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Koninklijk Conservatorium Den Haag

Intention-based Piano Pedagogy

Bridging the gap between tradition and recent scientific insights

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1. Introduction

The Royal Conservatoire of The Hague (hereafter: KC) aims to prepare students to function in society successfully, by employing a variety of professional activities, such as performing, creating and teaching ("mixed professional practice"). These activities are ideally experienced as "originating from the same artistic source" in the sense that musicians use their artistic competences in all of them. Hence, the KC aims to provide students with enough capacities for all aspects of mixed professional practice, not only to start their professional careers successfully, but also to experience fulfilment and inspiration in all professional activities, thus enabling life-long learning.

One of my jobs at the KC is to teach piano methodology ("piano pedagogy")[1] to classical pianists in the bachelor program. This course lasts a little longer than a year, starting in the second semester of the second bachelor year and ending with the educational exam in April of the third bachelor year. It involves weekly lessons of approximately one hour. In connection with this, students perform an internship consisting of 25 lessons involving two pupils: one complete beginner and one more advanced pupil. Internship lessons take place within the building of the conservatoire on a weekly basis. Participating internship pupils pay a modest lesson fee to the conservatoire. Piano methodology is part of the minor in education program, which is mandatory for classical pianists. This minor also includes courses in music psychology and educational pedagogy. Students get feedback on their internship lessons both from the teachers of subject methodology and teachers of music psychology/educational pedagogy. On average the group size of my piano methodology classes is three students: one third are Dutch and two thirds are from other countries.

One of the inspiring aspects of piano methodology is the difference in background between the students, not only in terms of language and culture but especially in the way they "grew up" musically. This is not only caused by the fact that they come from different countries all over the planet, but mainly by the wide variety of music teaching approaches that exist worldwide, even within one country. These various musical and educational backgrounds enable and trigger the debates and exchanges of ideas on piano pedagogy that frequently take place in the methodology lessons. The way students were taught in their childhood plays an important role (and is often easily recognizable) in their own actions as a beginning piano teacher.

The piano methodology course covers various aspects of piano pedagogy, such as auditory approaches, improvisation, keyboard harmony, practice strategies and knowledge of educational repertoire. However, the core content of the course is how to teach qualitative aspects of piano playing, such as articulation, dynamics, pedalling and phrasing. Within piano pedagogy there is a wide variety of pedagogical approaches to these pianistic skills. My aim is to enable students to acquire

[1] Although the internationally used term is piano pedagogy, in this thesis I will refer to this course with the name that is used at the KC (piano methodology).

effective teaching strategies that suit their educational convictions. As a result, the course intends to offer students enough freedom and autonomy in order to develop a personal voice as a teacher. Students should experience that core values of their own musical upbringing are respected and can be maintained and utilized when they teach. At the same time, I intend to guide students towards effective teaching strategies that correspond to up-to-date scientific insights into motor skill learning and motor control. In an early stage of my career as a pianist and piano teacher, I became fascinated by recent scientific insights into motor skill learning and human motor control. I have been collecting information arising from these fields of science, incorporating it into my practice. I aim to make this body of information available and practically applicable to students of piano methodology so that they can use it to their benefit. In my experience, research on motor learning and motor control is potentially valuable for music pedagogy. It lends support to certain practices within piano pedagogy and puts others into perspective. All in all, I believe science may offer piano pedagogy new ideas and tools for evaluating current teaching practices.

In previous years, I have put together an over-arching vision on musical motor learning processes that is based on the aforementioned body of scientific information. Moreover, I have applied this vision to piano pedagogy and collected and organized practical examples of it in order to present students with concrete ideas of its application. I will discuss this vision and its scientific underpinnings in detail in chapter 2. Key principle is that motor actions in music are primarily shaped according to mental auditory representations of intended musical sounds ("musical imagination"). Pupils need to have vivid ideas of the musical sounds they intend to bring about by their actions. Therefore, movement, musical imagination and listening should ideally be addressed in conjunction by teachers. In addition, research on motor skill learning suggests that motor learning processes ideally take place implicitly, i.e. learners acquire little or no verbal knowledge of movement performance (knowledge of "how" they move) and focus their attention on the outcome of their actions rather than on how they move. This contrasts with current practice in music education, in which teaching strategies are predominantly explicit, providing learners with literal instructions how to move and suggesting them to focus their attention on how they move. Recent scientific research shows that explicit and implicit motor learning both have different outcomes. The advantages of implicit motor learning are, among other benefits, better performance under stressful circumstances, greater movement economy and greater attention for other aspects of the task, for example the way strategy is applied in case of sports. These advantages are very much relevant for musicians and music teachers.

During my observation of internship lessons, I noticed that students are doing a fine job with many aspects of piano pedagogy. Most notably, they exhibit a high sense of responsibility towards their pupils, often resulting in lessons exceeding their indicated length. Also, students are capable of quickly and accurately identifying pianistic deficiencies such as rhythmic unevenness, shortcomings in articulation and pedal flaws. Focusing on their instruction style, I observed that students tend to

employ movement instructions that are not related to auditory musical goals: isolated movement instructions. In many cases these instructions were generalized and normative, literally suggesting to pupils "how one is supposed to sit or move", without addressing which improvement of pianistic quality in terms of sound is intended. Considering current scientific insights into motor learning processes, this is a relatively ineffective teaching strategy. This notion is further supported by the observation that the impact of this type of instruction generally does not last long: once pupils start playing, the described "correct" posture or hand position soon disappears, causing frequent repetitions of movement instructions.

In summary, I observed a problematic discrepancy between the pedagogical approach to pianistic quality that I advocate in the piano methodology course and the pedagogical approach that students predominantly applied in their internship lessons. On the one hand, during methodology lessons students found it obvious that musical imagination is the primary agent in motor control and that listening is an important source of feedback on one's musical actions. On the other hand, they seemed to find it difficult to put this insight into practice in their lessons and to treat movement, musical imagination and listening holistically. My research primarily aims to address this situation and identify which additional guidance I can provide my students with in order to acquire effective teaching strategies. The subsidiary goal of my research is to review relevant research from the fields of motor skill learning and motor control in order to underpin the overarching view on musical learning processes conveyed in my piano methodology course. Moreover, I intend to demonstrate the relevance of this body of information and to make it accessible to musicians.

Throughout this thesis I will use the word "student" when referring to students of my piano methodology course and "pupils" to refer to their internship pupils or piano pupils in general. In the discussion of the contextualisation of my research, the word "learner" refers to persons who are learning a motor skill.

1.1 Research question

Based on the aims of my research, the main research question is:

> *How can I guide the students of piano methodology towards applying effective educational principles for achieving pianistic quality in their internship lessons?*

Additionally, I formulated these subquestions:

A. *Which educational principles for achieving pianistic quality can be derived from current scientific knowledge of motor control and motor skill learning?*

B. *Why do research-supported views on motor skill learning not typically match practice and opinions regarding motor learning, that are traditionally passed on in music education?*

C. *What are the conditions under which students of piano methodology can understand and apply their study material properly? Is my presumption that I should have more, and better instruction and training material correct? Are there other factors?*

D. *What are the characteristics of lesson material for the piano methodology course that aims at conveying research-supported principles of motor learning processes applied to piano pedagogy and enabling students to apply these principles effectively and independently in their internship lessons?*

At the end of the first year of this research, I decided to implement peer-learning as an additional tool for developing effective teaching strategies. More specifically, I created opportunities for students to observe their own and each other's lessons in a structured manner and provide themselves and each other with feedback. As a result, I added one more subquestion:

E. *How can I facilitate peer-learning in the internship?*

1.2 Relevance

This research aims at improving the conveyance of effective educational principles to students of my piano methodology course. I intend to discover which additional interventions help my students to apply research-supported principles of piano pedagogy independently in their internship lessons. More specifically, my aim is that students learn to address movement, musical imagination and listening in conjunction when working on pianistic quality with their pupils. In my experience, this is a relevant goal since it enables students to benefit from valuable knowledge arising from scientific research, thereby enhancing the effectiveness of their teaching. This in turn will increase the likelihood that they experience fulfilment in teaching and will continue to develop as a piano teacher throughout their career.

The subsidiary aim of this research is to show the relevance and potential applications in music pedagogy of information arising from research into motor skill learning and motor control. Based on conversations with colleagues I know that many music teachers are interested in acquiring up-to-date knowledge on these topics. However, most research involves non-musical skills and not much has been written about applications of this knowledge in music pedagogy. My discussion of the contextualisation of this research intends to review relevant research results and show its implications for music pedagogy in general and piano pedagogy in particular. I hope this will generate more interest in this body of knowledge among musicians and contribute to innovative teaching practices.

2. Research contextualisation

The performance of music requires the ability of musicians to accurately, flexibly and reliably translate their musical ideas into actions. The actions of musicians are accompanied by a constant stream of sensory feedback. In the first place, musicians hear the outcome of their actions. Secondly, sensors in their bodies generate feedback towards the central nervous system concerning joint position and movement, muscle length and force exerted on tendons. This source of feedback is called proprioception, which has been defined as "the sense of the relative position of one's own parts of the body and strength of effort being employed in movement" (Anderson, Anderson and Glanze 1994, 1284). Furthermore, instrumental players feel the contact with their instrument whilst playing. Lastly, musicians may receive visual feedback on their actions. For instance, pianists see how their hands move in relation to the keyboard. The coordination of the actions required for the performance of music can only take place effectively when it is functionally linked to the perception of its consequences. Put another way, perception and action are tightly coupled within musicians' nervous systems. The skills required for the performance of music can therefore be classified as perceptual-motor skills. One of the current definitions of perceptual-motor skills is: "Any ability or capacity involving the interaction of perception and voluntary movement, typical examples being the ability to type and the ability to play a ball game" (Colman 2015). Motor skills are acquired and improved as a result of practice and experience. Over time, smoothness and accuracy of the movements involved increase. This phenomenon is called motor skill learning. Richard Schmidt proposed the following definition of motor skill learning: "A set of processes associated with practice or experience leading to relatively permanent changes in the capability for movement" (Schmidt and Lee 1999, 264).

One of the goals that I pursue, both in teaching piano and in teaching piano methodology, is to create a link between current scientific information on motor skill learning and piano pedagogy. Even though little research has been done on the learning process of pianistic skills, information arising from research about other perceptual-motor skills can be applied in the field of piano pedagogy. Over the past years I have collected and organised scientific knowledge from the field of perceptual-motor skill learning and human motor control that I found relevant for the pedagogic approach of piano lessons. Based on this information, I have put together an over-arching vision on the learning process of pianistic skills, which I present to students in my piano methodology course. In this chapter, I will summarize the information that underlies the pedagogical approach of piano lessons conveyed in my piano methodology course, their implications for music teaching in general, and piano pedagogy in particular.

This chapter starts with a discussion of intentional, goal-directed actions, focusing on how these are processed in the nervous system. I will explain how the brain uses predictions of the sensory consequences of one's actions in order to generate movements that produce the intended result:

predictive processing. Furthermore, I will argue that in music making, the production of intended musical outcomes is the goal of one's actions. Accordingly, musical intentions and corresponding auditory expectations of outcomes of musical actions are the primary agent of motor control processes. Next, I will discuss how musical intentions and motor control are linked in the brain and how they become better adjusted to each other as a result of learning processes. The learning processes leading to more successful translations of intended perceivable outcomes into actions are called ideomotor learning processes and take place without the learner being aware of it, as a result of self-organization taking place in the nervous system. After this, I will discuss musical intentions in detail, contrasting musical imagery (conscious mental experiences of musical sounds that are not physically present) with musical imagination (non-conscious auditory intentions underlying musical actions). Subsequently, I will discuss the concepts of self-organization and implicit motor learning, summarizing the constraints-led approach to motor skill acquisition and reviewing information on implicit and explicit motor learning strategies. The next part of this chapter demonstrates how ideomotor learning processes can be facilitated by music teachers in various ways. I will summarize the educational concept of nonlinear pedagogy, which suggests that practitioners (teachers, coaches) can manipulate factors that influence motor performance of the learner ("constraints") in order to guide learners towards optimal movement solutions. Moreover, I will present a variety of constraints that can be manipulated by piano teachers in order to facilitate the learning process of pianistic skills. This will include various applications of implicit motor learning in piano pedagogy. After this, I will summarize the pedagogic approach to the acquisition of pianistic skills that I convey in my piano methodology course. The chapter will finish with a discussion of the tension that exists between traditional approaches to motor skill learning in music pedagogy (and the paradigms that underpin them) and more recent, research-supported teaching strategies.

2.1 Predictive processing

> Interviewer: Tell us the secret of beautiful sound.
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> Murray Perahia: I wish I knew. Pianists go into even books about sound production. And I tried to read these books and they're Greek to me, I don't know, about the level of the arm or the… I don't know, you probably have studied all of this. For me it's Greek. It's something in the heart and the way you hear the music that tells you how the sound is playing. The combination of the way you hear it and the way your heart tells you to hear it. For me there's no magic, it just comes straight through. I sometimes think about technique, but largely it's instinctive.
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> Interview with pianist Murray Perahia by Arie Vardi *(Perahia 2012)*

Human beings possess the capacity to move intentionally, i.e. to move in such a way that intended outcomes are achieved. For example, a person intending to pick up a pen lying in front of him, will move his body, arm and hand in a gesture that accurately and effortlessly leads to the desired result. People are sometimes aware of their intentions and capable of expressing them verbally. However,

they are largely unaware of the processes taking place in their nervous systems that transform their intentions into actions. In music making, the production of intended musical outcomes is the goal of the activity. Musical intentions and corresponding auditory expectations of outcomes of musical actions are the primary agent of motor control processes. Put differently, based on anticipations of intended musical sounds, the nervous system generates patterns of movement that lead to the production of the former. Novembre and Keller explain this fundamental insight by means of the following example:

> Let us take a basic example: striking a piano key with a finger. The movement (striking the key) is intended to generate a goal (a piano tone). When this is observed from the "outside" perspective of another individual, this phenomenon seems straightforward: the movement preceded its goal. However, when considering a "first person" perspective, it is the musician's intention (i.e., producing a piano tone) that leads the generation of a movement: moving the finger toward the piano key. This distinction might seem trivial, but in fact it represents a fundamental step to understanding that movements and their ensuing effects are intrinsically coupled in the human brain and in cognition. More specifically, a representation of a perceptual effect can trigger the movement necessary to produce the effect itself *(Novembre and Keller, 1)*.

Before initiating a goal-directed action, the individual must have a representation of the desired effect in mind and must use this representation to select a movement pattern that will successfully bring about this effect. This insight was first described by the philosopher William James and has become known as the "ideomotor principle" (James 1890). Recent neuroscientific research has suggested that the nervous system achieves this transformation of intention into accurate motor control by means of predicting the sensory consequences of one's actions, a phenomenon known as predictive processing (Adams, Shipp and Friston 2013). Based on the intended outcome of the action, the brain continuously predicts the required movements and the sensations that will arise as a result of them. These predictions are based on previous experiences and implicit knowledge of our own body and the world around us. Implicit knowledge here refers to the individual not being aware of having learned it and not being capable of expressing it verbally, but demonstrating the knowledge indirectly via performance (Willingham, et al. 2000), otherwise known as tacit knowledge. Put simply, the brain "knows" how to affect the surroundings in order to achieve intended results, and which actions of the body are required, as a result of prior experiences. Preceding the initiation of actions and during their performance, the brain keeps readjusting its predictions, thus enabling accuracy and early processing of feedback that results from one's actions. The feedback that results from such actions can be divided into exteroception, by which one perceives the outside world, and proprioception, which is the sense of the relative position of one's own parts of the body and strength of effort being employed in movement (Anderson, Anderson and Glanze 1994). Muscles, tendons and joint capsules are equipped with sensors that continuously keep the nervous system updated on muscle effort, the force exerted on tendons, joint position and speed of movement. Adams et al. have argued that the signals the brain sends down the spine in order to generate intended actions should be seen as predictions of the

proprioceptive consequences of these actions. Classical reflex arcs at the level of the spine respond to these predictions by fulfilling them: they bring about changes in muscle length and joint position so that the actual proprioceptive signals match the predictions, thus producing the intended movements (Adams, Shipp and Friston 2013).

