oblige teachers to change their teaching methods and their way of thinking' as 'communication needs to be approached in a new way' (2003: 5). According to Moore and Kearsley, 'distance education […] requires special techniques of course design, special instructional techniques, special methods of communication' (2011: 306). Homfray mentions that Woude-Rantalaiho, a string teacher at the Sibelius Academy in Finland, 'had to learn new skills' (2007: 40) in order to teach remote students and Pinchas Zukerman 'learnt to teach in ways that you can't in a studio' (2007: 37). Based on the literature, it is expected that teaching piano remotely will require adaptations to the new teaching format and that changes in verbal and physical behaviours due to the distance factor will be observed. The comparison between the two teaching environments will provide an indication of any changes or modifications that might have resulted from the impact of the distance factor. A better understanding of actual changes in the participants' verbal behaviours and physical actions for on-site and distance piano lessons will provide us with a clearer knowledge of the teaching adaptation that needs to happen with this new educational medium.

Methodology

An in-depth quantitative video content analysis was used to compare the verbal and physical behaviours of participants involved in a series of on-site and distance piano lessons over a period of one year: one beginner piano student getting on-site lessons and one beginner piano student receiving lessons via video conferencing, both with the same piano teacher and with one of their parents attending lessons. This research project was conducted by the Piano Pedagogy Research Laboratory at the University of Ottawa and all lessons were delivered in the studio of this research facility. Fred Rees and Bill Budai facilitated the set-up for the distant lessons where the young piano student and her parent visited a studio at Indiana University (Purdue campus) for her lessons. The project was approved by the University of Ottawa Office of Research Ethics and Integrity.

Studio and technical set-up

On-site location: the environment in which the on-site student had her lessons consisted of two cameras: one recording from the left side of the student and the other from the right side. The left-side camera provided the best view of the on-site student lessons as it was the furthest away and it provided a wider angle; it gave a good view of the student, the teacher (sitting to the right of the student) and the parent (sitting to the right of the teacher). For video analysis, the left-side camera was used as much as possible. We relied on the right-side camera when, for technical reasons, the left-side camera recordings could not provide us with the needed information.

Distance location: the environment for the distance student was a typical piano studio with two cameras: one to the right and one to the left side of the student. Pre-sets had been arranged for full body view and for zoom-in on the hands and arms. A technician would make the appropriate switch between the cameras according to the angle needed for the distance teacher to see. One flat screen was positioned on the right side of the student, which made it necessary for the student to turn her head to the right side to see the teacher. The distance student's parent sat behind her.

Teacher's studio for distance lessons: the teacher's studio had a grand piano in the middle of the room where the teacher sat for the duration of the lesson. A camera just above the piano and facing the teacher was used to talk directly to the student or the parent. This angle only recorded the teacher's face and could not be used for any demonstration at the keyboard. Another camera on the teacher's right side could zoom in on the teacher's hand or face, or zoom out to show the teacher's whole body. Throughout the lesson, a technician would make the switch between the cameras and the appropriate pre-sets according to the angle needed. Two large flat screens were vertically aligned just above the teacher's piano. The screen above showed the image from the camera recording the teacher (the image that was sent to the distance student) and the screen below showed the distance student sitting at her piano.

Participants

Two female beginner students aged between 5.5 and 6 years old participated in the study. Neither student had ever had prior piano lessons nor knew the teacher before starting lessons. Both students' mothers attended the lesson and served as 'home coach' for daily practice. Both students had a similar number of lessons. The same piano teacher taught both students using the Suzuki method. This piano teacher had 35 years of teaching experience, and all ten levels of Suzuki teacher training. Since the aim of the study was to observe behaviours during piano lessons in two different environments, having the same teacher eliminated differences due to teaching styles.

Procedure

Each student received weekly piano lessons over a one-year period. One student received her lessons in person, in a regular piano studio, and the other student received her lessons at a distance via synchronous videoconferencing. All lessons in both environments were recorded by a technician using two cameras. The lessons were approximately 30 minutes in length and followed Suzuki Piano book one. Using the same method ensured comparable lesson

structure and a similar progression for both piano students; it also allowed easy comparison of behaviours between the two environments.

Data collection

Video analysis tool in music research: lessons filmed on video constitute a permanent record of a set of behaviours captured in their natural setting. The researcher feels intimately present, but that presence neither influences nor disrupts the lesson. According to McNaughton (2009), the use of video allows the researcher to 'eavesdrop' on the interactions of a lesson in a way that would be otherwise impossible. Griffee believes that 'video can give a detailed, naturalistic, "sense of being there" […] and can reveal things that might otherwise go unnoticed' (2005: 39). Markle and colleagues (2011) argue that recorded lessons permit multiple playbacks allowing for multiple viewings during the video analysis; it also allows a third party to check and verify the data collected.

   Selection of recorded lessons: there were 54 recorded lessons (25 distance lessons and 29 on-site lessons). To get a representation of both students' progress over time, every third lesson beginning with lesson 3 and ending with lesson 24 was selected for observation (i.e. lessons 3, 6, 9, 12, etc.). Due to an issue with lesson 3 (one video recording was missing the beginning of the lesson), we decided to use lesson 4 as a replacement. The duration of each lesson is presented in Figure 1. These times reflect the actual duration of the lesson itself, beginning with the first lesson-related engagement (such as bowing at the beginning of the lesson or asking a musical question related to the lesson) to the last lesson-related engagement (bowing at the end of the lesson or the last directive for home practice). Introductory comments and social greetings at the beginning and end of lessons were left out of the duration measurement.

   For each lesson, both students spent about the same amount of time with the teacher (about 30–35 min); the duration difference that we notice between lessons is mostly due to the time each student would take to get ready; and that preparatory time (social talk, taking books out of the bag, etc.) was not retained for analysis. Because the on-site student generally took longer to get through the preparatory phase, the distance student's actual lesson times were nearly always slightly longer (mean duration: 31 min for distance lessons and

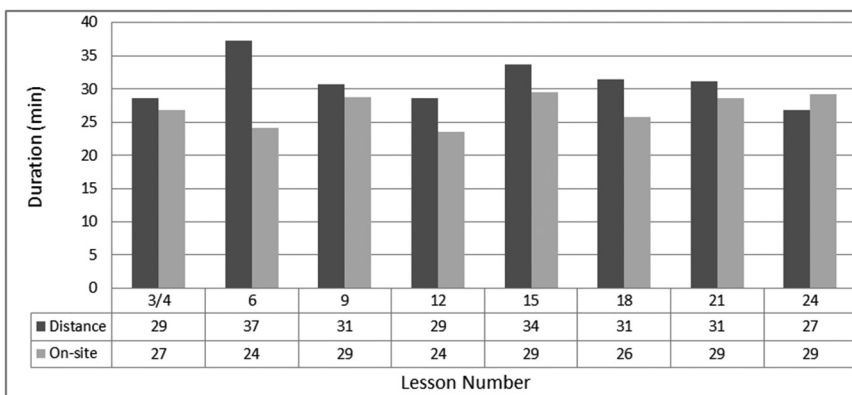| Lesson Number	3/4	6	9	12	15	18	21	24
Distance	29	37	31	29	34	31	31	27
On-site	27	24	29	24	29	26	29	29

Figure 1: Total time for each of the eight lessons.

27 min for on-site lessons). That difference in time must be kept in mind when reporting the frequency of behaviours or the time occupied by each behaviour.