The effects of predictive processing can be seen in certain aspects of motor control in musicians. For instance, pianists have been found to perform wrong keypresses ("wrong notes") softer than correct keypresses. In conjunction with this, differences in brain activity connected to wrong or correct keypresses are observable already 100 milliseconds before keypresses are fully executed (Maidhof, et al. 2009). In practical terms, this indicates that pianists "know" they are going to play a wrong note a split second before playing it and even (non-consciously) try to mitigate negative consequences of the wrong note by playing it softer. This phenomenon is attributed to predictive processing in the pianist's brain, more specifically the detection of a mismatch between a predicted sensory consequence of an action and the intended action goal.

2.2 Ideomotor learning

In order to perform intentional actions successfully, the individual needs to "know" in advance what the consequences of a particular movement will be. As a result, voluntary action requires the ability to associate movements and their perceivable consequences. When individuals perform actions, they learn what the consequences of these actions are, a process known as ideomotor learning (Melcher, et al. 2013). The capacity for linking movements and their ensuing effects is inborn and is fundamental for motor skill acquisition in all stages of life (Hommel and Elsner 2009). Ideomotor learning happens spontaneously, in the sense that it does not require effort or attention of the learner. Moreover, it takes place non-consciously, as a result of self-organizing properties of the nervous system, i.e. the intrinsic tendency of the nervous system to improve its organization without an external control agent (Haken 2008).

Elsner and Hommel (2011) have proposed a two-stage model for the acquisition of voluntary action control, which aims to explain what happens in the brain during the process of ideomotor learning. The first stage is characterized by the individual performing exploratory actions and "discovering" their sensory consequences. Concordantly, this might be named the "incidental" stage. Applied to music making, the incidental stage can be seen when novice learners explore their instruments in order to get acquainted with them, or when more experienced players explore their instruments, aiming to discover how a certain musical outcome that is new for them can be generated. Individuals experience that a certain movement is followed (nearby in time) by certain sensory events. As a result, the representations of both movement and resulting sensory consequences become connected in the brain in two directions: activation of one representation will tend to activate the other one as well. Some examples of this co-activation will be presented below. The action effect thus becomes a retrieval cue

for the associated motor pattern. In stage 2 of the model, these retrieval cues are used for the selection of goal-directed movements by anticipating their effects. The emergence of an intention activates representations of related action effects, resulting in a sensory anticipation of the action that is about to be performed. For musicians, this means that auditory anticipations of outcomes of musical actions are generated. By means of the acquired movement–effect association, this anticipation will activate the related movement pattern, which is then performed and actually produces the intended effect. Since this stage is characterized by moving intentionally, it might be named the "intentional" stage (Elsner and Hommel 2001).

Ideomotor learning results in the emergence of associations between movement patterns and intended perceivable outcomes, also known as action-perception couplings. The brain can form action-perception couplings as a result of tight functional and anatomical links between brain areas involved in perception and brain areas involved in motor control. Current neuroscience suggests that action perception and action execution are intrinsically coupled in the human brain (Novembre and Keller 2014). This point of view is supported by the observation that individuals who perceive events of which they know (as a result of previous learning) that they may result from certain movements, sometimes start performing the movements leading to them, a phenomenon known as ideomotor response activation (Elsner, Hommel and Mentschel, et al. 2002). Put differently, movements can be evoked by using their perceivable consequences as external cues. Ideomotor response activation can even be observed when individuals do not perform any physical movements. For example, various studies have demonstrated that areas of the brain associated with motor planning and execution are co-activated when musicians listen to their instrument (Bangert, et al. 2006). Furthermore, it has been shown that the imagination of perceiving an event automatically activates motor parts of the brain involved in bringing about this same event. For example, it has been found that pianists who imagine producing certain sounds on their instruments automatically activate corresponding motor areas of their brains, even when they do not move physically (Davidson-Kelly, et al. 2011). Conversely, the performance of actions automatically triggers activation of perceptual brain areas, even in the absence of perceivable action effects. It has been demonstrated that the production of silent playing movements leads to activation of auditory areas of the brain (Bangert, et al. 2006). The action-perception couplings required for music making emerge as a result of being musically active. Accordingly, the co-activations described above are only observed in individuals who had (varying amounts of) musical training. Nonetheless, it has been found that action-perception couplings are formed remarkably quickly: non-musicians develop a certain amount of co-activation of auditory and motor brain areas within a couple of days of training a simple musical task (Lahav, Saltzman and Schlaug 2007).

Perception leading to conscious recognition and perception leading to motor control have been hypothesized to be processed along different neural pathways in the brain. According to the dual-stream model of action and perception, conscious perception and recognition is a function of ventral

neural pathways originating in auditory and visual brain areas, whereas perception intended for activating motor control is processed by dorsal neural pathways (Goodale and Milner 1992). The ventral pathways are located more towards the bottom of the brain, the dorsal pathways more towards the top. Dorsal connections between auditory and motor brain areas allow for quick transformation of perceived or imagined musical sounds into motor control. It has been found that musicians who improvise regularly and musicians who do not (regularly) engage in improvisation ("score-dependent musicians") show different patterns of neural activation involved with the transformation of auditory perception into motor action planning (Harris and de Jong 2015). More specifically, improvising musicians showed larger activation of auditory cortex and extensive right-hemisphere activation of the dorsal frontoparietal network, which was not found in the score-dependent musicians. In subsequent research, both groups of musicians had to replicate and transpose non-rehearsed musical fragments by ear. Not surprisingly, the improvising musicians performed this task better than the score dependent musicians: the improvising musicians scored higher on replication of both pitch and rhythm (Harris, van Kranenborg and de Jong 2016). Harris explains the observed behavioural and neural differences by means of the dual-stream model of action and perception and in terms of predictive processing:

> Current practice in classical music can be understood in the context of the dual-stream model of action and perception which claims that conscious aural perception is functionally and anatomically distinct from online audiomotor control. Conscious aural perception and discrimination (audition-for-perception) is a function of the ventral stream, while online audiomotor control (audition-for-action) is a function of the dorsal stream. The fact that music performance is primarily dependent on the latter suggests that the training of conscious aural discrimination skills might have less effect on performance than audiomotor training. Activation of the right dorsal frontoparietal network in improvising musicians suggests that their performance is reliant primarily on online audiomotor control (audition-for-action) rather than on conscious aural perception (audition-for-perception. […] Current brain models suggest that the brain predicts the sensory consequences of our actions and revises motor commands even before overt movement can take place. Even during the performance of an action, early sensory input via the dorsal stream enables the correction of movements before their sensory effects are able to reach perceptual awareness. Prediction of the sensory consequences of our actions is based on previous experience, in particular on implicit knowledge of action syntax acquired non-consciously during practice and performance. The fact that classical musicians do not engage in the improvisation of novel music suggests that, in their case, the brain's prediction of the aural consequences of instrumental performance is not supported by implicit knowledge of the music syntax. *(Harris 2017, 167)*

Continuing this line of thought, Harris suggests a causal relation between traditional approaches of classical music education (in which playing from sheet music is dominant) and the observed relative inability of classically trained musicians to play by ear. Finally, he mentions the predominantly declarative (explicit) approach of classical music theory training (i.e. an approach that emphasizes the acquisition of extensive knowledge, and conscious recognition/discrimination of auditory elements) as a potential cause of the difficulties classical musicians typically experience when having to play by

ear. The ability to make rapid and accurate translations from (mentally) perceived sounds to motor actions is dependent on the acquisition of procedural (implicit) knowledge rather than on declarative (explicit) knowledge. Procedural and declarative modes of learning are now understood to proceed along functionally and anatomically distinct neural pathways. According to Harris, the ability of improvising musicians to play aurally perceived music in more than one tonality can be seen as the expression of enhanced implicit knowledge of music syntax, suggesting that the practice of improvisation could promote the implicit acquisition of hierarchical musical syntax and vice versa (Harris, van Kranenborg and de Jong 2016, 13).

2.3 Musical imagination and musical imagery

> And, here's a clincher: ´I have never practiced scales and always got bad marks for technique' he says. So where did he get all those silvery scale passages, lightning arpeggios and thundering octaves that he releases with such ease during his performances? When asked that question by a music critic/writer from the German Suddeutsche [Süddeutsche] Zeitung, he answered, 'It is the LISTENING, not the PLAYING. I develop a sound image my mind and then I try to project this image in my music. That's all. It's not always easy, but for me it is the only possible way.'
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> Interview with pianist Arcadi Volodos by Cheryl North *(Volodos 2003)*

Musicians have mental representations of the musical sounds they intend to bring about. Various names are used by musicians and music teachers to describe this capacity: musical imagination, audiation, auditory imagination, inner hearing, the mind's ear, to name a few. Some instrumental musicians experience the inner drive for producing musical sounds so vividly that they cannot suppress the urge to sing or hum along whilst playing, pianists Glenn Gould and Keith Jarrett being well-known examples of this phenomenon. The capacity for hearing music in one's mind is not only found in musicians, but is present in a vast majority of people and can for example be observed by the fact that many people exhibit spontaneous musical activities such as singing, humming, whistling or rhythmic finger-tapping (Honing 2010).

Professional musicians are generally capable of vividly imagining musical sounds that are not present at that moment. The skill of reading scores of unknown pieces and forming mental images of how these pieces sound ("notational audiation") is common among professional musicians. A minority of musicians regularly apply mental practice (or, more precisely "mental imagery rehearsal"): they practice by imagining the sound of the piece they are learning, without actually producing this sound (K. Davidson-Kelly 2014). Mental practice requires both extensive musical training and considerable effort. The capacity for consciously imagining music in the absence of it is called musical imagery. It may be effortfully initiated (for example in mental practice) but can also arise automatically (Schaefer 2017, 25). A well-known example of automatically arising musical imagery is the experience of a tune being spontaneously recalled and repeated within the mind, also known as "earworms", or (more accurately) "involuntary musical imagery" (Jakubowski, et al. 2017, 122). More than 90 percent of

people experience earworms regularly, i.e. at least once a week (Liikkanen 2008).

The concepts of musical imagery and musical intentions differ at a crucial point, namely the role of consciousness. Whereas musical imagery refers to conscious experiences of imagined music, musical intentions are not (necessarily) experienced consciously. As has been argued above, musical intentions (mental auditory representations of intended musical sounds) arise prior to and during performance, and shape musical actions, regardless of musical skill level or instrument. Musicians do report having musical intentions which underly their actions (see for example the quotations from Murray Perahia and Arcadi Volodos earlier in this discussion), but do not report their musical intentions being conscious experiences of musical sounds during performance. Given this crucial difference, the question arises how musical imagery and musical intentions are related. Bailes suggests that musical imagery may be an involuntary corollary of musical activity, such as working towards an ideal musical sound in performance based on internally "hearing" how it should sound (Bailes 2002, 1). Continuing this line of thought, musical imagery should be seen as a "side-effect" of musical intentions. Keller distinguishes between the use of mental imagery prior to performance ("offline") and during performance ("online"), (Keller 2012, 207). However, Keller does not explicitly state whether online mental imagery (necessarily) takes place by means of consciously experienced musical sounds. In his book "The Inner Game of Music", double-bass player Barry Green addresses the issue of musical intentions: "Effectively, you are playing a duet between the music in your head and the music you are performing. Any notes you play that don't correspond to your imagined sense of the music stand out, and your nervous system is able to make instant, unconscious adjustments" (Green 1986, 75). I assume that Green uses the word "duet" metaphorically, in the sense that he does not actually experience two sources of sound whilst playing.

I use the term musical imagination to refer to musical intentions, using it in the following sense: non-conscious mental auditory anticipations of intended musical sounds that initiate and steer motor control processes prior to and during musical actions. As has been argued above, musical imagery and musical imagination differ, but they also partially overlap. Musical imagination may lead to conscious experiences of imagined musical sounds, for example in mental practice. More importantly, musical imagination and musical imagery both involve activation of (parts of) the auditory cortex and automatic co-activation of (parts of) the motor cortex. Thus, knowledge about musical imagery may help in understanding the role of musical imagination in music making. Therefore, the next part of this discussion will be a summary of scientific information about musical imagery and auditory imagery, after which I will discuss the concept of musical imagination, explaining its usage in my piano methodology course.

2.3.1 Musical imagery and auditory imagery

The concepts of musical imagery and auditory imagery partially overlap. Musical imagery is generally described as a multimodal mental representation of music, i.e. a combination of auditory, motor, visual, visuo-spatial and analytical components. For example, Keller describes musical imagery as a multimodal process by which an individual generates the mental experience of auditory features of musical sounds, and/or visual, proprioceptive, kinaesthetic, and tactile properties of music-related movements, that are not (or not yet) necessarily present in the physical world (Keller 2012, 206). In this definition, musical imagery is not limited to the imagination of auditory aspects of music. Intons-Peterson proposes the following definition of auditory imagery: "The introspective persistence of an auditory experience, including one constructed from components drawn from long-term memory, in the absence of direct sensory instigation of that experience" (Intons-Peterson 1992, 46). In this definition, auditory imagery is not limited to the imagination of musical sounds but involves the imagination of sound in general, including for example speech and environmental sounds.

In his review of empirical findings about auditory imagery, Hubbard concludes that auditory imagery is related to musical ability or experience, but that it is not clear whether differences in auditory imagery lead to differences in musical ability and experience or whether differences in musical ability and experience lead to differences in auditory imagery (Hubbard 2010, 323-324). Keller and Koch have suggested that individuals with more musical training possess greater vividness of auditory imagery than do individuals with little or no musical training (Keller and Koch 2008, 289). Auditory imagery has been suggested to contribute to increased ability in sight-reading, musical performance, and musical note identification. Additionally, auditory imagery is evoked during notational audiation by trained musicians, and there are anecdotal reports that auditory imagery was used in composition by several noted composers, Beethoven being a well-known example (Hubbard 2010, 324).

Deliberate, effortful musical imagery ("mental imagery rehearsal") has been shown to be a valuable practice strategy for musicians (K. Davidson-Kelly 2014). Bernardi et al. (2013) have found auditory imagery to be the most beneficial element of mental practice, whereas mental visualization of motor actions may have a negative influence on learning outcomes:

> Altogether, these findings have practical implications for the way musicians could rehearse or memorize new repertoire when the instrument is not available: First, imagery of the sounds should be a default operation, a foundation on which other operations rest. Second, analyzing the structure of the piece in terms of harmonic relations, melodic phrases, and rhythmic structures is another key component of effective MP [mental practice]. This applies to formal analysis not just as a deliberate, explicit operation, but also as a background process that runs parallel to the auditory/motor rehearsal. Third, reliance on external models [i.e. listening to recordings] can be an effective way to support practice, as long as it is clear that the goal is to build up an auditory/structural mental representation that holds even when the model is no longer present. Finally, motor and visual cues as well as

> overt finger tapping could be of occasional help, depending on the specific nature of the piece and the subject's preferences. However, they alone do not provide a reliable foundation for mental study, and in some cases they might even become a source of distraction. *(Bernardi, et al., 286)*

Auditory imagery has been found to involve many, but not all, of the brain areas involved in auditory perception. The brain areas that become active when hearing music are largely the same as when imagining music. The main difference in brain activation between imaging and hearing music is the role of the primary auditory cortex, which is activated by auditory perception but not activated as strongly by instructions to generate or use auditory imagery (Hubbard 2010, 321).

It has been shown that anticipatory auditory imagery benefits music performance by enabling rapid and thorough action preplanning, as demonstrated in speeded reaction time tasks (Keller and Koch 2008). The efficiency of this mechanism increased with musical experience, which may be attributed to the effects of music training on the vividness of auditory images and/or functional links between auditory and motor brain regions (Keller, Dalla Bella and Koch 2010, 508). In addition to this, anticipatory auditory imagery has been demonstrated to result in less forceful movements:

> This mechanism [anticipatory auditory imagery] may assist in (1) selecting which movements should be made (e.g., which keys of a musical instrument to act upon), and (2) planning how these movements should be executed in order to produce the intended distal effects (ideal sounds) in a biomechanically economical manner. In sum, cross-modal ideomotor processes may function dually to facilitate planning efficiency and biomechanical economy in voluntary action. It may be the case that anticipatory auditory imagery, while not necessarily facilitating timing accuracy, generally enhances biomechanical economy by encouraging less forceful, smaller amplitude movements *(Keller, Dalla Bella and Koch, 512)*.

2.3.2 Musical imagination

As mentioned above, I use the term musical imagination to refer to musical intentions, in the sense of non-conscious mental auditory anticipations of intended musical sounds that initiate and steer motor control processes prior to and during musical actions. I deliberately chose the word imagination, in order to emphasize the generative, flexible and personal aspects of musical intentions. The generative aspect of musical imagination is obvious in improvising musicians, who need to generate musical ideas "on the spot". Nevertheless, even classical musicians (who generally perform well-rehearsed musical pieces that are notated) must internally generate musical intentions. This can (for example) be inferred from the observation that musical scores allow performers certain amounts of freedom. Scores from the Baroque era often provide (almost) no information regarding articulation, dynamics or even tempo, thereby presenting performers with a great amount of freedom. In addition to this, musical imagination does not imply a rigid idea of how a musical piece should sound, but is inherently flexible, allowing musicians to deviate "on the spot" in response to performance circumstances, inspiration or as a result of interaction with other players. Some classical musicians exhibit remarkable performance-to-performance invariance in the musical approach of their repertoire, the classical

pianists Krystian Zimerman and Arturo Benedetti Michelangeli being examples of this. Notwithstanding this observation, in principle musicians are free to decide to play pieces differently from performance to performance. An extreme example of this is the classical pianist Glenn Gould, who is reported to have played certain pieces radically different from take to take (Tommasini 2018). Even though listening experiences and demonstrations by teachers play a role in musical learning processes, musical imagination emerges as a result of internal generative processes and is therefore by definition a personal phenomenon.

2.4 Self-organization and implicit motor learning

As has been argued in the above, ideomotor learning (the acquisition of links between mental representations of movements and perceivable outcomes) takes place as a result of being actively involved in a certain task. It results in perception-action couplings, which enable the learner to transform intended perceivable outcomes into goal-oriented actions. Ideomotor learning occurs without awareness of the learner, as a result of self-organization in the nervous system. Self-organization here refers to improved organization that emerges without an external control agent (Haken 2008). The process of self-organization that continuously takes place in the nervous system can be compared with the co-operation that emerges in ant colonies when they construct an ant bridge: as a group, the ants exhibit smart and effective behaviour (they reach the food source), even though there is not a single ant that is in charge of (or even oversees) the whole activity. The coordination between the ants emerges spontaneously, as a result of simple patterns of interaction between the ants themselves and their environment (Hartnett 2018). In a similar fashion, coordination between different parts of the nervous system emerges spontaneously, without any part of it overseeing the process.

This paragraph first introduces the constraints-led approach to motor skill acquisition, which is a conceptual model based on the principle of self-organization. Next, I will discuss the influence of verbal knowledge of movement performance and awareness on the learning process of motor skills. More specifically, I will summarize the results of scientific studies into implicit and explicit motor learning.

2.4.1 Constraints-led approach to motor skill acquisition

The constraints-led approach to motor skill acquisition is a recently developed, multidisciplinary, conceptual model of human movement behaviour and skill acquisition, based on the insight that motor skill learning processes are a result of self-organization within the learner (Davids, Button and Bennett 2008). It provides a framework for understanding how coordination emerges between parts of each learner's movement system, as well as key variables or constraints that learners use to regulate or guide these coordination patterns. One of its goals is to provide movement practitioners (physical educators, sport scientists, movement scientists, psychologists and physiotherapists) with a valid conceptual model of human movement behaviour that is supported by research. It offers a framework

for understanding how coordination patterns are assembled, controlled and acquired.

Within the constraints-led approach, the concept of constraints is used in two distinct ways. On a fundamental level (within the framework of complex system theory), constraints are the boundaries or features that limit the motion of the minute parts of a system (Newell 1986). Davids, Button and Bennett (2008) present the following explanation of the concept of constraints:

> Constraints can be either physical or informational. Physical constraints can be structural or functional in the human movement system. For example, the size and grip strength of a child's hands are structural physical constraints that influence how that child can pick up and manipulate an object such as a toy train or a large ball during play. Functional physical constraints include processes such as reactions and perceptual abilities, which support movement performance. Informational constraints, on the other hand, are the various forms of energy flowing through the system, such as the pheromones for insects, light reflected from a toy train, or sound waves that a child perceives when a ball bounces across the floor. Young children explore haptic (touch) informational constraints as they pick up and play with objects in their environment. Informational constraints help to shape requisite movement responses and support the coordination of actions with respect to dynamic environments. *(Davids, Button and Bennett, vii-viii)*

On a practical level, constraints are all factors that influence motor performance and motor learning of the learner, some of which can be manipulated (with the intention of supporting the learning process) by teachers, coaches or practitioners. Constraints are generally classified into three categories: performer-related, environment-related and task-related. Performer-related (or organismic) constraints include factors such as individual anthropometrics (height, weight, and limb lengths), fitness (strength, aerobic capacity, and flexibility), mental skills (concentration, emotional control, and motivation), perceptual and decision-making skills (recognizing patterns of play, anticipation by reading the movements of opponents) and personality factors (risk taking behaviours) (iResearchNet n.d.). Environmental constraints are physical aspects of the situation in which the activity takes place, for example ambient light, weather conditions and altitude. Social factors, such as family support, peer groups, societal expectations and cultural norms are also considered to be environmental constraints. Task constraints include task goals, specific rules associated with an activity, activity-related implements or tools, surfaces, ground areas and boundary markings such as nets, line markings, and posts (Davids, Button and Bennett 2008). According to these same authors, the interaction of organismic, environmental, and task constraints on the neuromuscular system results in the emergence of different states of coordination that become optimized with practice and experience (Davids, Button and Bennett 2008, 42).

2.4.2 Implicit and explicit motor learning

Recent scientific research has produced a substantial amount of information about the differential effects of implicit and explicit approaches to learning perceptual-motor skills. However, the terms implicit and explicit motor learning have been used in a non-uniform way among experts in the field

of motor learning. Kleynen et al. (2014) have presented definitions of implicit and explicit motor learning resulting from a consensus-seeking procedure involving a group of 49 international scientists and practitioners with expertise related to motor learning. They propose the following definitions:

> Explicit motor learning can be defined as learning which generates verbal knowledge of movement performance (e.g., facts and rules), involves cognitive stages within the learning process and is dependent on working memory involvement. Implicit motor learning can be defined as learning which progresses with no or minimal increase in verbal knowledge of movement performance (e.g., facts and rules) and without awareness. Implicitly learned skills are (unconsciously) retrieved from implicit memory. *(Kleynen, et al., 9)*

Implicit motor learning has been found to have advantages over explicit motor learning that are relevant for music pedagogy. Numerous studies have demonstrated that implicitly learned motor skills are less susceptible to deterioration under psychological stress, compared to explicitly learned motor skills (R. Masters 1992), see Zhu et al. for an overview of studies that have shown this (Zhu, Poolton and Masters 2012). The relevance of stress-resistant skills is self-evident in the field of music. Furthermore, implicit motor learning has repeatedly been found to produce motor skills that remain relatively stable whilst performing a second task concurrently ("multitasking"), in comparison with explicit motor learning (Maxwell, Masters and Eves 2003). This benefit is meaningful for musicians, since musicians typically must be able to perform whilst carefully observing other members of an ensemble, often having to adjust aspects of their performance (such as timing and dynamics) to a high level of accuracy. Continuing this line of thought, acquiring motor skills implicitly may give musicians more attentional "space" for musical communication with their fellow performers. Furthermore, implicitly learned motor skills have been demonstrated to have enhanced transfer to novel situations and skills, relative to explicitly learned motor skills (Totsika and Wulf 2003). In other words, an implicit learner outperforms an explicit learner when required to perform a variation of the trained skill in question or having to perform the skill under different circumstances. This is a relevant benefit for musicians, since having to perform under widely varying circumstances is a normal element of the life of a professional musician.

Researchers have presented several explanations for the benefits of implicit motor learning. Richard Masters (1992) has proposed the "reinvestment theory" to explain the relative stress resistance of implicitly learned motor skills. This hypothesis states that relatively automated motor processes can be disturbed by the learner trying to exert conscious control over his movements based on task-relevant declarative knowledge. According to Masters:

> […] if, in passing from novice to expert, or unpractised to practised, explicit learning can be minimized, the performer will have less conscious knowledge of the rules for execution of the skill, and will be less able to reinvest his or her knowledge in time of stress. This should result in a lower incidence of skill breakdown under stress. In practical terms, the performer will be less likely to choke. *(R. Masters)*

One of the differences between implicit and explicit motor learning is the acquisition by the learner of verbal knowledge of movement performance: explicit motor learning generates this knowledge whereas implicit learning proceeds with no or minimal increase in verbal knowledge (Kleynen, et al. 2014). Even when no instructions on how to move are given by trainers, instructors or teachers, some learners do develop verbal knowledge of how they move during the learning process of a certain skill. Poolton and Zachry describe this phenomenon like this: "[...] beyond outside instruction, learners also accumulate declarative knowledge from their own trial-and-error attempts to find successful ways to complete a task" (Poolton and Zachry 2007, 68). For example, a novice golf player might find out by himself that he shifts his weight from his right foot to his left foot during his golf swing. However, one of the objectives of research on implicit motor learning is to measure the outcome of motor learning that took place with little or no increase in verbal knowledge of motor performance. This implies that research about the differential outcomes of implicit and explicit motor learning must involve an intervention that suppresses the acquisition of verbal knowledge of movement performance for the learners in the implicit learning group. In early research about the differential outcomes of implicit and explicit motor learning, the build-up of verbal knowledge was suppressed by dual-task learning: learners in the implicit-learning group had to perform a concurrent secondary task whilst practising the primary skill. For example, in the study by Masters (1992) the implicit learners had to generate and call out random letters of the alphabet at a specific rate whilst learning to putt a golf ball. The idea behind the application of dual-task learning is: "[…] that the secondary task is a resource-limiting device which will place such demands on short-term memory capacity that accretion of explicit putting-skill knowledge will be virtually nil" (R. Masters 1992).

Although dual-task learning has been shown to suppress the acquisition of verbal knowledge, it is too unpractical for real learning situations such as sport training sessions, physical education classes and music lessons. On top of that, dual-task learning has been found to slow down the learning process. As a result, the need was felt for a learning strategy that produces the benefits of implicit motor learning whilst being practically applicable and not slowing down the learning process. Considering this, Richard Masters suggested using analogies or metaphors to provide instruction in motor learning processes (R. S. Masters 2000). Research about the learning outcomes of analogy motor learning has shown that it does result in the benefits associated with implicit motor learning such as robustness under secondary task load (Liao and Masters 2001) and under stressful conditions (Lam, Maxwell and Masters 2009), without slowing down the learning process. Also, it was found that analogy motor learning results in reduced acquisition of explicit movement rules, which suggests that it can be

considered an implicit motor learning strategy. The benefits of analogy motor learning in comparison to explicit motor learning have been reproduced in several studies (Tse, et al. 2017). Nevertheless, there are studies that have shown no difference between analogy motor learning and learning by technical instruction (Schücker, Hagemann and Strauss 2013). I will discuss the topic of analogy learning more deeply in paragraph 2.5.1.

The benefits of implicit motor learning have consistently been shown in experimental research and are relevant for music pedagogy. Nevertheless, there are several reasons for being restrained in implementing implicit motor learning in music pedagogy and dismissing with explicit motor learning altogether. In the first place, long-term learning results of implicit motor learning have not been researched enough to allow for conclusions about its long-term effectiveness (Beek 2011). The development of musical skills typically takes place over a long period of time. Furthermore, little research has been done about the application of implicit motor learning strategies in music pedagogy. Although there are strong reasons to assume that the benefits of implicit motor learning also apply to music pedagogy, more experimental evidence is needed to support this assumption.

2.5 Facilitation of ideomotor learning

As has been argued in the above, ideomotor learning takes place non-consciously, as a result of self-organization within the learner. Consequently, the question arises how ideomotor learning processes can be facilitated by piano teachers. Put differently, it creates the need to investigate how piano teachers can effectively assist pupils in acquiring perception-action couplings, so that motor skill learning takes place optimally. This part of my discussion focuses on this issue. I will introduce the educational concept that has been put forward based on the constraints-led approach to motor skill acquisition: nonlinear pedagogy. Key principle of nonlinear pedagogy is the manipulation (by teachers) of factors that influence motor behaviour of learners (constraints), aimed at guiding them towards optimal movement solutions. After this, I will discuss three teaching strategies that aim to facilitate ideomotor learning by means of manipulating constraints, namely analogy motor learning, the induction of external attentional focus and manipulation of musical task and environmental constraints. For all three strategies I will present examples of their practical application in piano pedagogy. The paragraph ends with an overview of discussed teaching strategies for acquiring pianistic skills.

2.5.1 Nonlinear pedagogy

Based on the framework of the constraints-led approach, Davids, Button and Bennett describe and argue for nonlinear pedagogy for the acquisition of motor skills:

> Nonlinear pedagogy advocates awareness by practitioners that a learner's coordination solutions are the products of self-organization and that periods of movement variability should be valued as part of the learning process. To

> encourage emergence of functionally relevant coordination solutions, it supports the manipulation of performer-environment interactions through altering relevant task, environmental and performer constraints. […] In terms of skill development, the movement practitioner's role has traditionally been associated with tasks such as employing practice drills to perfect performance in relation to an idealized motor pattern, evaluating technique, giving instructions and feedback, and carefully managing the learner's practice environment. […] A central theme emerging from nonlinear pedagogy is the importance of facilitating independent learning through search, discovery, and exploitation of constraints. *(Davids, Button and Bennett, 98)*

Furthermore, these same authors advocate the concept of the hands-off practitioner:

> A useful analogy for the hands-off practitioner is that of a gardener. Plants differ in preferred growth conditions, such as soil composition and position in the garden, and gardeners do not dictate when a plant should flower. Instead, evidence shows that flowering is a result of emergent, self-organizing processes, and gardeners play an important role in creating the appropriate growing environment for each plant. When necessary, gardeners may intervene by watering the plant or relocating it to a larger pot, but the main business of growth and flowering is ultimately left to the plant, which has perceptual systems to sense informational constraints such as ambient temperature and light *(Yanofsky and Kay 2002)*. In a similar vein, significant tasks for the hands-off practitioner are to create a learning environment, for the discovery of optimal solutions by manipulating constraints, interpreting movement variability, and nurturing learners in their search activities. There is no ideal motor pattern that suits every performer, so compared with more traditional instructional approaches, these hands-off methods allow greater opportunities for each learner to seek and identify appropriate movement patterns within practice. *(Davids, Button and Bennett, 99)*

As has been described in the above, the manipulation of task constraints is a typical approach to instruction in the framework of nonlinear pedagogy. Manipulating task constraints may involve presenting the learner with a set of adapted rules. For example, a soccer coach can help learners to improve their ball control and passing skills in a modified practice game where individual players are permitted a limited number of ball touches (Davids, Button and Bennett 2008, 158). Another source for exploiting task constraints is the performance area. For instance, in tennis, novice learners generally start to play on strongly reduced sized courts, often within the service box of a full-size court. Furthermore, practitioners may present learners with adapted equipment, in order to guide them in a desired direction. An example of this is to let a tennis player hold a ball or a racket in his non-dominant hand, in order to (implicitly) guide him towards a single-handed backhand. Finally, practitioners can present learners with temporary simplifications of the task to be learned, which are called intermediate or in-between steps. Traditionally, practitioners make use of part-task training, which involves practicing a subset of task components as a preparation for the performance of the whole task. For example, novice swimmers learn the leg kick for the front crawl separately before the kicking and arm actions are integrated into the whole pattern. However, based on recent insights in motor skill learning, the effectivity of part-task training is doubtful (Davids, Button and Bennett 2008, 168). In the first place, during part-task training the interdependence of the components (such as the

leg kick and arm actions in the front crawl) is not experienced by the learner. Secondly, part-task training tends to be static, whereas the desired skill is dynamic in nature. Finally, part-task training potentially decouples perception and action systems in the learner. As a superior alternative to part-task training, simplification strategies are promoted, in which practice conditions simulate natural performance conditions, but key performance variables such as velocities of objects, and forces of moving people and objects are reduced to simplify the task. As an example of this it is suggested that novice long-jumpers "reduce the run-up distance to the takeoff board so that they can practice the running and jumping components of the task together […]. They can begin a few steps from the takeoff board and gradually move the starting position back as learning occurs" (Davids, Button and Bennett 2008, 168).