Software: the use of computer software to observe and analyse music teaching behaviours has become fairly common (Benson and Fung 2005; Daniel 2006; Duke et al. 1998; Henninger 2002; O'Neill 2003; Taylor 2006; Westbrook 2004; Worthy 2005). In our study we used Simple Computer Recording Interface Behaviour Evaluation (SCRIBE) version 4.2, a 'data analysis program that permits users to label events in live observations or in digital video recordings, summarize event timings, and play back labeled events in customized configurations' (Duke and Stammen 2011), to collect data on the frequency and duration of the behaviours that we were interested in tracking. This software was developed specifically to facilitate video analysis in music education (Duke and Farra 2000; Duke and Stammen 2011) and it has been used in various music studies: pre-service music teaching, Suzuki method, choral performance and orchestra conducting (Buckner 1997; Champion 2006; Colprit 1998, 2000; Duke and Farra 2000; Duke and Henninger 1998; Garrett 2009; Kennell 1997; Lethco 1999; Seddon 2007; Westbrook 2004).

Behaviour selection: studies (Benson and Fung 2005; Gipson 1978; Siebenaler 1997; Speer 1994; Worthy 2005) that have analysed teachers' and students' behaviours during private instrumental music lessons have identified specific categories of behaviours appropriate for observation: the teacher behaviours across these studies were directives, information, demonstration, questions, coaching (i.e. giving comments and advice as the student is playing), feedback (approval and disapproval or positive and negative), modelling (i.e performing or demonstrating on the instrument) and off-task comments; the student behaviours were questions, response, performing and off-task. These categories served to build up an original list of behaviours for our own study. However, the literature was not very helpful with identifying parental behaviours during lessons. The role of parents has been studied in the context of Suzuki music lessons (Colprit 1998, 2000; Duke 1999; Lee 2007; O'Neill 2003) but, to our knowledge, no research has documented the verbal and physical behaviours of a parent's interaction during a piano lesson, and so we had to develop our own list of behaviours. As we began to analyse the videos, we identified new behaviours that would be interesting to track and we added them. When we began inter-judge reliability testing, new behaviours were identified and these were added as well. Our final list contained 56 variables in verbal interaction and physical action divided between teacher, student and parent.

Observation: for each video, we found it best to observe one group of specific behaviours at a time. During the first pass through the video, the observer would focus on the student's physical actions (i.e. performing, bowing, etc.). Next, the observer would focus on the teacher's physical actions (i.e. modelling, observing, touching, etc.); the teacher's verbal actions (i.e. giving instructions, procedural information, criticism, etc.); the student's verbal actions (i.e. asking or answering questions, talking to the parent, off-topic talk, etc.); the parent's verbal actions (i.e. asking or answering questions of the teacher, giving directives to the student, offering procedural information to the student, etc.); and the parent's physical actions (i.e. writing in a notebook or on a score, physical contact with the student to adjust position or posture, using props or tools, etc.). By dividing the task of analysis into these stages, the observer was able to code each behaviour more accurately. For each

Teacher behaviours		
VERBAL (to student)	VERBAL (to parent)	ACTION
Directives: instruct to play, stop or do another piece	*Directives*: instruct parent during lesson	*Modelling*: physical demonstration of movements, and clapping rhythms
Information: musical content	*Information*: musical information given to parent	*Touch*: physical contact (to show hand movement, etc.)
Procedural: instruct how to do a movement		
Posture and adjustments: instruction/ criticism/question about posture	*Directives for home practice*: instruction on what to do and how to practice	*Coaching*: movement/conduct/ sing/shape music while student play
Praise: positive reinforcement or approving comments		*Observation*: watching and listening to student perform
Criticism: corrective comments *Questions*: on musical content	*Questions*: questions on home practice	*Accompaniment*: teacher plays along with student
Questions on home practice	*Off-task*: talking of non-musical subjects	*Props/Tools*: use of stick for student's fingers, abacus, etc.
Answers		
Inaudible talk		*Notebook writing*
Off-task: talking of non-musical subjects		*Off-task*: adjusting equipment
Student behaviours		
VERBAL (to teacher)	VERBAL (to parent)	ACTION
Question: student asks a musical question	*Question*: student asks a musical question	*Performing*: student performs on piano, claps rhythms
Answer: student answers teacher's questions	*Answer*: student answers parent's questions	*Preparation*: student bowing (before and after lesson), climbing on the bench
Talk: student talks about musical topic	*Talk*: student talks about musical topic to parent	*Ensemble playing*: student plays with teacher or another student
Talk to teacher – inaudible		*Posture and adjustments*: adjusts posture
Off-task: student talks of non-musical topic		*Off-task*: any non-musical behaviour

(Continued)

Parent behaviours		
VERBAL (to student)	VERBAL (to teacher)	ACTION
Directives: directs students on certain tasks, provides cues	*Questions*: asks what needs to be done or musical question	*Modelling*: demonstrates on piano or mimes
Information: gives musical information to student	*Answer*: answers teacher's questions	*Touch*: physically helps student (hand movement/body posture)
Procedural: instructs student how to do a movement	*Talk to teacher*: about music topics	*Coaching*: movement/conduct/ sing/shape music while student plays
Posture and adjustments: instruction/ criticism/question student's posture		*Props/Tools*: uses props/tools in lesson
Praise: positive reinforcement to student		*Writing in Notebook or score*
Criticism: corrective comments to student		*Off-task*: fiddling with equipment
Question: on musical content		
Answer: answers student's question		
Talk to student – inaudible		
Off-task		

Table 1: Categories of behaviours.

video, the observer followed this strategy, and usually made between 6 and 8 passes through each video to ensure accuracy.

Observers: two observers who had prior knowledge of the categories and experience with the software were selected to review the recorded lessons. The observers had not been involved in the recording phase. For consistency, one observer carried out the entire study, identifying the behaviours, segmenting the beginning and end of each behaviour and tagging each segmented clip with the proper category name. To ensure that data from observer one were reliable, a second person analysed a portion of the 8 lessons to compare the results. The second rater analysed either the first half or the last half of both students' lessons 6, 12, 18 and 24. Once the analysis was completed, the two raters compared and discussed data differences. After the first comparison of data from the first two lessons, the observers studied discrepancies in their coding, and re-evaluated the list of behaviours and new behaviours were added to add clarification. With the new list of behaviours, they re-analysed the lessons and compared data again. This process was then repeated to compare all eight lessons until all discrepancies had been resolved and a consensus between the two evaluators had been reached.

Results

Before analysing the verbal and physical behaviours observed during the on-site and distance lessons, we looked at the students' progress by examining repertoire mastered over their first year of lessons. This analysis revealed

that the distance student was clearly more advanced than the on-site student in the amount of repertoire learned at the end of the year (nine pieces hands together for on-site compared to thirteen pieces hands together for distance). This information is important because if the distance student had not been progressing well, we could have concluded that distance teaching was not an appropriate format for a beginner piano student. However, the fact that the distance student in our study was able to achieve a higher performing level than the on-site student indicates that this teaching environment can be successful. It justifies the importance of identifying the verbal and physical behaviours that might be specific to distance piano teaching.

Overall lesson profile: a summary of the verbal and physical behaviours observed during the lessons is provided in Figure 2. It identifies the categories of behaviours most and least displayed by the teacher, the students and the parents. Each of these categories is then broken down for a more refined analysis.

Teacher verbal behaviour: the teacher's verbal interaction with each student is presented in Figure 3 and the teacher's verbal interaction with each parent is presented in Figure 4.