The next part of this discussion focuses on teaching strategies that involve manipulation of constraints to facilitate ideomotor learning. In the first place, the application of analogies intended to elicit motor patterns ("analogy motor learning") will be discussed in detail. Next, the influence of attentional focus on motor skill learning will be explained, followed by a discussion about how piano teachers can induce attentional focus towards musical goals in their pupils. Both analogy motor learning and the induction of external attentional focus can be seen as manipulations of performer-related constraints, since they aim to influence properties of the learner. Lastly, the manipulation of musical task and environmental constraints will be discussed.

2.5.2 Analogy motor learning

Kleynen et al. propose the following definition of analogy motor learning: "Learning facilitated by metaphors. The complex structure of the to-be-learned skill is integrated into a simple metaphor that the learner is provided with" (Kleynen, et al. 2014, 7). According to Poolton and Zachry (2007), analogy motor learning can be thought of as a "biomechanical metaphor" for movement, which the instructor employs to enhance the motor learning process. They present the following example: "Mr. Miyagi made an indelible impression on people all over the world by using this type of learning when he taught Daniel-san how to deflect a punch using the "wax on, wax off" analogy in the movie The Karate Kid" (Poolton and Zachry 2007).

As mentioned before, analogy learning has been shown to produce the benefits associated with implicit learning, namely robustness of the trained skill under stressful circumstances and secondary task load. Poolton and Zachry have remarked that analogy motor learning and external focus of attention (which will be discussed hereafter) appear intertwined, since experiments involving external focus instructions often employ movement analogies (Poolton and Zachry 2007). An example of this is the analogy to "let the club perform a pendulum-like motion", which was used for the participants in the external focus group in a study involving golf pitch shots (Wulf, Lauterbach and Toole 1999). These same authors have suggested that it may be the use of these analogies that helps an external

focus to be effective. According to Poolton and Zachry (2007, 75): "[...] an analogy can be a powerful enhancement to external focus instructions, but an external focus will usually be available as an instructional cue even when it is difficult to think of an appropriate analogy for a particular skill". These authors furthermore emphasize the need for the chosen analogy to be meaningful to the learner. They present the following anecdote to illustrate this:

> […] the local population of Hong Kong was less willing and/or able to apply the concept of the right-angled triangle analogy to the movement of hitting a table tennis ball with topspin than their Western counterparts. However, when the analogy for this population was changed to, "Move the bat as if it is traveling up the side of a mountain," *(Poolton, et al. 2006)* the findings replicated those of Liao and Masters (2001). This highlights the need for coaches to carefully choose analogies and account for differences among groups and between individuals. *(Poolton and Zachry, 74)*

Application of movement analogies in piano pedagogy

Even though to my knowledge no experimental research has been done about analogy motor learning applied in music pedagogy, in my opinion it is an attractive teaching strategy for music pedagogues. As stated above, the benefits associated with implicit learning are relevant for music learners. In my view it is likely that the advantages of analogy motor learning will also emerge when applied in music pedagogy. Furthermore, examples of analogy learning can be found in contemporary and historical music pedagogy. For instance, piano pedagogue Margit Varró advocates triggering movement sensations that facilitate playing gestures by means of analogies with daily-life activities (such as touching objects, walking, skipping and bouncing a ball) or suggestive motor imagery, such as asking pupils to imagine their lower arm is the beam of a balance scale (Varró 1929, 109). Below I present a selection of movement metaphors that can be applied for the facilitation of the acquisition of motor skills on various instruments. I have obtained these from students participating in my lesson series about implicit motor learning in music (part of the curriculum of the Master of music education) that I teach at the Royal Conservatoire of The Hague since 2014.

Instrument	Goal	Movement analogy
Cello	Find a suitable posture with the instrument	*"Give the cello a bear hug"*
Recorder	Preparation for articulation by tonguing	*"Imitate the sound of a bazooka"*
Saxophone	Find the embouchure (early stage of learning)	*"Imitate the face of a beaver"*
Singing/ wind instruments	Breath support	*"Breath in and out very quickly, like a little dog that has been running"*

Table 1: Movement metaphors in music education

As mentioned above, Poolton and Zachry (2007) underscore the need for a movement analogy to be

relevant to the learner. Teachers can make sure of this by letting pupils find appropriate movement analogies themselves during the learning process. In addition to this, I present my students with four recommendations for the effective application of analogy motor learning in music pedagogy. Firstly, I suggest that movement metaphors should trigger a movement sensation, rather than being a movement norm or movement description in disguise. For example, in piano pedagogy, it is a common instruction to hold your hands "as if you have an apple in them". Even though this instruction may look like a movement metaphor, in my perception it might function as a normative description of the shape the hands should have (according to the teacher who uses this analogy) whilst playing. On top of that, this movement metaphor describes a static function of the hands, rather than a dynamic function. Based on this, I assume it is unlikely that learning accompanied by this instruction will lead to the manifestation of the typical benefits of implicit motor learning. Rather, I expect that the movement metaphor to "move your hands like spiders and imagine that your fingers are their legs" will trigger a movement sensation within the pupil. Also, it describes a dynamic function of the hands. Therefore, I believe that this movement analogy is much more likely than the apple-metaphor to result in the advantages of implicit motor learning. Secondly, I recommend my students to apply movement analogies that trigger movement patterns that their pupils already know. A music teacher can promote this by choosing useful movement metaphors derived from daily life activities. As an example, a piano teacher might use the movement analogy of finger drumming when impatient, in order to assist the learning process of fast runs. The third recommendation is to make sure to choose movement analogies that trigger fine motor reactions in pupils. For example, in piano pedagogy a popular movement metaphor for helping pupils to play short staccatos is to suggest that they pretend the keys of the piano are hot. Since the reflex movement of removing the hand from a painfully hot object is a gross motor gesture, I am not in favour of this movement metaphor. Rather, I recommend students to use analogies such as "imagine that you play upward, out of the key", which are in my view more likely to trigger a fine motor control gesture. Lastly, I emphasize the need for pupils to have clear ideas of the musical goals they are trying to achieve and to preserve an attentional focus towards this musical goal. Pupils ideally focus on the musical sound they intend to produce, rather than on how they move, which will be substantiated in the next paragraph.

2.5.3 External focus of attention

Traditionally, motor skill learning is considered to start with a stage in which the learner exerts conscious control over his movement. Fitts and Posner have proposed three stages in the learning process of motor skills, namely the cognitive, associative and autonomous stage (Fitts and Posner 1967). In the cognitive stage of learning, movements are controlled relatively consciously: learners execute the skill in a "step-by-step" manner. Since learners may use overt or covert self-talk in this stage, Adams has labelled it the "verbal stage" (J. Adams 1971). Movements are typically relatively slow, not fluent and not economical in this stage. Both the movement pattern and the level of

achievement are unstable. The associative stage of learning involves more subtle movement adjustments. Disadvantageous co-contractions (muscles that contract unnecessarily in a counterproductive manner) gradually diminish and movements become more reliable and consistent. Movements are controlled more automatically, thereby allowing for more attention to be directed to other aspects of performance. In the autonomous stage of learning, motions are fluent, economical and accurate. The skill is performed with little or no conscious control.

Human movement scientist Gabriele Wulf (2007) gives the following summary of the traditional view among practitioners (sport coaches, teachers) on motor learning for novices:

> It is generally assumed that novices benefit from information about how to best perform a motor skill. After all, they need to get an idea of the correct movement. Therefore, the traditional belief is that learning during the early stages is enhanced when learners are made aware of their movements and of how they are performing in relation to the goal movement. To facilitate the learning process, instructions and feedback are typically given that direct learners' attention to various aspects of their movement coordination. That such instructions promote the use of conscious modes of control is not viewed as problematic, but rather as a necessary phase that the learner must go through in order to reach the stage in which movement control is more or less automatic. After all, the purpose of instructions and feedback that teachers or coaches give is to guide the learner toward the correct movement and to avoid the need to make changes in the technique later when the pattern of coordination has already become stabilized. But are these instructions really helpful? *(Wulf, 6)*

In recent years, many experimental studies have been done about the differential effects on motor learning and motor performance of an external focus of attention (the learner focuses on the outcome of his actions) in comparison to an internal focus of attention (the learner focuses on his movements). In this type of research, participants in the internal focus group typically receive instructions about movement performance that are generally considered to be “correct” among experts in the field of the skill in question. For example, in a study focusing on basketball free throws, participants in the internal focus group were instructed to focus on the “snap” (i.e. flexion) of their wrist during the follow-through of the throw, which is generally considered to be an element of correct technique among basketball coaches. Participants in the external focus group where told to concentrate on the centre of the rear of the basketball hoop (Zachry, et al. 2005). The outcome of this study was that participants who focused externally performed better in terms of accuracy and movement economy than participants who focused internally.

Gabriele Wulf (2007) has reviewed the results of recent scientific research about the differential outcomes of an external focus relative to an internal focus of attention. Based on this body of research she has formulated implications for practitioners (for example sport coaches, physical education teachers and movement therapists) in her book “Attention and Motor Skill Learning” (Wulf 2007). The overall image that emerges from the research results is that an external focus of attention is both

beneficial for the instantaneous performance and for the learning process of motor skills, i.e. how well the trained skill improves during and is retained after training sessions. In other words, the adoption of an external focus of attention results in both immediate and long-term advantages. Additionally, adopting an external focus of attention has been demonstrated to enhance transfer to novel variations of the skill. Furthermore, the advantages of an external focus of attention have been shown to be generalizable across tasks, skill levels, and age groups. Lastly, individual differences between learners do not play a significant role in the relative effectiveness of an external versus internal focus of attention.

Instructions or feedback that direct learners' attention to the movement effect, rather than the coordination of their body movements, have been found to result in greater movement effectiveness, e.g. accuracy, balance and speed. For example, in basketball (Al-Abood, et al. 2002), volleyball (Wulf, McConnell, et al. 2002), dart throwing (Marchant, Clough and Crawshaw 2007), and golf (Wulf and Su 2007), movement accuracy was enhanced by instructions or feedback inducing an external focus. Moreover, external focus of attention has been shown to result in increased movement efficiency, which can be observed in the form of reduced muscle activity, monitored by electromyography (the recording of electrical activity in muscles). In the process of acquiring a motor skill, typically less and less muscular energy is required as individuals learn to reduce unnecessary co-contractions and exploit passive forces (Gentile 1998). Instructing learners to focus on the movement goal appears to facilitate this increase in movement economy. Several studies have demonstrated that external relative to internal focus instructions, or no instructions, results in reduced muscular activity accompanied by greater movement accuracy (Zachry, et al. 2005; Lohse, Sherwood and Healy 2010). Importantly, the benefits of external focus have not only been shown relative to internal focus conditions, but also relative to control conditions (i.e. the group of participants that received no instruction what to focus their attention on). This may support the notion that individuals tend to adopt less optimal (internal) foci by themselves, if not instructed to do otherwise. A remarkable finding in several studies is that even seemingly insignificant differences in instruction may lead to different learning outcomes. For example, in a study by Freudenheim et al. the effects of attentional focus on swimming speed were examined (Freudenheim, et al. 2010). Participants in the internal focus group received the instruction to “pull your hands back”, whereas participants in the external focus group were instructed to “push the water back”. Swimming speed was significantly higher in the external focus group compared with both the internal focus and control conditions. Thus, the minor difference in the wording of the instruction resulted in a significant advantage for the external focus condition. Finally, several studies have shown that focusing on one aspect of the skill (for example finger movements) can impact other components of the skill (for example leg movements). Put another way, an internal focus on one part of the body appears to have a more global influence on the motor system, hampering overall performance (Zachry, et al. 2005; Wulf, Zachry, et al. 2007; Wulf, Dufek, et al. 2010; McNevin and

Wulf 2002).

Wulf, McNevin & Shea (2001) have suggested the "constrained action hypothesis" to account for the better learning outcomes produced by an external compared to an internal focus of attention. According to the constrained action hypothesis:

> […] trying to consciously control one's movements constrains the motor system by interfering with automatic motor control processes that would "normally" regulate the movement. Focusing on the movement effect, on the other hand, might allow the motor system to more naturally self-organize, unconstrained by the interference caused by conscious control attempts—resulting in more effective performance and learning. *(Wulf, McNevin and Shea, 1144)*

The view that an external focus results in a more automatic type of control than an internal focus is supported by frequency analyses of movement adjustments, particularly regarding balance control. Learners adopting an external focus make faster and smaller balance adjustments, resulting in greater stability and better performance of the task, compared to participants with an internal focus (Wulf 2007). Furthermore, performance of motor skills under external focus conditions has been demonstrated to require a smaller amount of attentional capacity, relative to performing with an internal focus. Lastly, the reduced muscle activity associated with an external focus also supports the constrained-action hypothesis.

Even though at that time no research involving musical skills had been done, Wulf and Mornell (2008) suggest that experimental findings about the influence of attentional focus on motor skill learning might have important implications for music pedagogy. According to Wulf and Mornell:

> Teachers will ideally look for verbal instructions that direct attention away from small muscle movements or body, so that automatic motor programs are not disrupted by cognitive interference. At the same time, the externally focused music student will find and store an individual solution for a desired movement pattern implicitly – resulting in a "memory without a record" […] Thus, when teachers give instructions, they should describe the effect to be achieved, such as "the melody line should push forward and climb towards the climax" as opposed to the specific "strike the notes harder using finger muscle and increase arm thrust towards the end of the line"; or using an image such as "the accompaniment is like a peaceful ocean of sound" rather than "pull back your left wrist to prevent the fingers from reaching the bottom of the key bed." […] Teachers often attempt to fix students' technical problems by using internal focus instructions, but these problems have been seen to solve themselves when the right external goal is offered. [...] Therefore, musicians are better off imaging the effect they want create, not trying to control exactly how they achieve the effect, and they should attempt to hear [the] piece as a whole, not as the sum of its parts. *(Wulf and Mornell, 14-15)*

The benefits of an external attentional focus have recently been demonstrated to apply for skilled musicians as well. Experimental research by Mornell and Wulf has shown that graduate and undergraduate music university students perform better in terms of both musical expression and

accuracy, as a result of focusing on playing for the audience and the expressive sound of the music, rather than on the precision of their finger movements and correct notes (Mornell and Wulf 2019). Williams (2017) has investigated the effects of external focus on accuracy and confidence in conservatory students of natural trumpet. Her research has demonstrated a significant positive influence of external focus. Williams furthermore states:

> The question for a musician is not "How does it work?" but rather: "What do I need to do in order for it to work?" A musician does not need to understand the workings of his muscles, nerves and neurons or to be instructed what movements to make *(Masters 2012; Wulf 2007; Wulf 2013; Wulf and Mornell 2008)* but rather have an exploratory and holistic approach to practicing and performing in which their mind, body and emotions cooperate to get the best results. Ideally, the mind is concerned with external focus on musical elements (rather than with things like analysis, judgement, internal focus, comparison, worry about consequences, and distraction) in order to allow the body's implicit mechanisms to learn or remember the appropriate movement. External focus – or focussing on musical intention – can be informed by the emotions – i.e. the performer's own emotions (connected with the music) or the emotions embedded in the music. *(Williams 2017)*

Application of external focus-instructions in piano pedagogy

In my piano methodology course, I discuss the role of attentional focus in motor learning with my students. Firstly, I present them with a summary of the aforementioned experimental results and their implications. Moreover, I suggest two strategies for teaching and learning aimed at inducing an external focus of attention in their pupils, namely listening assignments and goal-oriented feedback. Listening assignments are instructions that encourage pupils to listen to specific aspects of their playing. The general formulation of a listening assignment is: "Play [*part of the piece*] and listen for [*auditory aspect of the music*]". An example of a listening assignment is: "Play this phrase and listen for the connections between the tones of the melody". In principle, they are applicable to all auditory aspects of pianistic quality. The concept of listening assignments has been derived from the concept of awareness instructions, as presented by Barry Green in his book "The Inner Game of Music" (Green 1986). Listening assignments ideally do not include opinions or instructions what to do. They aim to induce a specific auditory attentional focus which encourages pupils to discover features of the musical sounds they produce by themselves, so that they may adjust these. Goal-oriented feedback is feedback by which teachers inform pupils about auditory features of their playing. It may be formulated as a literal description of what the teacher heard (for example: "I heard an accent on that note") or as a musical metaphor (for example: "I heard a bump on that note"). Goal-oriented feedback can be contrasted with movement-oriented feedback, which presents pupils with information about their movement performance, for example: "I saw that you pushed your wrist down on that note". Based on the aforementioned information regarding the influence of attentional focus on motor learning, movement-oriented feedback might induce an internal focus and should therefore be avoided as much as possible.