The teacher verbally communicates with the on-site student nearly twice as much as the distance student (43% compared to 26%). In this case, the difference is partially due to the on-site student's personality; she was more social and receptive to the teacher's instructions while the distance student often relied on her parent to give or repeat instructions, and as such, if the distance student was on-site, these results may not have been much different; and Suzuki students are often young and because a parent is present at every lesson the dynamic can be quite different than a traditional lesson set-up with only a teacher and a student. Also, the distance student's parent needed to supplement the teacher's instructions, and so the proportion of teacher verbal interactions was lower for the distance environment. Interestingly, when the teacher's verbal interactions with both student and parent are added together, the teacher offered a very similar amount of verbal time interactions in both teaching situations (47% for distance and 53% for on-site). However,
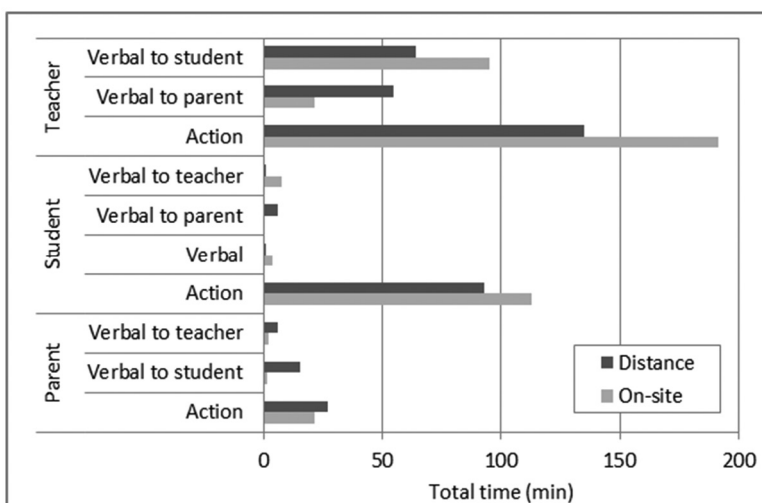

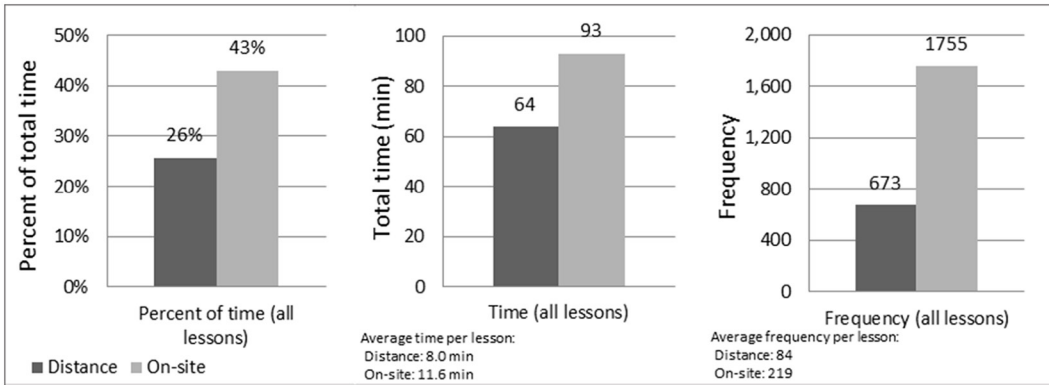*Figure 2: Overall lesson profile in total time.*

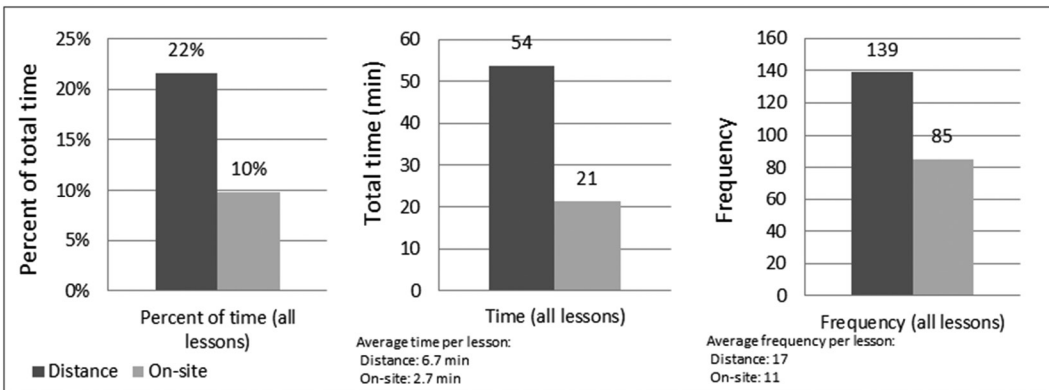*Figure 3: Teacher verbal interaction with student.*

Figure 4: Teacher verbal interaction with parent.

one notable difference is the frequency of verbal interactions by the teacher (student and parent combined), with 812 during distance lessons and 1840 during on-site lessons. This huge difference can probably be explained by the ease with which the teacher can address the on-site student, and so the verbal interactions can be short and frequent, while in the distance set-up, every verbal interaction by the teacher means stopping what is actually happening at the far end and because of the delay in time, this is not always easy. It would be natural for the teacher to interject less frequently and to accumulate comments before delivering them. Also, for on-site lessons, most teacher verbal interactions are with the student, and so the comments are kept short and frequent, while in the distance situation, most comments are with the parent, and so comments can be longer and less frequent. Finally, the more introverted nature of the distance student could be another reason for the lower frequency of verbal interactions, but we cannot rule out the effect of being taught remotely, as a previous study by Henderson and Jones (1997) has reported that distant students ask fewer questions.

The teacher's verbal behaviours were also calculated by types of interaction and are represented in Figures 5 and 6.

The most prominent teacher verbal behaviour was *directives*, with 12% for on-site (average of 64 events per lesson or three min nine seconds per lesson)
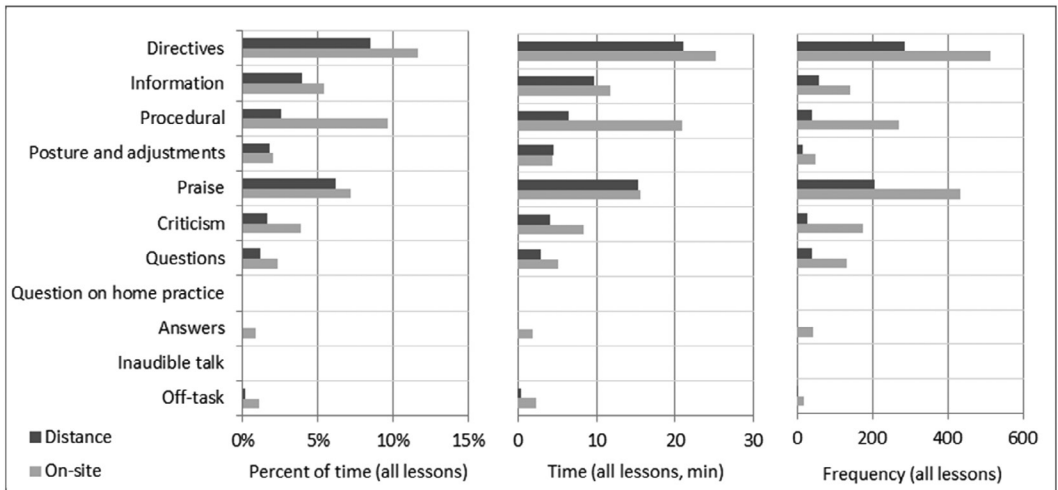
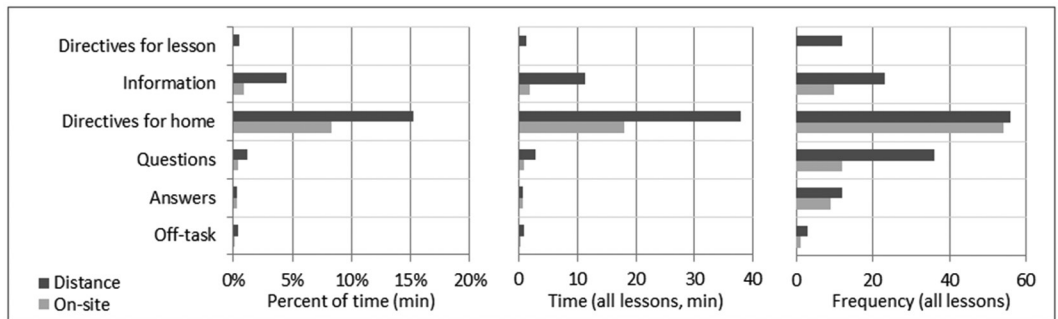*Figure 5: Teacher to student total verbal interaction by types.*