2.5.4 Manipulation of musical task and environmental constraints

As has been argued above, both analogy motor learning and the induction of external attentional focus can be seen as teaching strategies that involve manipulation of performer-related constraints. However, in music pedagogy, task-related and environmental constraints can also be exploited. In music making, the production of intended musical sounds can be considered the main task. Below I describe five (categories of) pedagogical tools for achieving pianistic quality that are based on manipulation of musical task and environmental constraints, namely clarification of musical goals, musical challenges, variability practice, in-between steps, and the application of handicaps.

Clarification of musical goals

> Make the mental tonal picture sharp; the fingers must and will obey it. *(Hofmann, 39)*
>
> The execution of a certain movement is inseparably connected with the expectation of a certain sound.[2] *(Varró, 109)*

In order to successfully acquire or improve pianistic skills, clear and vivid mental representations of target (improved) musical effects are a prerequisite. As a result, effective pedagogical strategies for the acquisition or improvement of pianistic skills should address this and include activities intended to enrich and clarify musical imagination of intended improvement of pianistic quality within pupils. To put it another way, piano teachers ideally possess a variety of teaching techniques that help pupils develop a clear mental auditory representation of intended musical outcomes. As can be concluded from the quotes from Josef Hofmann and Margit Varró at the top of this section, this insight can already be found in certain historic approaches of piano pedagogy. In this paragraph I describe how I put it into practice in my piano methodology course.

Clarification of musical goals within pupils can be achieved by means of demonstrations, musical metaphors or clarifying musical activities. Demonstrations are the most direct strategy for presenting pupils with ideas of how (fragments of) pieces they play may sound. A particularly effective application of demonstrations is to contrast an imitation of the pupil's playing with a demonstration of how it could be improved. This should obviously be done in a respectful way in order to avoid negative emotions. Musical metaphors are non-literal verbal descriptions of the musical effect to be achieved. They are a commonly applied tool in music pedagogy, so examples are plentiful. In my experience, students have no difficulty to find appropriate musical metaphors to clarify their pupils' idea of the musical effect to be achieved. Musical metaphors are particularly effective when applied in conjunction with demonstrations. Finally, musical activities that do not involve the piano, such as singing, tapping, clapping and walking on the beat (or a combination of these activities) can result in a

[2] Originally in German: “Die Ausführung einer gewissen Bewegung ist unlöslich mit der Erwartung eines gewissen Klangs zu verbinden.”

better idea within pupils of how (a fragment of) the piece they are learning should sound. Based on the points of attention that the music teacher applies, they can be aimed at improving various aspects of performance, for example rhythmic fluency, phrasing or dynamic levels. I find it remarkable how effective these activities are in changing or improving the musical imagination of pupils. In most cases, performing a musical phrase with a combination of voice, hands and/or feet instantaneously leads to a more vivid and accurate performance of it on the piano. Moreover, listening to how pupils perform pieces without the piano may provide piano teachers with valuable information about how pupils hear their pieces in their musical mind. In other words, it gives insight into the musical imagination of pupils, including elements of it that need improvement.

Musical challenges

Task constraints can also be applied in piano pedagogy by means of gradually increasing demands on the pianistic quality of the pupil. Piano teachers can apply musical challenges as a tool for (implicitly) inducing improvements in fine-motor control in pupils. Rather than presenting their pupils with prior, literal and normative instructions regarding how to move in order to achieve an improved musical effect, I recommend my students to aim at developing a better auditory image of the musical goal within their pupils. In my experience, musical challenges implicitly trigger pupils to unconsciously employ better fine-motor control playing gestures. This teaching approach is in my opinion more likely to induce an external focus of attention in pupils than approaches that are characterized by literal and normative movement instructions. An example of the application of musical challenges in order to implicitly improve fine-motor control can be found in the didactic approach of young pupils who play with a gross-motor playing gesture that is commonly described as “fore-arm pushing”. Typically, the sound that results from this type of playing is experienced as bumpy, disconnected and harsh. Traditionally, this problem is approached by means of literal and normative instructions, such as: “Keep your arm still and use your fingers actively.” In addition to this, piano teachers sometimes put a coin on the back of the hand of the pupil, requiring them not to drop the coin whilst playing. Contrastingly, in this type of situation, I recommend my students to apply task constraints in order to guide pupils with similar problems towards more refined playing gestures implicitly. Playing softly, fluently and legato requires fine-motor control playing gestures. In other words, it cannot be achieved by means of gross-motor playing gestures. As a result, challenging pupils to play softly, fluently and legato implicitly triggers improvements in fine-motor control. In order to illustrate this, I present students with a video that shows the easily recognizable changes in playing gesture and posture that emerge in an eight-year-old pupil as a result of the aforementioned musical challenge. When applying this type of approach, musical goals function as constraints on the formation of movement patterns.

Variability practice

Varying musical goals deliberately can be applied as a practice strategy. Instead of repeating a difficult

passage over and over in the same way ("repetitive practice"), it is more effective and more interesting for a learner to "repeat without repeating", i.e. to perform the difficult passage in a variety of ways, changing aspects such as tempo, dynamics, articulation and rhythm. According to Wulf and Mornell, musicians need to train skills in such a way that they can apply them flexibly in performance, since performances are unpredictable, and musicians need to adapt to the circumstances. What musicians do in performance is never just a repetition of what they practise (Wulf and Mornell 2008, 18). Variability practice is an example of alteration of task constraints and can therefore be considered to be in line with the learning approach advocated in nonlinear pedagogy.

In-between steps

In music pedagogy, an often-applied strategy for acquiring instrumental skills is to let the learner first perform one or more simplified versions of a target task. For example, piano teachers may present pupils with a preparatory exercise for playing double thirds, before applying double thirds in a piece. This teaching strategy is known as in-between (or: intermediate) steps. It is common practice for music teachers to facilitate the learning of complicated motor skills by breaking them down into progressively organized series of intermediate steps. I present students of piano methodology with this approach and provide them with practical applications of it. An example of this is the learning process of legato pedalling: the learner first experiments with the effects the right pedal produces, then applies legato pedalling to playing a single melodic line, then applies it to connect the sounds of consecutive chords and finally applies it to a piece.[3] In music pedagogy, part-task training is often applied as a teaching strategy. An example of this is the traditional recommendation in piano pedagogy to first learn the right- and left-hand parts of a piece separately, before playing the piece with both hands together (Evertse 1996). Like the approach of learning the leg kick of the front crawl separately from the arm actions (described in paragraph 2.4), the practice strategy to learn the left- and right-hand parts separately does not address the mutual dependence of the components of the target task. Applying the concept of nonlinear pedagogy to this situation, piano teachers might look for possibilities to temporarily simplify the piece, whilst keeping the outline of the piece intact. For instance, a complicated accompaniment pattern might be reduced to a single chord or a single bass note. This practice strategy does allow the learner to experience the interdependency of the musical parts at an early stage of learning a piece.

Handicaps

In nonlinear pedagogy, specific rules associated with an activity may be used as a tool to guide the learner in a desired direction. The aforementioned soccer practice game, in which the learners are permitted a limited number of touches in order to improve their ball control and passing skills, is an

3 These in-between steps are described in detail on page 39-40 of part 2 of the syllabus for piano methodology, that is included as a separate document on the exposition of this research in the KC Research Catalogue

example of the manipulation of rules. In other words, learners are presented with a handicap that implicitly guides them towards an improvement of motor skills. This teaching strategy can also be applied to piano pedagogy. A well-known exercise within piano pedagogy is to let learners play a difficult passage without pedal and with as much legato as possible, in order to guide them towards finding appropriate fingerings. Handicaps can also be applied for guiding young novice pupils towards employing all ten fingers and finding fine-motor control playing gestures. Young piano pupils often let their thumbs and fifth fingers hang below the level of the keys, playing only with their second, third and fourth fingers. The resulting pattern of movement is usually described as "pushy": performing a gross-motor control forearm motion on every note they play. Pupils who employ this movement pattern can be guided towards fine-motor control playing gestures by means of the "River-Path-Forest" game, which presents them with a set of handicaps conveyed by a story.[4] In this game, the black keys are considered to be trees, the surface of the white keys in front of the black keys represents a path on which you can walk, the space in front of the keyboard is suggested to be a river, in which crocodiles are swimming. The rule or handicap of this game is to play with all fingertips on or above the area that is considered to be the path, as if the fingertips are making a walk along the riverside. The river must be avoided by all fingertips, since the crocodiles might take a bite of them. A variation of this game is to let the fingers make a walk through the forest, i.e. between the black keys. The handicap of placing all fingertips on or above the white keys decreases the opportunities for playing with a forearm push on every note, and as a result implicitly creates the need for playing with fine-motor control finger motions instead. In this approach, the geography of the keyboard is exploited as an environmental constraint for guiding pupils towards fine-motor control playing gestures.

2.5.5 Overview of teaching strategies for acquiring pianistic skills

Below I present an overview of all teaching strategies intended for acquiring pianistic skills that have been discussed so far.

4 See page 7-8 of part 2 of the syllabus for piano methodology, for a detailed description of this game

Teaching strategy	Goal	Manipulated constraint
Movement metaphors	Facilitate the emergence of a playing gesture that produces the intended musical outcome	Performer-related: Motor control
Listening assignments	Induce attentional focus towards a specific aspect of how pupil sounds	Performer-related: Attentional focus
Goal-oriented feedback	Induce attentional focus towards a specific aspect of how pupil sounds	Performer-related: Attentional focus
Demonstrations	Clarification or induction of (new) musical goals	Task-related: Musical goal
Musical metaphors	Clarification or induction of (new) musical goals	Task-related: Musical goal
Clarifying activities	Clarification or induction of (new) musical goals	Task-related: Musical goal
Musical challenges	Guide pupil towards more sophisticated playing gestures	Task-related: Musical goal
Variability practice	Increase musical flexibility in trained skills	Task-related: Practice strategy
Intermediate steps	Facilitate the acquisition of new pianistic skills	Task-related: Practice strategy
Handicaps (e.g. games)	Implicitly guide the pupil towards new movement solutions	Environment-related

Table 2: Overview of teaching strategies

2.6 Intention-based piano pedagogy

As has been demonstrated in the above, current scientific knowledge about motor control and motor skill learning presents music teachers with opportunities for evaluating traditional approaches to musical motor learning processes and coming up with innovative, research-supported teaching strategies. In my piano methodology course, I aim to enable my students to benefit from these opportunities. My goal is to convey research-supported principles of effective teaching in a coherent manner. Additionally, I present students with a wide variety of practical applications of these principles in piano pedagogy, with the intention of stimulating them to create their own applications and applying these in their internship lessons. This part of my discussion presents a summary of the pedagogic approach of pianistic quality that I convey in my piano methodology course in order to achieve these goals. Since musical intentions of the learner (musical imagination) play a crucial role in this approach, I have decided to use the term intention-based piano pedagogy for it.

The discussion of intention-based piano pedagogy within the piano methodology course starts with a presentation of two contrasting instructional strategies, namely intention-based learning and instruction-based learning. By means of example lesson fragments, I suggest that some approaches to teaching motor skills rely primarily on instructions how to move (instruction-based learning), whereas other approaches are aimed at helping pupils to discover movement solutions “from within” that achieve their musical intentions (intention-based learning). Next, I argue that the production of intended musical outcomes is the goal of musical actions. We speak about the concept of musical imagination, defining it as the non-conscious mental auditory anticipations of intended musical outcomes that initiate and steer motor control processes prior to and during musical actions. We

continue by discussing intentional movements, focusing on how the brain brings about successful actions based on intentions by means of predictive processing. Correspondingly, we study how action-perception couplings emerge as a result of ideomotor learning, more specifically how auditory and motor cortex improve their co-operation, thus enabling learners to transform their musical intentions into movements. In order to further clarify the central role musical imagination plays in the acquisition of pianistic skills, I have designed the following model of music production and perception:

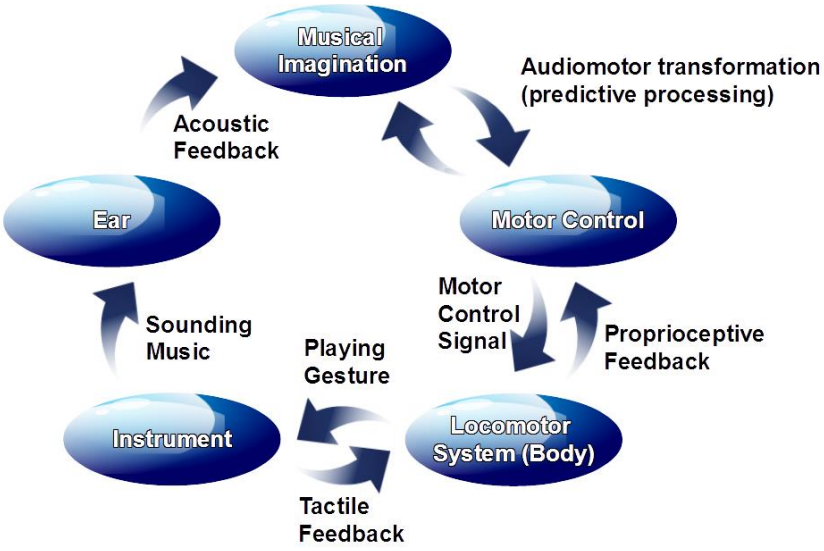


Figure 1: Model of music production and perception

Based on this model, we investigate how music teachers can influence the process of music production within their pupils, aimed at facilitating the acquisition of instrumental skills. In the first place, we discuss teaching strategies for helping pupils acquire or clarify mental auditory representations of intended (improvements of) musical outcomes, namely demonstrations, musical metaphors and clarifying musical activities. Next, we examine how music teachers can encourage their pupils to listen to specific features of their playing by means of listening assignments and goal-oriented feedback. We continue by discussing how music teachers can help their pupils in finding playing gestures that match their musical intentions, for example by using movement metaphors. Furthermore, I introduce the concept of in-between steps (also known as intermediate steps) and present students with examples of its application in piano pedagogy. In addition to this, we study a selection of practice strategies that piano teachers can convey to their pupils in order to increase the effectiveness of their practicing process. All the information that has been discussed so far is then summarized in a set of "guidelines for an intention-based approach to pianistic quality". Moreover, I present the following checklist (in the form of a flowchart) for the pedagogic approach to pianistic quality that students can use to check whether the prerequisites for the acquisition of pianistic skills have been met:

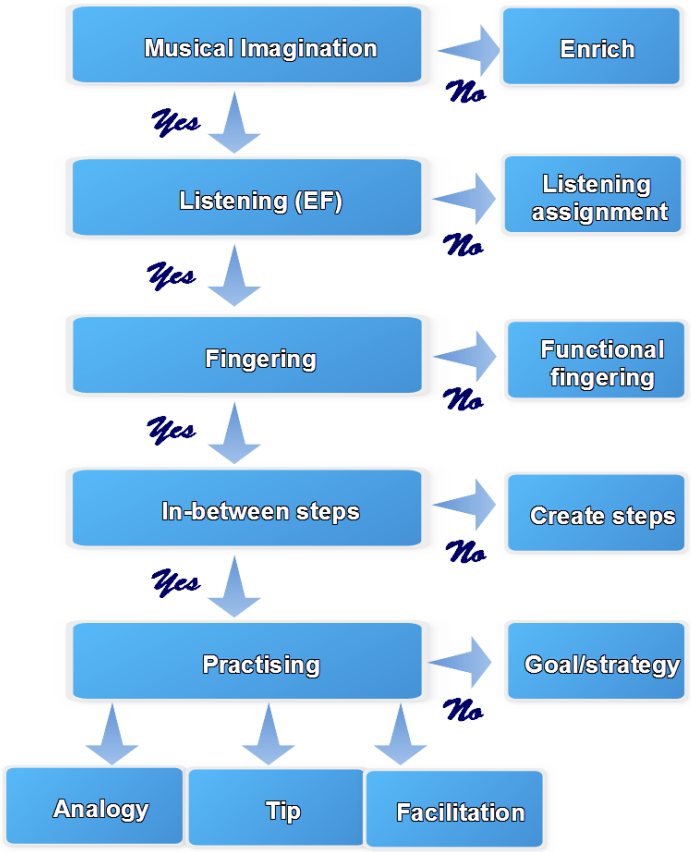


Figure 2: Checklist for the pedagogic approach to pianistic quality

After this discussion of educational principles and concepts, we continue with the examination of practical applications of them in piano pedagogy. We discuss a broad selection of common aspects of pianistic quality, such as articulation, dynamics and pedalling. For each aspect, we exchange teaching strategies such as exercises, in-between steps, listening assignments and movement metaphors. Lastly, the research-supported educational principles for achieving pianistic quality also underlie the questions on the observation sheet that the students use for providing themselves and each other with feedback on their actions in internship lessons. See paragraph 3.2.2 for more information about peer-learning within the piano methodology course.