Figure 6: Teacher to parent total verbal interaction by types.

and 9% for distance (average of 36 events per lesson or two min 38 seconds per lesson). The frequency of verbal directives given by the teacher clearly shows a much larger number of interactions for the on-site student (514 occurrences against 286). However, when we calculate the amount of time that the teacher provides directives, we obtain 26 min for on-site and 21 min for distance. Since the distance parent plays an important role in assisting the teacher during the lesson, it is interesting to add the parent's numbers. These results become even closer, with the on-site student at 12% of total time and the distance student at 10%. When analysing the frequency of verbal *informa-tion* provided by the teacher, we observe a much larger number for the on-site student (140 occurrences against 58). However, when we compare the amount of time for verbal information, we obtain similar results as above, with the teacher providing eleven min of information for the on-site student against nine min for the distance student.

The percentage of time when the teacher provides *praise* is very similar in both contexts (6.2% for distance and 7.2% for on-site or fifteen min nineteen seconds for distance and fifteen min 31 seconds for on-site); however, the frequency of praise was much higher for the on-site student (433 compared to 207). It seems that the ease of on-site interactions favours frequent verbal

comments while the delay in interventions with the distance student and the need to interrupt an activity in the distance studio contribute to a smaller amount of interactions. But when calculating the percentage of total observed time, and even more so with the percentage of the total amount of time attributed to praise, the numbers are very similar. It is as if the teacher makes sure that each student benefits from the same amount of time of positive feedback.

In both contexts, the amount of praise far exceeds the amount of *criticism*; however, the on-site student received more critical comments (average of 22 per lesson) compared to the distance student (average of 3.4 per lesson). After observing the video, it appears that this is due in large part to the personality of the two students. The distance student was very focused, an extreme perfectionist and constantly careful not to make any mistakes; the on-site student was more easily distracted, causing many small mistakes or errors that brought criticism from the teacher.

The largest difference in the teacher's verbal behaviours is found in the *procedural* category with 269 interactions for on-site and 39 interactions for distance (or twenty min 40 seconds for on-site and six min twenty seconds for distance). These numbers are not surprising. We observed that much of the time, the teacher was giving procedural instructions while using physical contact to show or correct a movement. This pairing of interactions does not occur in the distance lessons and this could explain the disparity between the two environments.

Teacher action behaviour: the total amount of teacher action is presented in Figure 7. The teacher action behaviours were also calculated by types of interaction and are represented in Figure 8.

Observation is a more passive activity where the teacher is looking and listening to what the student is doing. We found observation to be the most prominent action behaviour exhibited by the teacher and the overall percentage and observation time is nearly the same for both environments, with 39% (on-site) and 40% (distance). *Touch* was the next most prominent physical behaviour (20%), but it could only occur with the on-site lessons. In terms of the more active actions happening in both sites, *modelling* was a prevalent behaviour in both distance and on-site lessons. However, modelling took place slightly more with the on-site lessons (13% compared to 10%).

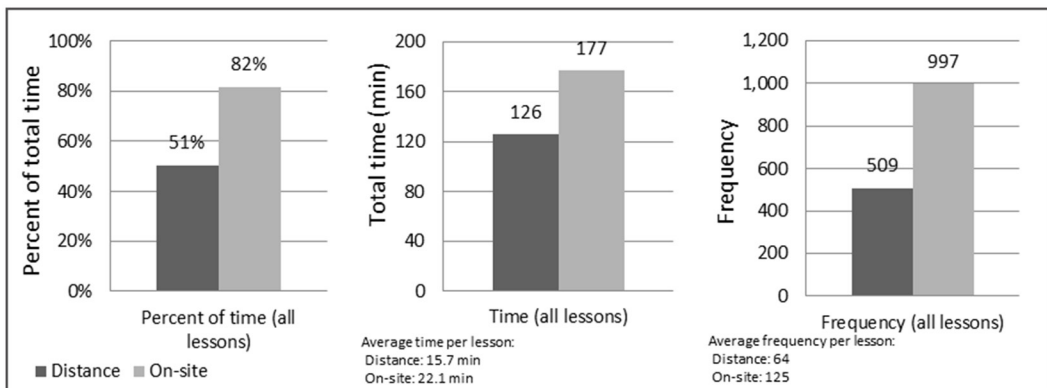*Student verbal behaviour*: the student verbal interactions are presented in Figures 9 and 10.

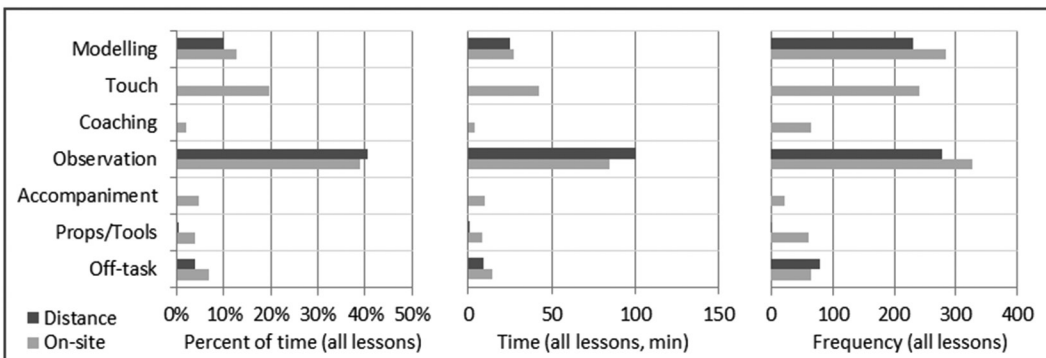*Figure 7: Teacher action behaviour.*

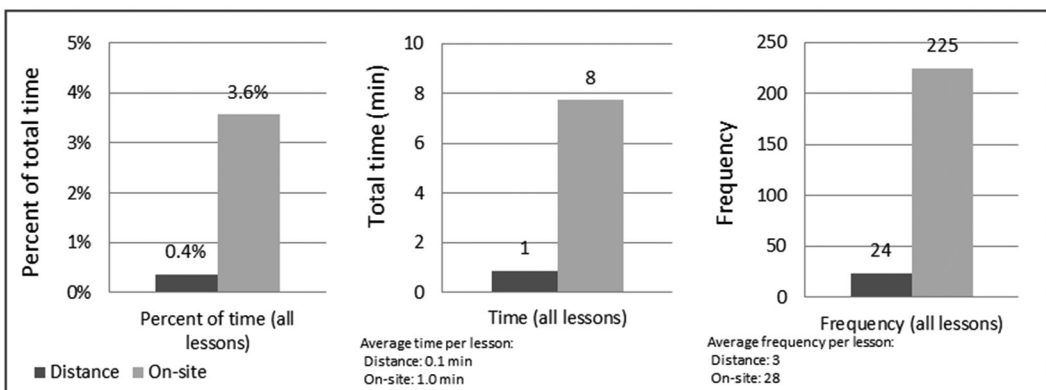*Figure 8: Teacher action behaviour by types.*