2.7 Traditional versus research-supported approaches to motor skill acquisition

As described before, when observing internship lessons in the years prior to this research, I noticed that students tend to apply isolated movement instructions: literal and generalized movement norms that are not connected to musical goals. On the one hand, during methodology lessons students find it

obvious that musical imagination is the primary agent in motor control. On the other hand, they seem to find it difficult to put this insight into practice in their lessons. One of the potential explanations for this apparent difficulty is a paradigm clash between notions about motor learning processes that are traditionally passed on within piano pedagogy and more recent scientific insights into motor learning that underlie the pedagogical approach conveyed in piano methodology. In early stages of their development as a piano teacher, students often apply approaches that their own teachers have used for them. They model their teaching after previous instructors, thus implicitly taking over ideologies connected to them. This tendency can be interpreted as an expression of their sense of responsibility: they feel the need to teach their pupils properly and want to provide them with good instructions that will prevent them from developing bad motor habits. Despite the good intentions behind their approaches, some of the tacit assumptions underlying their actions might hamper the effectiveness of their teaching.

In this paragraph I will focus on three elements of traditional piano pedagogy that potentially conflict with research-supported approaches to motor skill acquisition, namely the necessity of conscious stages of motor learning, the isolation of movements and their ensuing musical effects, and the usage of ideal movement templates, i.e. ideas and instructions about "how one should move in order to play the piano properly".

2.7.1 Consciousness and motor learning

Traditional views on motor skill acquisition emphasize the need for the learning process to start with a stage in which learners receive verbal, explicit instructions about how to move and exert conscious control over their movements. This notion can be recognized in the stages of motor skill learning proposed by Fitts and Posner (Fitts and Posner 1967). Their model consists of three progressive stages: a cognitive stage in which movements are performed relatively consciously, an associative stage during which the performer learns to perform the skill with gradually diminishing conscious control, and an autonomous stage during which the performer learns to carry out the skill with little conscious effort. The notion that conscious control of movements is beneficial or even mandatory for novice learners is also found in piano pedagogy, both in historical approaches of piano teaching and in current practices. The famous piano pedagogue Tobias Matthay (1903) expresses the necessity of conscious control in learning like this:

> Yet, the act of playing, is a widely different experience from the act of learning to play! Practically everything we learn, has first to be done consciously; and also very often self-consciously too! Only by habit can we ultimately succeed in "naturally" accomplishing the required actions. The greater the talent, the greater the speed and the less the apparent effort with which we learn, that is all. Playing forms no exception to this universal law. *(Matthay, 4)*

Piano pedagogue Ellen Amey (1921) states the following about conscious control:

> Broadly defined, it is the ability which enables him [the pianist] to control his effects at all times; his ability to control consciously and to direct the physical in the performance of conceptions formed from impressions or mental images, within recall. This same ability should manifest itself proportionately in the study and performances of the student. It is as necessary to him as to the artist, and the very qualities that make it a recognized factor are those that make the pupil a student and the hour a success. *(Amey, 1)*

The Taubman Approach is an example of a contemporary approach to piano pedagogy based on conscious control of movements. Among other things, it aims to provide injured pianists with tools to motorically "retrain" them in order to overcome their injuries. Pianist and piano pedagogue Teresa Dybvig (whose teaching approach follows the principles formulated by Dorothy Taubman) presents the following explanation of the role of consciousness in the retraining of pianists: "Pianists who retrain their techniques build their consciousness while they rebuild their techniques, so eventually, they know consciously how to play each finger in a beautiful toned balance, how to move from note to note, how to play chords -- how to handle every musical situation the repertoire requires." (Dybvig 2004)

On the one hand the role of consciousness in musical motor skill acquisition should not be considered a settled matter. Experimental research has not addressed musical learning processes sufficiently for justifying categorical statements. On the other hand, the notion that a learning stage in which learners exert conscious control over their movements is necessary and unavoidable is contradicted by experimental evidence. As has been summarized in paragraph 2.4.3, providing learners with literal instructions how to move and asking them to focus their attention on their own movements yields inferior learning results in terms of learning speed, retention, accuracy, stress-resistance and transfer to related skills, when compared with the outcomes of learning under externally focused conditions. The superiority of an external focus of attention has been shown in a wide variety of skills and seems to be independent of age, level or personal preference of training approach of learners. All in all, it is considered to be a robust phenomenon. Moreover, Harris has pointed out a potential fundamental flaw in current teaching strategies for instrumental skills, namely the reliance on declarative knowledge and conscious perception (Harris 2017, 77-92). Instrumental teaching approaches are typically based on providing learners with verbal movement instructions, for instance about hand position. However, music performance requires the implicit (or "procedural") skill of transforming perceived or imagined musical sounds into motor control. Declarative learning (learning "THAT") and procedural learning (learning "HOW") occur in anatomically and functionally distinct areas of the brain. Harris expresses the need for instrumental pedagogy to address this discrepancy between current instrumental teaching strategies and recent neuroscientific insights, more specifically to develop approaches that facilitate procedural learning processes. The application of implicit motor learning strategies might be one of the ways to meet this need.

2.7.2 Isolation of movements and their ensuing musical effects

Some of the early 19th century approaches of piano pedagogy employed initial learning stages in which the pupil was required to perform dry pianistic exercises only, being explicitly forbidden to play anything musical (Laor 2016). An example of this is the approach to piano teaching advocated by Friedrich Guthmann, in which novice learners start with a period of 8 to 10 months of exclusively performing finger exercises (Guthmann 1805). According to Laor, these approaches are based on a mechanistic paradigm which emerged from Enlightenment philosophy of science. Mechanistic approaches of piano pedagogy involve a radical separation of movements and musical artistry, which is rarely seen in piano pedagogy nowadays. Yet, the notion that playing gestures can and should be learned in isolation of the musical effects they intend to produce can still be recognized in contemporary approaches of piano teaching. A common approach employed in the first couple of piano lessons is to let learners perform single strokes or elementary pianistic patterns (such as five-finger patterns) and guiding these movements by verbal instructions. Typically, in this type of situation most instructions involve movement norms (specifying for example proper hand position) and little or no instructions involve the intended musical outcome.

As has been summarized in paragraph 2.2, recent neuroscientific research has demonstrated the functional and anatomical connections between auditory and motor brain areas. The ability to perform music relies on fast perception-action couplings which enable predictive processing and thereby accurate motor control. Considering this, isolation of movements and musical goals is potentially counterproductive. Nonlinear pedagogy (the research-based approach to motor skill acquisition summarized in paragraph 2.4) stresses the need for perception and action to be coupled in order to ensure good learning outcomes. It therefore seems better to present novice learners with more musically meaningful activities, for instance replacing the single strokes and elementary pianistic patterns with simple melodies acquired by singing, so that a mental auditory representation is present right from the start. Instructions may then be directed to auditory aspects of pianistic quality, such as the instruction to “listen for the connections between the notes”, intended to facilitate legato playing. This approach has the additional benefit of being more likely to induce an external focus of attention within learners, since they are asked to play a certain melody a certain way rather than move their hands/fingers in a certain way.

2.7.3 Ideal movement templates

Piano pedagogy traditionally places a lot of emphasis on how to sit and move properly, so that “natural”, “optimal” or “economical” movements will emerge. This emphasis can for example be recognized in the title of the famous piano method by Rudolf Maria Breithaupt from 1903: “The

natural piano technique"[5] (Breithaupt 1903). Piano methods (both historical and contemporary) typically include many pictures of "correct" and "incorrect" sitting postures, arm/wrist/hand positions and finger gestures. This indicates that traditional piano pedagogy tacitly assumes that there is a set of movement norms which can be considered "the correct way of playing", and which is applicable to all learners: an "ideal movement template". Moreover, this ideal movement template is implicitly expected to be beneficial for learners, thus receiving correct instructions at the start of their learning process so that they can develop good motor habits.

Although traditional piano pedagogy is remarkably uniform in its assumption that ideal movement templates exist and are beneficial, it is notorious for disagreeing on the movement norms themselves. The history of piano pedagogy is studded with debates about for example proper hand position and the role of arm weight that continue to the present day. More importantly, recent scientific insights into motor learning put the value of idealised motor patterns into perspective. In the first place, elite athletes have been found to perform their highly trained skills with considerable differences in motor performance, both among different athletes and between attempts of a single athlete (van der Loo 2010). Training systems involving deliberately "incorrect" variations of the target movement ("Differential learning") have been found to yield identical or superior learning outcomes compared to "classical" technique training involving instructions and corrections towards an idealized movement (Schöllhorn, Davids and Hegen 2012). Furthermore, proponents of nonlinear pedagogy point out the danger that an ideal movement template may not suit individual properties of learners: "There is little value in instructing athletes to copy an idealised motor pattern that may not suit their individual intrinsic dynamics" (Davids, Button en Bennett 2008, 118). The website iresearchnet.com explains why patterns of movement only represent optimal solutions for individuals when they match their intrinsic properties:

> Task goals relate to the specific intentions and aims of individuals during task performance. With few exceptions, such as predetermined movement patterns specified by the rules of a sport, exemplified by the performance criteria in diving, ice skating, or gymnastics, task goals tend to not precisely specify how a task should be achieved. Movement coordination solutions are, therefore, only optimal for individuals due to the unique interactions between individual, environmental, and task constraints, meaning that the search for a putative general ideal movement pattern or classical technique is a redundant goal in coaching and teaching. Functional movement patterns of an individual performer may vary, even within activities which require high levels of performance outcome consistency, such as a gymnastic vault, a long jump approach run, or a golf swing, because the task, environmental, and individual constraints differ from performance to performance. *(Task Constraints sd)*

Rather than instructing and correcting learners based on ideal movement templates, I suggest students to view emerging patterns of movement as individual solutions for achieving musical goals.

[5] Original German text: "Die natürliche Klaviertechnik"

Pedagogical interventions that actually help pupils to achieve musical goals likely lead to permanent changes in their patterns of movement. Ideally, piano teachers offer pupils assistance in procedurally discovering gestures that lead to intended musical outcomes. Holding on to ideal movement patterns may hamper this process.

3. Research methodology

My research aims at finding practical solutions for a complex educational problem, namely the discrepancy between research-based principles of effective piano pedagogy and teaching strategies employed by students in their internship lessons. Even though I did identify potential improvement measures prior to my research (namely the development of coherent teaching materials), improving upon the initial situation would probably involve multiple interventions. A process of trying out different measures, observing their consequences and re-evaluating the situation seemed most appropriate. Based on these considerations, I chose educational action research as the main methodology of my research.

Cain (2008) formulated a general model of educational action research, in which the research process is described as a plan – act – evaluate – reflect cycle:

> Educational action research can begin with practitioners asking, "how do I improve my practice?" (Whitehead 1989). In seeking answers, they investigate their own practice, plan and carry out interventions to improve it and evaluate the intended and unintended consequences of these interventions, interrogating data in order to ground their evaluations in evidence. They reflect on each stage in order to generate new plans, thus starting the cycle again. *(Cain, 284)*

My research lasted two seasons: from September 2017 until April 2019. In each season I taught one class of students and went through an intervention cycle of planning, acting, evaluating and reflecting. The first class consisted of three students; the second class had four students.

3.1 Measurement of results

The outcome measure of my research is the improvement in didactic skills that can be observed in the internship lessons of my students. In order to measure this development, students were asked to record their internship lessons on predetermined moments. I selected fragments from these recordings, based on the criterion that the involved student applies a listening assignment, in-between steps and/or a movement metaphor in it. Definitions and detailed description of these strategies for teaching and learning can be found in paragraphs 2.5.3 (listening assignments), 2.5.4 (in-between steps) and 2.5.2 (movement metaphors). I chose the application of these teaching strategies as a selection criterion for the internship video fragments because I believe they correspond to research-supported principles of effective piano pedagogy and can therefore be useful tools for the learning process of pianistic skills, if applied well. Furthermore, the quality of application of these strategies for teaching and learning indicates to what extent students have processed the information regarding the learning process of pianistic skills transmitted in the methodology course and can apply it independently and effectively in their own lessons. Finally, I wanted the selection of lesson fragments to take place as objectively as possible.

The prototype observation sheets

The objective of this research is not only for students to learn to apply a set of strategies for teaching and learning, but (more importantly) to guide students towards increasing the quality of their application. Put differently, effectiveness of teaching strategies depends on how well students apply certain teaching strategies. Consequently, the aim of observing the recorded internship lessons is not to check whether students apply certain teaching strategies, but to observe improvement of application quality. For this purpose, at the beginning of the year 2018, I designed three prototype observation sheets which are aimed at measuring how well the students applied the aforementioned strategies for teaching and learning. They are attached to this thesis in appendix 1A through 1C. Each observation sheet contains questions concerning one of the three strategies for teaching and learning, that progress from objective and descriptive to subjective and evaluative. For example, the first two questions on the prototype observation sheet for movement metaphors (Appendix 1C) ask for a description of the applied movement metaphor and the musical goal addressed by it. These questions are descriptive in nature. Questions 3 and 4 focus on two qualitative aspects of the application of the involved movement metaphor, namely whether the pupil has a clear idea of the improvement in terms of sound he is pursuing by the movement metaphor and whether the movement metaphor aims at triggering a movement sensation. These two qualitative aspects have an influence on the effectivity of the applied movement metaphor. My aim is to help students get better at creating the circumstances in which their instructions trigger the desired outcome within their pupils. These questions intend to obtain information about this. Finally, the observation sheets include questions that adopt the perspective of the "teacher of the teacher". An example of this is question 7 of the observation sheet for movement metaphors, which asks the observer for suggestions for enhancing the effectivity of the application of movement metaphors for the observed teacher.

The unified observation sheet

In November 2018 I integrated the observation sheets into one document and revised the content, based on usage experiences and comments by supervisors. This improved version of the observation sheet is attached in Appendix 2.

Expert consultation meetings

I organized expert consultation meetings at the end of both seasons in which my research took place (i.e. 2017-2018 and 2018-2019), in which two fellow piano methodology teachers and I evaluated and discussed a selection of video fragments of internship lessons, using the observation sheets as a tool to facilitate intersubjectivity. These meetings were intended to obtain information about whether students showed progress in their application of research-supported principles of effective piano pedagogy. In addition, they provided me with feedback on the improvement process of the piano methodology course. I decided to engage fellow piano methodology teachers because I wanted to obtain feedback

from colleagues who are also in the position of guiding piano students of various educational backgrounds in their first actions as a piano teacher. I intended to acquire specific and to-the-point feedback based on the experiences of these colleagues. I chose to apply focus group sessions rather than individual interviews, because I wanted the members to engage in a lively discussion about the backgrounds of their opinions. The ideologies underlying their feedback were as important to me as their feedback itself. Furthermore, I intended to enhance the capacity of my colleagues to come up with potential improvement measures by bringing them together. Focus group discussions are more capable of inducing creativity than individual interviews (Mortelmans 2007, 342).

3.2 Interventions

3.2.1 Design of teaching materials

The development of teaching materials was one of the main interventions I undertook. The methodology of this part of my research exhibits similarities to educational design research. Plomp proposes the following definition of educational design research: "the systematic analysis, design and evaluation of educational interventions with the dual aim of generating research-based solutions for complex problems in educational practice, and advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them" (Plomp 2013, 16). In accordance with this definition, my research aims to generate solutions to a complex educational problem, and to acquire knowledge about the characteristics of these solutions. More specifically, I intend to create effective teaching materials and acquire knowledge about what characteristics these teaching materials need to have in order to be effective.