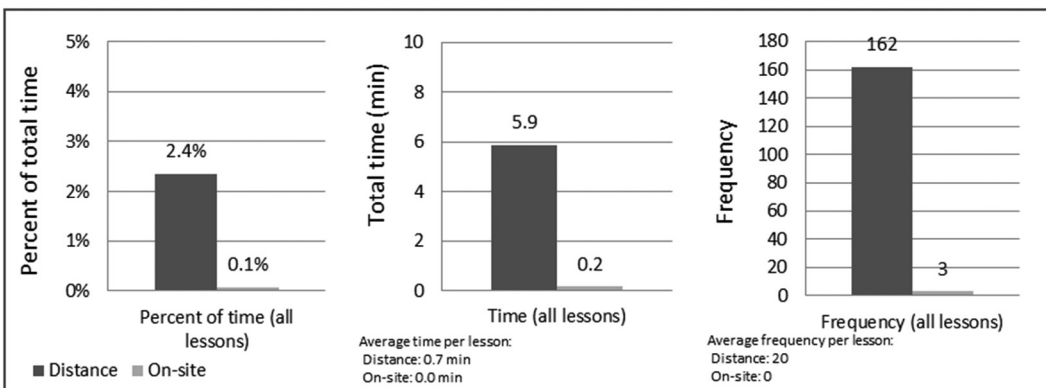*Figure 9: Student verbal interaction with teacher.*

Figure 10: Student verbal interaction with parent.

The student verbal behaviours by types of interactions are represented in Figures 11 and 12.

The on-site student was much more vocal, due in part to her personality. The on-site student was much more comfortable interacting with the teacher while the distance student preferred to interact with her parent. In fact, the
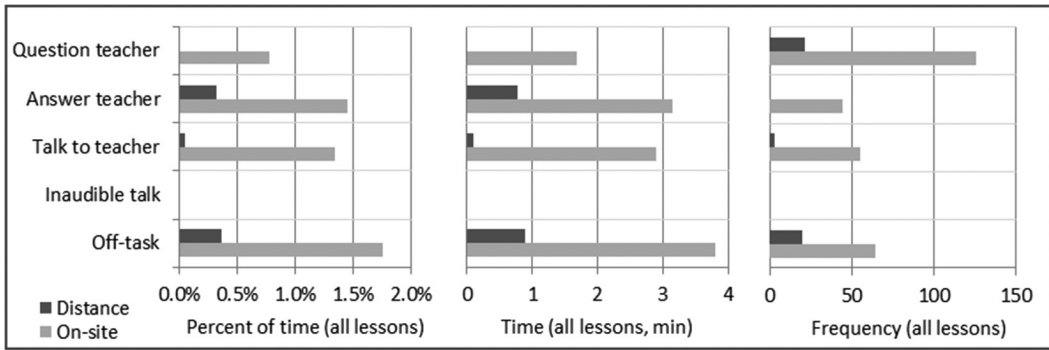
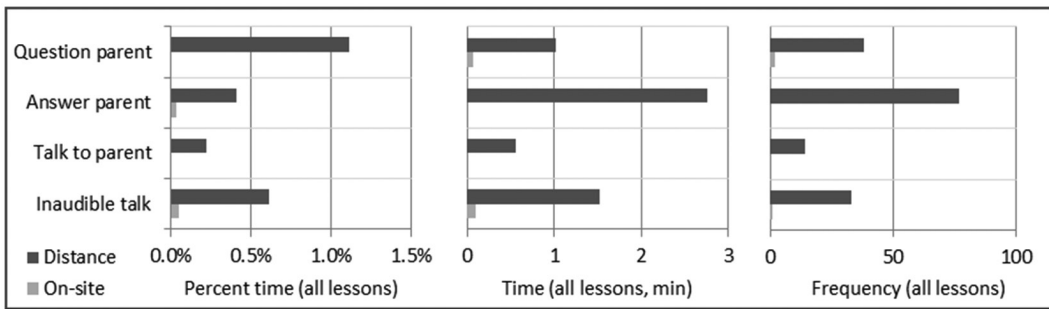*Figure 11: Student to teacher verbal interaction by types.*

Figure 12: Student to parent verbal interaction by types.

distance student's main verbal interaction was with the parent and this is the case for nearly every lesson. Talking to the parent made up 0.61% of lesson time for the distance student and a negligible 0.05% for the on-site student. Similarly, the distance student would provide answers to her parent for 0.41% of the lesson time compared to 0.03% for the on-site student. The parent in the studio lessons played a much smaller role, while in the distance lessons, most of the student's verbal behaviours were towards her parent.

The on-site student talked to the teacher and parent about lesson-related topics for 3.7% of all observed lesson time and the distance student talked about musical topics 2.7% of the time. The most prominent student verbal behaviour for on-site student was *off-task*, comprising 1.8% of the overall lesson time compared to the distance student's 0.4%. The difference can at least partially be attributed to the personalities of the two students, with the on-site student being chatty and the distance student being more attentive and more discrete. Overall, student verbal events did not take up much time during the lessons (3.1% for distance, 5.4% for on-site).

Student action behaviour: the total amount of student action is presented in Figure 13. The student action behaviours by types of interactions are presented in Figure 14.

Students' action behaviours were quite even, with the on-site student having slightly more physical behaviours. The largest disparities in the student action were in off-task behaviours (5.6% difference), performing (4.5% difference) and ensemble playing (3.4% difference). The off-task disparity is largely due to the personality of the on-site student. The difference in performing
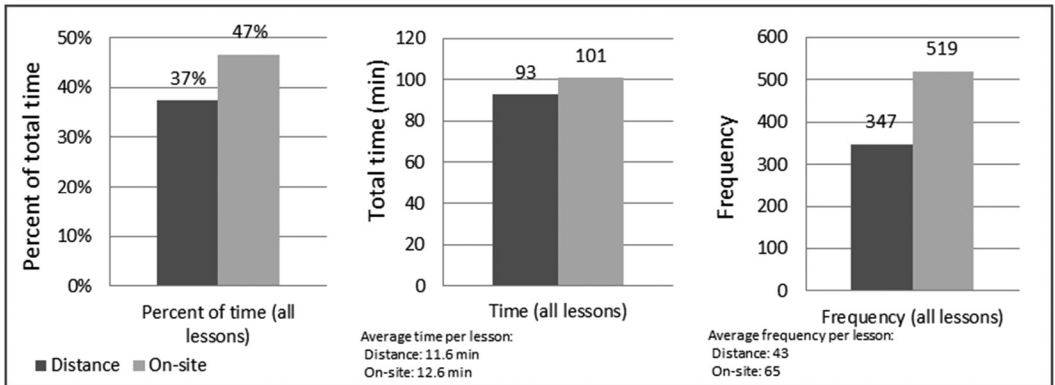
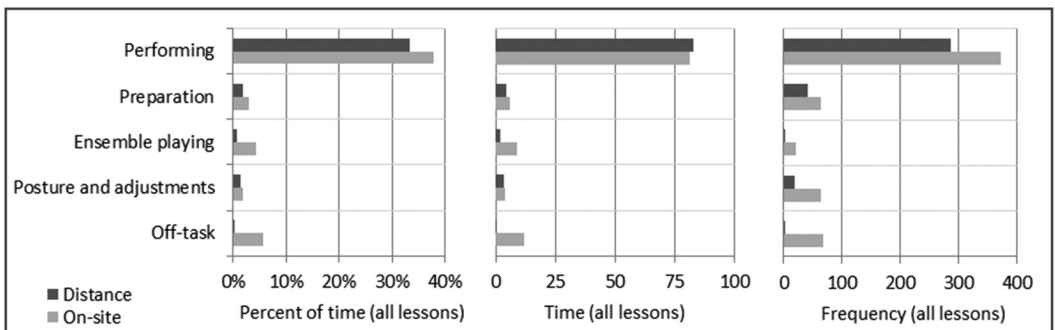*Figure 13: Student action behaviour.*

Figure 14: Student action behaviour by types.

percentage is slightly misleading as both students spent nearly the same amount of time performing (one hr 22 min for distance and one hr 21 min for on-site); however, the distance lessons were slightly longer than the on-site lessons and that changes the percentage. However, the frequency of performance events shows a large difference, with 285 performing events for the distance student and 372 for the on-site student. This could perhaps be explained by the fact that after a few months of lessons, the distance student became more advanced and so the pieces were longer (so fewer performing events for the same amount of time performing). The distance student was also very focused and very disciplined and would perform with few errors, while the on-site student was more fidgety, occasioning more mistakes that would require starting the pieces numerous times, each one counting for one performing event. The difference in ensemble playing is due to the conditions of distance teaching; since the on-site student was in the studio, it was easier to perform in ensemble as there were two pianos whereas in the distance lessons, the only opportunities that the distance student had to play with someone was when another student was present.

The percentage of total time is higher in terms of participation with the on-site student (47% compared to 37%); however, when calculated in total time, the numbers are very close (one hr 33 min for distance and one hr 41 min for on-site). The most prevalent student action behaviour was performing, accounting for 38% (on-site) and 33% (distance). When analysing the total

action time, we noticed that performance makes up 89% of the distance lessons and 72% of the on-site lessons. A major difference between the two students can be seen when looking at off-task action, with less than 1% for the distance student and 11% for the on-site student.

Parent verbal behaviour: the total amount of parent verbal interactions is presented in Figures 15 and 16.

The parent verbal behaviours by types of interactions are represented in Figures 17 and 18.

The distance parent had more verbal interactions with the teacher than the on-site parent. The most prominent parent verbal behaviour was the distance parent's procedural instructions (2.6%), followed by the distance parent's answers to the teacher's questions (2.1%) and the distance parent's directives (1.6%). This can be explained in part by the important role of the parent in the distance set-up, where the mother became the 'teacher's assistant'. In that capacity, she became much more involved in the lessons than her studio counterpart. But this difference is also partly due to the distance student's personality in that she was very timid and her mother would often answer questions for her; in fact, she would answer the teacher's questions three times more often than the on-site parent. The on-site parent also participated,
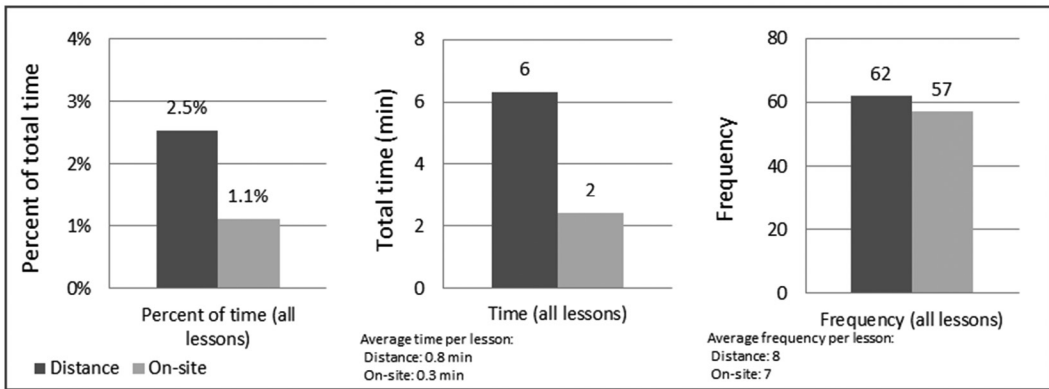

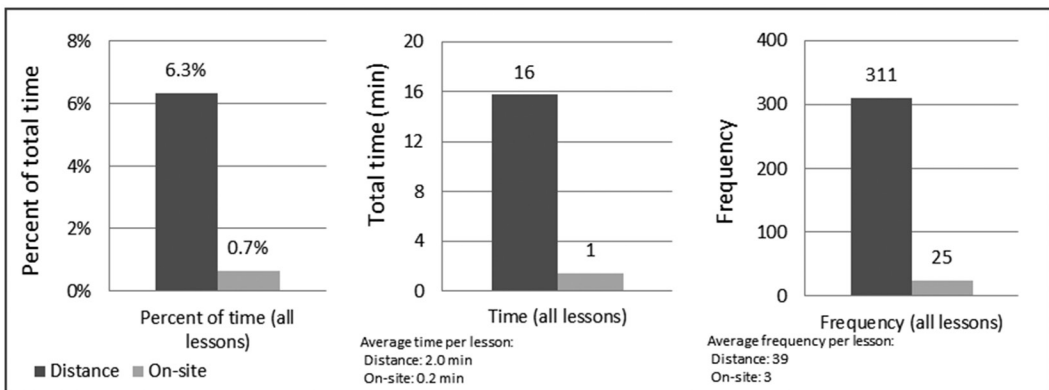Figure 15: *Parent verbal interaction with teacher.*

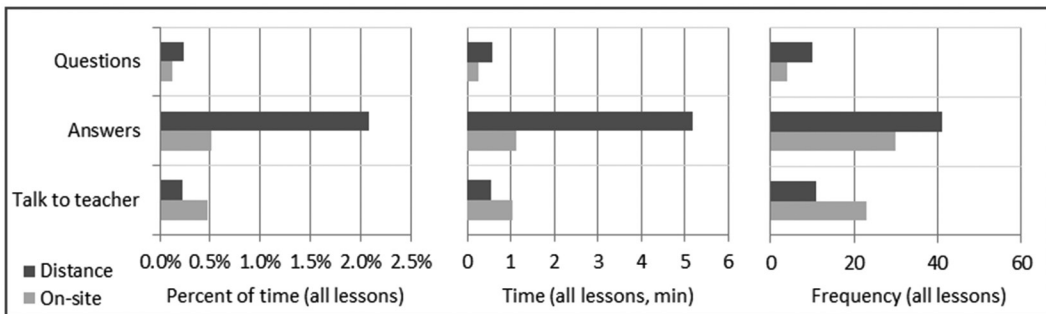Figure 16: *Parent verbal interaction with student.*