Plomp furthermore explains that educational design research is cyclical in character: "analysis, design, evaluation and revision activities are iterated until an appropriate balance between ideals ('the intended') and realization has been achieved" (Plomp 2013, 17). The design process of the teaching materials did not start with systematic analysis of the problem but with a more informal evaluation of the initial situation. After this, I put together a set of criteria for the teaching materials (attached in appendix 3) and designed a prototype of the teaching materials based on them. Next, I asked a group of seven fellow piano teachers for feedback on this prototype by means of a questionnaire, which is attached in appendix 4. I used the prototype in my methodology course and wrote down my usage experiences in a logbook. Furthermore, I asked students for their experiences with the materials. Finally, I improved the materials based on these sources of feedback at the end of both cycles of my research.

Nieveen and Folmer propose four quality criteria for educational interventions, namely relevancy, consistency, practicality and effectiveness (Nieveen and Folmer 2013, 160). According to these authors, an intervention is relevant if there is a need for it, and its design is based on state-of the art

(scientific) knowledge. The relevance of my research is described in paragraph 1.2, and the scientific knowledge that underpins the approach to piano pedagogy conveyed in piano methodology is reviewed in chapter 2 of this thesis. Nieveen and Folmer suggest that an intervention is consistent when it is "logically" designed. I obtained information about the internal consistency of the teaching materials by including questions focusing on this in the questionnaire I sent to fellow piano teachers. Also, I asked students how they experienced the consistency of the teaching materials during the evaluations of the methodology course that took place at the end of both seasons. In order to monitor the practicality (or: usability) of the materials, I wrote down my experiences applying the materials in a logbook. The effectiveness of the materials is reflected in the intended progress in teaching skills within students, the measurement of which is described above.

As mentioned, throughout my research, I engaged a group of seven fellow piano teachers in order to provide me with feedback on the materials in the making. These colleagues teach piano in a variety of contexts: they have private teaching practices, teach piano as a secondary instrument in the KC and/or teach piano in the music education program for pre-school children of the KC.[6] They also vary in their educational background since they studied piano in various Dutch conservatories. I selected these piano teachers because I know them personally and they have shown to be interested in the application of research-based educational principles of piano pedagogy. I contacted them by mail. After their agreement to participate, I provided them with a text summarizing the goals of my research and the design criteria. Next, I send them a questionnaire based on the design criteria and parts of the teaching materials. This questionnaire is attached in appendix 4. I collected their responses and improved the materials based on this source of information.

The result of the design process is a two-part syllabus that contain links to video fragments of lesson excerpts, a slide presentation that I use in the methodology course and a set of lesson sheets that help me keep track of key information during the methodology lessons. The syllabus is included as a separate document in the KC Research Catalogue exposition of this research.

3.2.2 Peer-learning

At the end of the first year of my research, I added a second element of intervention, namely implementation of more opportunities for feedback on the internship lessons by means of peer-learning. I decided to let my students apply the observation sheets as a tool to reflect on their own and each other's lessons. For this purpose, I organised internship discussions within the methodology lessons. These discussions involved students observing fragments of their own lessons as well as those of other students, filling out observation sheets and discussing their observations. In addition to

[6] PI: Music for pre-school children: https://www.koncon.nl/en/programmes/school-for-young-talent/school-for-young-talent/pi-music-for-pre-school-children?

providing the students with extra feedback on their actions, this also yielded feedback on the design of the observation sheets themselves. I decided to implement peer-learning because it is helpful for students to experience the role of the observer and having to provide each other with feedback based on this. Peer-learning has the potential to enhance reflectivity: the ability to evaluate one's actions and come up with alternative approaches for future similar situations. Reflectivity is an important goal of the music education program of the KC.

3.2.3 Scientific underpinnings

A secondary goal of my research was to make sure that the approach of piano pedagogy that I convey to students is in accordance with current scientific insights into human motor skill learning. In order to reach this goal, I reviewed scientific information on this topic, and integrated this in the lesson material and chapter on the contextualisation of my research in this thesis.

3.2.4 Internship guidelines

I created a more elaborate set of guidelines for the internships, which is attached in appendix 5. These guidelines are intended to provide students with detailed information about both practical and pedagogical aspects of the internship. I handed these guidelines out prior to the start of the internships. I thought that the difficulties students experienced in their internship were partially resulting from a lack of prior information. The more elaborate guidelines aimed at facilitating students to find the appropriate pedagogical direction for their internship lessons more quickly, in order to get the most out of them.

3.2.5 Logbook

I created a logbook of the methodology lessons in which I kept notes about my experiences using the lesson material prototype, the information we covered and the contributions the students made during the lessons. This helped me to keep track of the discussed topics, thus facilitating a smooth and logical connection between the content of the lessons.

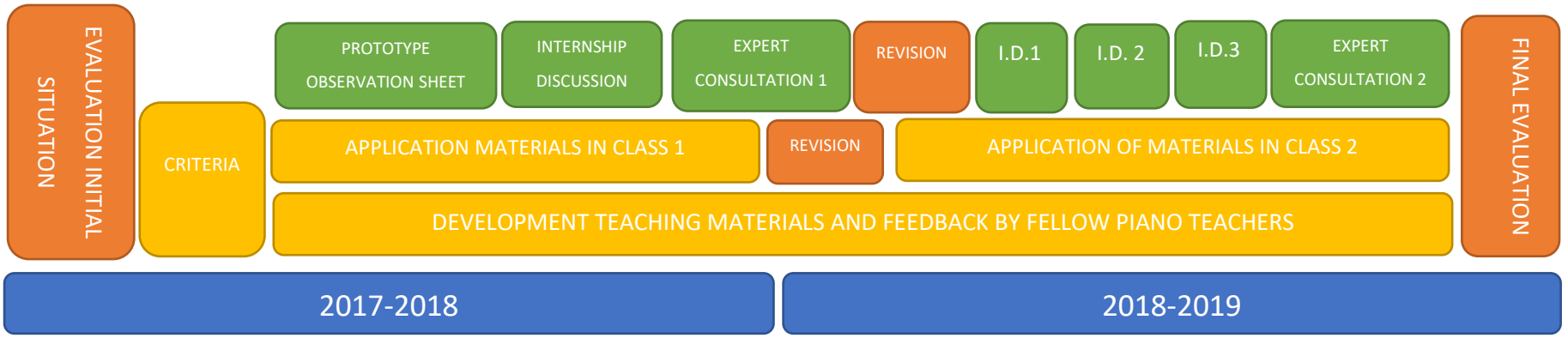
3.3 Timeline research process

Research activities involving observation and feedback on internship lessons

Research activities involving the development and application of teaching materials

Research activities involving evaluation of the problem, revision of the materials and observation sheet and the final evaluation of the research

- I.D. is an abbreviation of Internship Discussion: a session in which students observe their own and each other's lessons, fill out the observation sheet and give each other feedback
- Expert consultation refers to the meetings I had with fellow piano methodology teachers, in which we observed and discussed video fragments of internship lessons
- Criteria refers to the development of a set of qualitative design criteria for the teaching materials



4. Results

In this chapter I present the outcomes of the interventions I performed during my research. First, I will describe the development process of the teaching materials, including the feedback colleagues gave on it and experiences of its usage in the piano methodology course. Next, I will report on the internship discussions that took place within the piano methodology lessons. After this, I will describe the procedure and outcomes of the expert consultation meetings I organized at the end of both cycles of my research. Finally, I will evaluate the results of my research.

4.1 Development of teaching materials

At the start of my research, reflecting on the course of events in the methodology lessons I had given so far, I felt the need for unifying the texts I created about the pedagogical approach to pianistic quality into one syllabus. Also, I wanted to create links between different parts of the information in order to create a coherent line of argument. Finally, I felt it was necessary to present students with videos of lesson fragments in which the strategies for teaching and learning that we discussed are applied in piano lessons. My expectation was that a unified, well worked out syllabus would increase the likelihood of students using it actively as reference material during their internship. I also expected that seeing fragments of real lessons in which certain teaching strategies are applied, would help the students to apply these strategies themselves in their internship lessons. Therefore, I decided that the first intervention of my research would be the development of elaborate and coherent lesson material, supported by an organised collection of video fragments of real-life piano lessons.

I started by putting together a set of criteria that the teaching materials had to meet. Based on my evaluation of the initial situation and my own views on the overall approach of the piano methodology course, I made a set of 11 criteria, that are attached in appendix 3. The next step was to re-organise and expand upon the collection of teaching strategies (exercises, in-between steps, movement metaphors and the like) for pianistic skills. I created a list of common aspects of pianistic quality that I wanted to cover in my syllabus. For each aspect I described how it can be dealt with in such a way that musical intentions of pupils (rather than instructions by teachers) play a central role in the learning process. The collection of applied teaching strategies for common aspects of pianistic quality is part 2 of the syllabus.

I started making video recordings of fragments of my own piano lessons, both in my private teaching practice and my lessons in the KC (where I teach piano as a secondary instrument), which I have continued doing until the present day. I deliberately chose parts of lessons in which I applied teaching strategies that I want my students to master and apply in their lessons. I added titles and subtitles to these recordings, uploaded them as “hidden” videos to a private YouTube-channel, and created links to them in the syllabus.

After completing this part of the syllabus, I started working on the first part of it, covering the over-arching vision on piano pedagogy. For this part of the syllabus, there were several existing texts that had to be unified into one coherent document and meaningfully linked to the collection of practically applied teaching strategies. In addition to making this part of syllabus, I created a slide presentation for the methodology lessons, including a couple of video fragments that either explain concepts (such as proprioception) or function as an illustration of teaching strategies discussed in the lesson.

4.1.1 Feedback by colleagues on the teaching materials

Since I wanted to receive additional and early feedback on the syllabus, I engaged seven fellow piano teachers to critically read individual chapters of it. In summary, I concluded that they think that the lesson material generally meets the criteria. In the questionnaire, I asked them about the logical link between the educational concepts and the practical applications on them, which I considered to be the main element of internal consistency. Overall, they were positive about this feature of the syllabus, although they did point out some minor inaccuracies in my usage of piano pedagogy jargon. Furthermore, they provided me with several valuable additional teaching strategies, that I integrated into the syllabus.

4.1.2 Usage experience of the teaching materials

Applying the prototype of the teaching materials in the methodology course, I experienced a considerable improvement compared to the lessons in previous years. Designing the prototype had given me a clearer idea of what I wanted to convey. Also, it helped me to go deeper into the aspects of pianistic quality that I wanted to discuss. I noticed that we spent much more time on each aspect, and the students could contribute more of their ideas. However, in one of the early lessons applying the new materials, I experienced that using the syllabus prototype as teaching material within the lesson has the pitfall of the lesson tending to become a lecture based on it. In my view, the lesson became too much dominated by me, reading aloud the content of the syllabus and presenting examples of how to work on certain aspects of pianistic quality, rather than inviting students to come up with their own ideas and experiences.

In order to fix this problem, I created lesson sheets that summarize the information I want to transmit during the lesson, but also describe questions for the students to answer. The lesson sheets are attached in appendix 6. In general, I want the discussion of each aspect of pianistic quality to start with an exchange of pedagogical approaches that (former) piano teachers of my students have applied and approaches that students have applied themselves in their (internship) lessons. By doing that, we develop an image of the pianistic background of each student. Furthermore, it demonstrates that there is always more than one way to approach the acquisition of pianistic quality. In order to facilitate this exchange of experiences at the start of the lesson, at the end of the previous lesson I give the students

one or more questions to think about as a preparation for the next lesson, including questions about how their previous teachers approached the aspect of pianistic quality to be discussed. After exchanging how previous and current teachers approach the topic at hand, I aim at igniting a group conversation by means of an open question. During the exchange of approaches and group discussion, many possibilities are presented. We discuss how these can be linked to concepts of instruction that we have dealt with earlier in the methodology course. Finally, I show further strategies for working on the aspect of pianistic quality at hand, if I think these are a relevant addition to the ones already discussed. The lesson sheets help me to preserve the intended interactive nature of the methodology lessons.

Throughout the season, we discussed all information covered in the syllabus in the lessons. After the course, I gave students a copy of the syllabus as reference material. I used the syllabus to structure the lessons, but it was not used by students as study material. As a result, students could only comment on the internal consistency of the lessons (that took place based on the syllabus), not on the syllabus itself. They experienced no problems in the internal consistency of the lessons. However, they expressed that it would have been nice to have the syllabus at the start of the course.

4.2 Internship discussions

4.2.1 Internship discussion, first class – March 2018

On the 29th of March 2018, I organised an internship peer-learning discussion for the students of the piano methodology course. Peer learning can be a tool for improving one's professionalism with the help of colleagues or peer learners. Prior to this session, I selected one video fragment of an internship lesson from each student. I selected these fragments based on the criterion that the student applies a listening assignment, a movement metaphor or in-between steps as a tool for working on pianistic quality. Even though the students had handed in several recorded internship lessons, I found only one suitable lesson fragment for each student. On average, the fragments were three minutes long.

At the start of the session, I explained its procedure to the students. We watched a video fragment, filled out the observation sheet and exchanged what we had written down. In the exchange phase, the observed student had the first turn in the discussion, after which the other students and I had the opportunity to add our observations. I took notes of the main points of observation and feedback. Also, I made an audio recording of the session so that I had the opportunity to listen back to it in order to retrieve lost information.

The students expressed finding it awkward to see themselves in action as a teacher. At the same time, they also experienced it as useful. All in all, it was a positive and informative experience, both for the students and for me. I noticed that the students can point out peculiarities or possibilities for improvement for themselves. One student noticed she gave many instructions that started with

“Don't...”. Another student was worried about talking too fast. The third student immediately noticed that in the fragment of his internship lesson we observed, he did not ask his pupil to apply the demonstrated in-between step by himself, thus diminishing the likelihood of his pupil being able to apply it independently in his own practice sessions. The students also came up with suggestions for improvement for each other. However, the main points of attention were generally already mentioned by students themselves, so that there were hardly any substantial additions to be made by their peers and me.

I noticed that the setup of the observation sheets required quite a bit of explanation, even though we read and discussed all questions prior to watching the video fragments. For instance, the questions that involved indicating the extent to which the observer agrees with a presented statement were sometimes misinterpreted. Possible ways of dealing with this are adding more detailed instructions about how to fill out these questions on the observation sheet, preceding each observation with a step-by-step discussion of the questions and showing an example of a previously filled-out form.

In conclusion, it was a fruitful session, in which the observation sheets played a positive role in focusing the feedback students gave each other. However, the design of the observation needs some adjustments that enhance its practical usability, most importantly to make it easier to understand how to fill it out.

4.2.2 Internship discussion 1, second class – December 2018

The procedure for this session was different from the session with the first class. In the first place, I had unified the three observation sheets into one and revised the content of it. Also, students had to observe the selection of video fragments and fill out the observation forms prior to (instead of during) the session. In order to facilitate this, I sent them the fragments a week before the session. This gave us more time to exchange our observations and have a conversation about potential points of improvement. Finally, the discussion of each fragment was structured by the following sequence of actions: the observed student mentions the main points he/she noticed in his/her lesson, the observed student may formulate a question for the other observers (something he/she would like to get feedback about), the other observers present their main points of observation and answer the question (if any) by the observed student, the observed student formulates new approaches to try out in future internship lessons. Again, I took notes and made an audio recording of the session. This time, the average length of the video fragments was eight minutes. Despite using our time more efficiently by performing the observations prior the session, one hour was not enough for discussing four lesson fragments. In fact, we spent two full lessons on it. I experienced this as positive, since a lot of useful information was exchanged. Considering this, I am all right with spending two full lessons on one round of internship peer-learning discussions.

The students reported that they experienced their observations of the lesson fragments guided by the observation sheet as valuable, most notably since they had never observed lessons in a similar manner. In addition to this, the questions on the observation sheet had demonstrated them potential observation topics that they had not been aware of and therefore had never considered when reflecting on their own lessons. More specifically, the questions about practice strategies were an eye-opener to one of the students, who reported not being used to thinking during the lesson about what her pupils do outside of the lesson. The students reported to find it hard to fill out the more interpretative questions of the observation sheet. However, since the session involves a conversation about the observed lesson fragments (rather than just exchanging the filled-out forms), students get the opportunity to explain their answers. Put differently, the observation form is a tool for focusing observations and feedback and intends to enable a productive conversation in which students think about potential areas for improvement together. It helps to make sure all observers focus on the same things. This further explanation of the role of the observation sheet made it easier for the students to answer the more interpretative questions of the observation sheet.