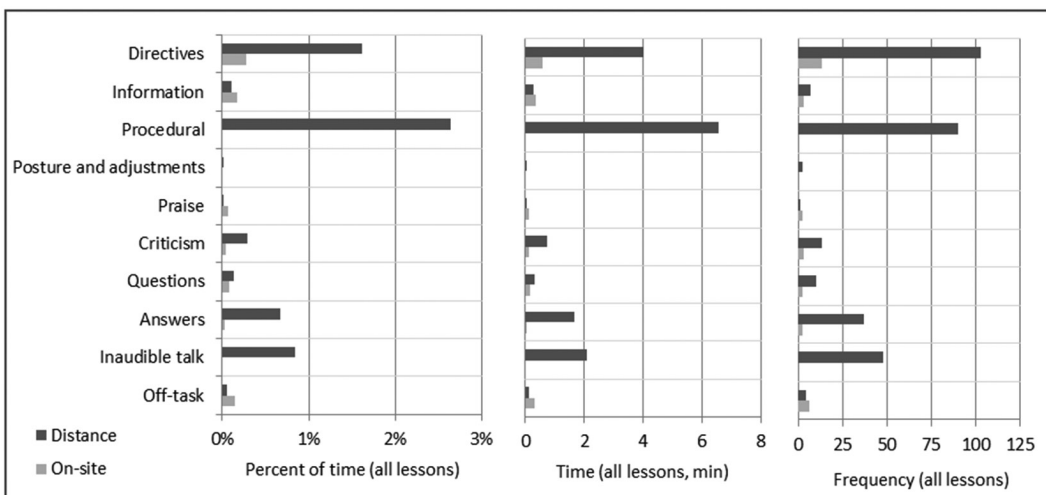*Figure 17: Parent to teacher verbal interaction by types.*

Figure 18: Parent to student verbal interaction by types.
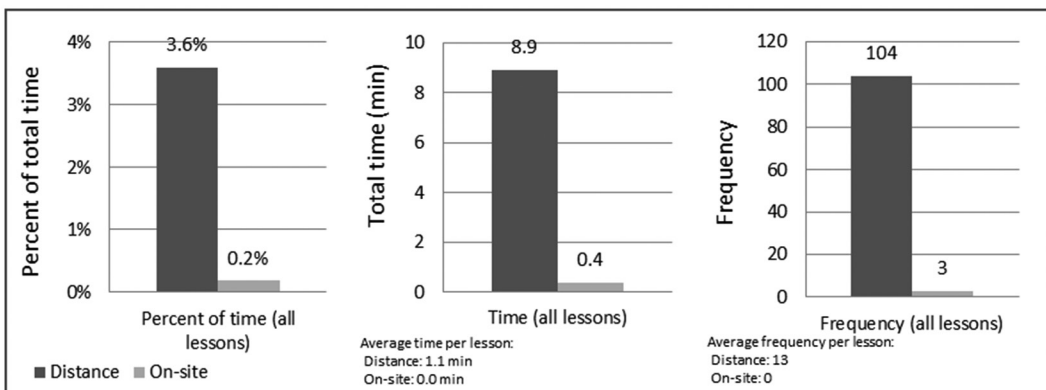

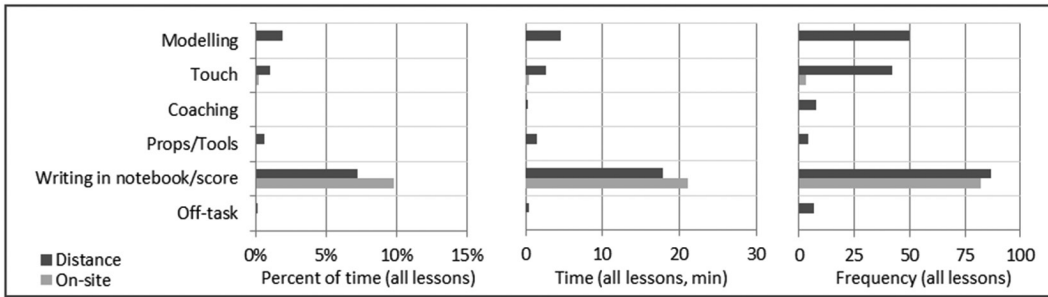*Figure 19: Parent action behaviour.*

Figure 20: Parent action behaviour by types.

but the parent's participation was usually the result of a prompt by the teacher or related to something the teacher said to the student.

Parent action behaviour: the total amount of parent action is presented in Figure 19. The parent action behaviours by types of interactions are presented in Figure 20.

Piano lessons often require a lot of active physical involvement with the student, particularly in the early stages. Because physical proximity between teacher and student does not happen with distance lessons, the parent became absolutely integral to the lesson's progression. This can clearly be observed in all parent action behaviours and most importantly in modelling and touch. While the percentages of the total time observed for distance parent modelling (1.9%) and touch (1.0%) are small, the actual number of times when such behaviour events happened is high, with 50 overall modelling events (or an average of 6.25 times per 30-min lesson) and 42 overall touch events (or an average of 5.25 times per 30-min lesson). From observing the lessons, it seems that the parent naturally took on the role of 'teacher's assistant'. It does not appear that it was ever planned to be that way, but it just naturally happened when there was a need for it.

Discussion

Question 1: Identifying verbal and physical behaviours during a series of beginner piano lessons

Teacher verbal: the literature observing interactions and actions during music lessons has found that the most prevalent behaviour is teacher verbalization (Benson and Fung 2005; Duke 1999; Siebenaler 1997; Speer 1994). Colprit (1998) has calculated that teacher verbalization occurs in 45% of the total teaching time. Kostka (1984) found that teachers' instruction occupied more than 40% of lesson time and Taylor (2006) found that teachers spent 37% of the lesson talking. This is comparable to our study, where teacher verbalization (to student and parent) was 47% (distance) and 53% (on-site). The fact that our study has a slightly higher percentage was to be expected since we were observing beginner students. Since piano lessons are based on a master/apprentice model, it is not surprising that teacher verbalization dominates the lesson time.

Teacher verbalizations were similar across studies in the use of directives, giving information, feedback and questions (Benson and Fung 2005; Gipson 1978; Kostka 1984; Siebenaler 1997). Colprit (1998) observed that verbalizations by the teacher were most frequently in the form of directives. A study by

Duke (1999) found that most of the teacher verbalizations were information statements (27%), directives (24%), positive feedback (12%) and teacher questions (10%). The numbers for our study (including teacher verbal to student and parent) are directives (20% for the on-site and 24% for distance), information (6.3% for on-site and 8.4% for distance), procedural (9.6% for on-site and 2.6% for distance) and questions (2.7% compared to 2.3%). The difference between our results and those of Duke is probably best explained by the fact that we were observing two young beginner students and Duke was observing a larger number of participants from different levels.

Studies report that teacher feedback accounts for less than 10% of lesson time (Goolsby 1997; Kostka 1984; Siebenaler 1997; Speer 1994; Yarbrough and Price 1989), in line with our own study, where teacher feedback (praise and criticism) made up 7.8% of distance lesson time and 11% of on-site lesson time. Colprit (1998) observed that positive feedback was twice the rate of negative feedback and Duke (1999) found a huge difference between positive feedback (12%) and negative feedback (2.0%). We also observe a considerable difference in our study between praise (7.2% for on-site and 6.2% for distance) and criticism (3.9% for on-site and 1.6% for distance). Finally, Speer (1994) noted that the teacher spent the least amount of time making social statements (0.1%) and doing off-task talk (3.1%). This is consistent with our study, where off-task verbalization was at 0.2% for distance lessons and 1.1% for on-site lessons.

Teacher Action: after the teacher's verbal behaviour, modelling is often the next most prevalent teacher behaviour (Gipson 1978; Schmidt 1989). Speer (1994) found that teacher modelling accounted for 16.45% of lesson time and Taylor (2006) observed that modelling accounted for 10% of the lesson time. This is similar to our own study, with 10% (distance) and 12% (on-site). Duke attributes 13% of lesson time to touch and our own study observed 20% of lesson time (on-site student only). The difference can be explained by the age of the students; our study had beginner students and more touch is often needed in the early stage.

Student action: authors often mention that performance is the main student behaviour activity during a piano lesson, taking up to approximately half of the lesson time. Kostka (1984) found that students under age 11 performed 53% of the lesson time and Siebenaler (1997) observed that students performed 51% of the time. Colprit (1998) reported that student performance accounted for 41% of the overall lesson time. Benson and Fung (2005) reported that the American group of piano students that they observed performed 40% of the time; Costa-Giomi et al. (2005) reported the exact same percentage while Speer (1994) reported 42%.

Our results were 33% (distance) and 38% (on-site) of performance time. These lower numbers can easily be explained by the very short pieces that our beginner students were learning. In Siebeneler's study, the average episode of playing was 26 seconds; with our students, the average playing episode was seventeen seconds for distance and thirteen seconds for on-site. Again, the lower numbers in our study most likely reflect the level of repertoire performed by the students. In Siebeneler's study, students were playing at a more advanced level, and so playing for a longer period of time before having to stop and rework a section or start all over again was more common. In our study, the duration of most pieces was less than 30 seconds. Finally, Kostka (1984) reported that 10% of lesson time was spent on off-task behaviours, a

Behaviour category	Distance	On-site
Action	13.8	10.8
Verbal to student	5.7	3.2
Verbal to parent	23.1	15.0

Table 2: Average time per teaching behaviour (s).

Behaviour category	Distance	On-site
Action	15.9	11.6
Verbal to teacher	2.2	2.1
Verbal to parent	2.2	3.4

Table 3: Average time per student behaviour (s).

result very similar to our on-site student at 11% of off-task activity (however, the very focused distance student had less than 1% of off-task activity).

Duration of teacher and student behaviours: the average duration of each teacher's behaviour was studied by Siebenaler (1997) and he concluded that the 'mean duration of any teacher behaviour category was, on average, less than 10 s', which is in agreement with the results of our study (Table 2), except for verbal communication with parents, something that was not studied by Siebenaler, as parents were not attending lessons. Colprit (1998) also found that student activity episodes were generally frequent and brief, something that was observed in our study (Table 3).

Question 2: Identifying the observed similarities and the differences in verbal and physical behaviours between the on-site and distance teaching environment

Teacher behaviours: We observed a few general trends in the teacher verbal behaviour. The percentage of verbal interaction with the distance student is much lower (43% for on-site compared to 26% for distance). However, when adding in the verbal interaction with the distance parent, the percentage becomes more similar between the two environments (53% for on-site and 47% for distance). The same observation can be made when we analysed the total time of teacher verbal behaviour (93 min for on-site and 64 min for distance). When the interactions with the parents are added, the results become identical (114 min for on-site and 118 min for distance). It appears that the differences observed are due to the person the teacher is interacting with and not how much verbal interaction is provided in each environment. While the teacher spent almost the same amount of time delivering verbal information, it is obvious that the distance parent is receiving a lot more verbal information from the teacher (22% compared to 10%). The difference in information given to the distance parent is eleven min fourteen seconds (or 4.5% of total time) compared to one min 53 seconds (or .87% of total time). These numbers confirm the prominent role played by the parent for the distance lessons.

The most striking observation is the similarity between the teacher's behaviours in both environments. Aside from procedural verbal behaviour, which is understandably more appropriate when the student is on site, all other teacher to student verbal behaviours had less than a 4% difference

between the two students. While the teacher was more physically engaged with the on-site student as she was physically in the studio, all other action behaviours that were not hindered by the distance were nearly equal overall (these behaviours being observation, modelling and writing in notebook).

Parent behaviour: as part of the MusicGrid project, a series of video-conferencing sessions were put in place to allow violinist Pinchas Zuckerman, Artistic Director of the National Arts Orchestra in Ottawa, to teach his violin students at the Manhattan School of Music in New York City (Williams 2010). Interestingly, for the lessons to be successful, Zukerman required an on-site 'home teacher' to demonstrate and correct, through touch and physical contact, specific playing techniques. In an interview, the teaching assistant recognized that when Zukerman was teaching from Ottawa via videoconferencing, he was 'unable to feel the student's tension or see a shoulder rising' (Homfray 2007: 37). While it is reported that these sessions were successful, they were dependent on having a teacher's assistant on-site.

It is obvious from our study that the parent was playing the role of the teacher's assistant for the distance student. While it is common for Suzuki lessons to have the parent attending the lesson, the distance parent had a prominent role. We also believe, after viewing the piano lessons, that the distance parent was better prepared for the role of home teacher as compared to the on-site parent. For example, when O'Neill (2003) studied the home practice session of a group of 30 Suzuki piano, violin and cello students under age 12, she observed that the parents were fulfilling the same role in the home as the teacher during the lesson, structuring, leading and pacing the practice. The parents modelled for the child, provided directives and information according to the content of studio lessons. Lee's (2007) findings also showed that the parent used positive feedback and reinforcement, directives cues and instructions and physical touch to help the student progress during the home practice session. In our study, we believe that the distance parent was better prepared than the on-site parent to play that role during home practice. Since the parent was working with the student during the lesson, the teacher could see if the parent understood exactly what the child had to do. Since the distance parent was often the one demonstrating at the lesson, it was clear that the parent left the lesson with a clear understanding of the technical movement or musical expression that was required during home practice. That could partly explain why the distance student progressed so rapidly. The distance student was also more focused and on-task during lessons, which could be another reason for faster progress. This might also suggest that it would be beneficial during on-site lessons to let the parent work with the child at times, while the teacher observes and provides comments. It might not be necessary that the teacher is always the one interacting with the student; coaching the parent on how to assist their child and observing them work together might be very beneficial to improve the quality of home practice.

Conclusion

The results of our study indicate that the most significant difference between the on-site and distance environments was the role played by the parent. During the distance lesson, we observed that the parent's participation was greatly increased as the parent became the teacher-assistant during lessons. We can therefore conclude that, in the case of individual piano lessons, additional assistance is required from the parent to overcome restrictions imposed

by distance. As for the students, although the on-site student had greater participation, their involvement and interactions remained quite similar despite the different learning environment. Surprisingly, the teacher's strategies were very consistent in both environments. While the amount of verbal interaction with the student was less with the distance student, that was largely compensated for by the verbal interaction with the distance parent. Overall, the amount of instruction was the same for the on-site and distance student and the teaching methods were very similar. This conclusion is very much in line with Orman and Whitaker's (2010) study comparing the use of time during on-site and distant teaching.

It is obvious that the main disadvantage related to distance teaching is the lack of physical proximity and physical touch. One of the important characteristics of private music lessons is the physical contact between teacher and student as a strategy to convey the technical skills required to play the piano. The teacher can manually shape the hand posture of a beginner student, adjust finger positions, move the forearm and the elbow to develop freedom of movement, point out tension in the arm and shoulder and rectify any other bodily aspect of piano playing. With distance music lessons, music teachers can no longer 'take the hands of the pupil and play together with him' (Maki 2001: 1213). While we originally thought that this aspect alone would be enough to slow down the pace of the lessons, limit the learning experience for the distance student and necessitate specific accommodations to overcome the lack of physical contact, we were very surprised to witness how the teaching of every physical aspect of piano playing happened so fluently and very naturally. We believe that future research should focus on analysing this particular aspect of distance piano teaching to understand how a distance student acquires proper piano technique when the teacher cannot provide any physical touch. This was one of the most fascinating aspects of the lessons that we observed and how it happened remains a mystery.

In addition to a successful demonstration of teaching a piano student remotely using videoconference technology, this study characterized and compared the behaviours of an on-site and a distance teaching context. Obviously, by comparing only two students, it is not possible to generalize the results. However, this study can be considered an exploratory study that serves as an opportunity to better understand what kind of behaviours are going on in two different piano teaching set-ups. A similar study with a greater number of participants to allow for inferences to the general population is recommended for future research.

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SUGGESTED CITATION

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