The fact that the observation sheets were now unified into one form implied that for each observed fragment there were several irrelevant questions. For example, lesson fragments may not involve one or more of the teaching strategies included in the observation sheet, making questions about them redundant. One student reported having to watch the video fragments several times. Since the unified observation form consists of five pages, it was challenging to keep all observation topics in the back of one's mind. As a result, it happened that she realized something relevant happened in an earlier part of the fragment after having watched it completely, forcing her to retrieve this relevant event. Nevertheless, all students reported that observing the fragments and filling out the observation sheet became easier after doing it a couple of times. We therefore decided not to change the procedure since we expected that more experience with it will lead to more ease in the future. One minor change in the procedure for selecting the fragments was agreed upon: Since homework assignments and instructions on how to practice are sometimes given at the end of lessons, I promised to also include these lesson fragments, if relevant. Nevertheless, the lessons handed in for this session did not include such discussions of homework or practice strategies.

Student A had recorded a lesson with an eight-year-old boy, who had recently started playing the piano. The lesson fragment I selected involved the application of listening assignments. Its main topic was the distinction between legato and staccato, the piece was "Een witte Kerst" by Leo Wouters. She concluded that her usage of listening assignments is good and suggested that she could also employ listening questions before demonstrating something in order to allow pupils to observe her demonstrations in a more focused manner. Most importantly, she intends to pay more attention to the practicing process of her pupils during the lesson.

Student B had recorded a lesson with a twelve-year old boy who played the piano for two years. The lesson fragment I selected involved both in-between steps and a movement metaphor. Its main topic was playing melodically by making little crescendo's towards accented notes and diminuendo's after them, the piece was an easy arrangement of "Angels we have heard on high". Student B reported that she found her teaching style to be similar to her own current piano teacher: she expresses clearly what she wants and is demanding, which has the potential pitfall of being pushy and over-asking pupils. She explained that the pupil in the recorded lesson has motivational issues, resulting in a very passive attitude in the lesson. She had been trying to apply an activating teaching approach by means of questions, but he kept saying "I don't know". Therefore, her question to the other observers was: "How can I engage my pupils more in the lessons?" After the discussion of her lesson, she planned to address this by employing activities away from the piano (such as singing and moving) and presenting this pupil with repertoire options. She will continue looking for an "entrance into his world".

Student C had recorded a lesson with an adolescent pupil who already has an advanced level of playing. In this lesson they worked on Impromptu op. 142 nr. 3 by Schubert, focusing on overall calmness in expression, staying soft, keeping the crescendo's small, play more legato and take more time at the end of phrases. The playing of this pupil demonstrates a good sense of style, high tempi and an easily recognizable enthusiasm. His main learning goal is to learn to "polish" his playing, for instance to be more accurate in terms of the correct notes, more fluent in his rhythms and to be clearer in building up and finishing phrases. The lesson fragment I selected involved both a listening assignment and in-between steps. Student C explained that observing his own lesson was a surprising experience. His questions to the other observers were: "Do I give this pupil too much space in trying certain things out?" and "How to encourage his [the pupil's] extreme motivation whilst helping him to stay in control?". Based on the discussion of his lesson, he intended to check more frequently whether his pupil has understood the instructions or comments, to be clearer and more specific in his instructions and to let his pupil focus longer on one aspect of the music, rather than introducing too many points of attention in a short amount of time. In addition, he planned to offer this pupil more guidance in how to approach practicing.

Student D had recorded a lesson with an adolescent pupil who had been playing for around five years. In this lesson they worked on Prelude op. 28 nr. 4 by Chopin, mainly focussing on pedalling. The lesson fragment I selected involved listening assignments and in-between steps. Student D concluded that he managed to apply many tools that he learned in the methodology course, more specifically listening assignments and self-feedback. He also noted that he regularly checked during the lesson whether his pupil understood his instructions and comments. His question to the other observers was: "Do I talk too much?" The observers expressed that they experienced the communication in the observed lesson fragment as positive, since it involved a balanced dialogue between pupil and teacher and many questions were asked. Also, the application of listening assignment was perceived as

productive. Focusing on feedback, it was found that his feedback largely expresses his opinion (evaluative feedback) rather than describe what he heard (descriptive feedback). Based on the discussion of his lesson, student D intended to more frequently apply descriptive feedback rather than evaluative feedback. Finally, he planned to let his pupil try out different ways of doing things (including "wrong" ways) rather than only practicing the "correct" way in the lesson.

4.2.3 Internship discussion 2, second class – February/March 2019

These internship discussions took place during two methodology lessons in February and March 2019. Each discussion lasted around 30 minutes, following the same procedure as in the previous round: the observed student mentions the main points he/she noticed in his/her lesson, the observed student may formulate a question for the other observers (something he/she would like to get feedback about), the other observers present their main points of observation and answer the question (if any) by the observed student, the observed student formulates new approaches to try out in future internship lessons.

Student A had recorded a lesson with the same eight-year old boy as in the first round of internship discussions. In the fragment I selected, they worked on the C-major and F-major scales, with two hands in parallel motion, one octave up and down. The pupil had to play these scales staccato and legato. In this lesson fragment, student A applied a listening assignment, namely the question "What is the difference between these two ways of playing" after her demonstrations of legato and staccato playing. Also, she applied the movement metaphor of "happy fingers" intended to facilitate fine-motor playing gestures in moving the fingers over the thumb in scales.[7] By observing this lesson fragment, student A found out that this pupil does not listen to the full instruction, but already starts playing during the instruction. Furthermore, in the discussion of this lesson fragment, we concluded that this pupil appears to be focused on the physical movement rather than the intended musical sound, which can be addressed by presenting him with goal-oriented (rather than movement-oriented) feedback. The pupil improvised with the practised scales, which is a nice way of encouraging pupils to develop a sense of tonality, rather than just playing scales up and down. We suggested that student A can give her pupil more feedback on his improvisations and let him explore different rhythms more. Finally, for the future student A aims to take more time for each step of the learning process.

Student B had recorded a lesson with a ten-year-old boy, who is a novice pupil. In the fragment I selected, they worked on achieving a light and clear sound in staccato playing. It involved the application of two movement metaphors intended to facilitate this goal, namely "Imagine your fingers are jumping on a trampoline" and "Imagine your fingers bounce the keys like a ball". Based on watching back her lesson, Student B concluded that she could have asked her pupil more about what he heard during the lesson. Also, she expressed finding it difficult to verbally express the intended

[7] This movement metaphor is described in detail in part 2 of the syllabus, page 26-27

musical outcome to pupils. During the discussion, we concluded that more reflection (i.e. expressing in his own words what he heard in his own playing) would be good for this pupil, with the aim to develop his musical imagination and listening skills. In addition, we found the movement metaphors to be well chosen. In the application of these metaphors we thought the pupil could be more focused on the musical goal rather than on the playing gesture, i.e. the pupil could be more externally focused. At the end of the discussion, student B explained that she plans on making a learning plan for teaching children that helps her to organize the content of her lessons.

Student C had recorded a lesson with the same pupil as in the first round of internship discussions. This time they worked on the second variation of Schubert's Impromptu op. 142 nr. 2, focusing on clarity of articulation and rhythmic coordination of the hands. The fragment I selected included in-between steps, namely, to first play the piece together (teacher plays left hand, pupil plays right hand) and playing a simplification of the piece in which the pupil only plays the bass notes of the left-hand part, in combination with the full right-hand part. Student C found his approach to this lesson incoherent; he had not made a lesson plan for this lesson. His pupil has difficulty to rhythmically coordinate the musical lines of both hands. Therefore, the question that he asked the other observers was which teaching strategy he could apply for this. The other observers suggested him to apply more reflection, make it clearer to his pupil what the musical goal is (for example by giving more demonstrations), and to take more time to focus on one specific thing. Student C aims to try these things out in future lessons.

Student D had recorded a lesson with the same pupil as in the first round of internship discussions. The piece they worked on was an Etude by C. Czerny, focusing on building up and finishing musical phrases, finding out which notes to emphasize, and applying expressive timing to clarify the musical phrases. The lesson fragment I selected included a listening assignment, namely a reflection by the pupil following an imitation of her playing by the teacher. Student D noticed that he asked many questions during this lesson fragment, which reflects his intention to apply activating didactics. He also noticed that he still formulates his feedback as an opinion ("I think…") rather than as a description ("I hear…"). In the discussion of the lesson fragment we concluded that the applied listening assignment worked well: the pupil could describe accurately what she heard. Throughout the lesson, she gradually improved the clarity of her phrasing, supported by the demonstrations, musical metaphors and exercises applied by student D. We suggested that he can additionally try out exploring alternative ways of playing phrases, such as asking the pupil to perform without dynamic differences or with "inverted" dynamics. This could help her to experience what the musical consequences are of various ways of phrasing, thereby enhancing her control of it. Also, playing together was suggested as a teaching strategy to convey phrasing non-verbally.

4.2.4 Internship discussion 3, second class – March/April 2019

The third and final round of internship discussions took place in March and April 2019. The procedure and average duration of both the lesson fragments and the discussions was the same as in the previous rounds.

Student A had recorded a lesson with an introvert, eight-year old boy, a different pupil from the previous rounds of discussions. They worked on an arrangement of the French folk song "Alouette", focusing on finding an appropriate practice tempo and dynamic differentiation. The lesson fragment I selected included listening assignments, mostly asking the pupil to identify what can be improved in his playing. This pupil plays with a gross motor playing gesture: a "pushing" motion with the forearm on every note. Student A asked the other observers how she can guide him towards finding more fine-motor playing gestures. During the discussion of this lesson fragment, we suggested to challenge this pupil in terms of his pianistic skills, for instance to ask him to play even softer than he already did, or to dynamically differentiate melody and accompaniment. Also, we suggested to apply more demonstrations, for instance of the proposed practice tempo.

Student B had recorded a lesson with the same ten-years-old pupil as in the previous round. In this lesson they worked on an arrangement of the song "What shall we do with the drunken sailor", focusing on making the accompaniment shorter and lighter, and playing the melody with accents on the right notes and playing the notes between the accents lighter. The lesson fragment I selected included a movement metaphor, namely, to imagine bouncing a ball, intended to facilitate the production of crisp staccatos. Student B noticed that it took her pupil long to achieve the intended improvement in pianistic quality. She also noticed that he continued playing during her instructions and demonstrations, which might be one of the reasons why it took him that long. The other observers suggested to use the lyrics of the song as a tool to convey the sense of accentuation she was aiming for. Since this pupil is a native English speaker and sings in choir, he is very likely to sing this song with the intended natural accents. He could then be challenged to produce these same accents when playing this song on the piano. Student B intends to make sure this pupil listens to her instructions and demonstrations. More generally, she aims to make sure that inner hearing and physical playing become connected in her pupils.

Student C had recorded a lesson with the same pupil as in the preceding rounds. As in the previous lesson, they worked on the second variation from the Schubert Impromptu, focusing on rhythmic accuracy of the left-hand part and accentuation of the right-hand part. The lesson fragment I selected included in-between steps, namely, to play only the bass notes of the left-hand part (leaving out the chords). Also, the student had to play the left-hand part, leaving out the bass notes and instead making a "sh" sound with his mouth. During the discussion, we suggested student C to shorten his instructions, be less analytical and let his pupil play more in the lesson. Additionally, we mentioned

that he can more frequently demonstrate the intended improvement, thereby providing his pupil with auditory models rather than verbal descriptions. We observed that the in-between steps in this lesson fragment worked well and that the pupil wrote them down in his notebook. Student C intends to be more specific and less analytical in his instructions and feedback, and to more often demonstrate potential improvements to his pupil.

Student D had recorded a lesson with the same pupil as in the previous rounds. In this lesson they worked on the first movement of Beethoven's Sonata op. 27 nr. 2, focusing on the dynamic balance between melody, chords and bass, and playing the soprano line with more melodic direction. The lesson fragment I selected included several in-between steps aimed at facilitating the dynamic differentiation of two musical "layers" that are played by one hand, namely a finger-tapping exercise on the lid of the piano, playing only the soprano line with the fifth finger (leaving out bass and chords), and holding the triad G#-C#-E with fingers 1, 2 and 3 of the right hand, and playing a repeated G# with the fifth finger on top of that. Student C explained that he was not sure whether the pianistic skill of dynamic differentiation within one hand is attainable for this pupil. In the discussion, we pointed out that the learning process of this particular skill generally takes time. More importantly, this pupil has a slow but consistent speed of development and has managed to master the skill of dynamic differentiation between two hands during her lessons in this season. Based on that, we felt that she will learn this new pianistic skill too, even though she did not succeed within this lesson. Also, we exchanged some additional exercises and in-between steps that can be applied for the learning process of this pianistic skill, namely, to divide the soprano line and chords over two hands and the "church bell game" that is described on page 38 of part 2 of the syllabus. Finally, we suggested student D to perform his demonstrations in the same register that his pupil plays in, so that she can more easily recognize differences between her playing and the demonstrations.

4.3 Expert consultation meetings

4.3.1 Expert consultation meeting 1 – September 2018

The first intervention cycle ended with an expert consultation meeting that took place on the 10th of September 2018. The primary goal of this meeting was to test the prototype version of my observation sheets. I wanted to find out whether they are functional tools for monitoring the development of didactic skills (in relation to pianistic quality) of piano methodology students. Additionally, I wanted to get feedback on their applicability as a tool for students to observe their own and each other's lessons.

I invited two colleagues who teach piano methodology at a conservatoire: Marc Pauwels (Amsterdam University of the Arts) and Steven Faber (ArtEZ University of the Arts, Zwolle). Prior to this meeting, I sent them the three short videos (around three minutes each) that I also used in the internship discussion session on the 29th of March 2018. These videos were derived from the video recordings of

the internship lessons, based on the criterion that in-between steps, a movement metaphor and/or a listening assignment was applied as a tool for improving the pianistic quality of the pupil. More specifically, these three lesson fragments were the only ones I could find in the recorded internship lessons, in which students clearly applied one of the selected strategies for teaching and learning. In addition, I sent my colleagues observation sheets and provided them with explanation about my research in general and the purpose of the expert consultation meeting in particular. All participants watched the videos and filled out the observation sheets prior to the meeting.

The expert consultation meeting took place at the apartment of Marc Pauwels in Amsterdam. It took around 75 minutes. We discussed the video fragments one by one, exchanging what we filled out on our observation sheets. I deliberately arranged the questions on the observation sheets from objective to subjective. I noticed immediately that there were big differences in our answers to the more subjective questions. However, despite this I concluded that having filled out the observation sheets was a useful foundation for a fruitful conversation about the observed video fragments.

The main conclusion from this expert consultation meeting was that the observation sheets are usable as a tool for monitoring the development of didactic skills and as a tool for students to observe their own and each other's internship lessons, provided that a couple of changes are made. The most important improvement of the observation sheets that my colleagues suggested is the inclusion of questions that are related to an over-arching vision on the didactic approach of pianistic quality. I deliberately narrowed down the questions on the first version of the observation sheets to the quality of the application of three specific strategies for teaching and learning: listening assignments, in-between steps and movement metaphors. However, good application of teaching strategies does not guarantee an effective didactic approach. Effectivity also depends on good application of higher order guidelines for the didactic approach of pianistic quality. I present and discuss an organized set of such guidelines to students in an early stage of the piano methodology course. These guidelines are described in chapter 5 of part 1 of the syllabus I made for the piano methodology course, which I present as a separate document on the research catalogue exposition of this research. We concluded that, in order to monitor the development of didactic skills of students and to serve as a tool for self-observation, the observation sheets should also include questions about over-arching aspects of the didactic approach of pianistic quality.

In addition to this, my colleagues came up with some minor suggestions. In the first place, they suggested that the internship pupils should be recorded from the side, in order to facilitate observation of their posture and movements. Also, the audio quality should be better. Finally, there was some confusion about the questions that are formulated as statements for which the observer has to indicate to what extent he agrees with it, for example questions 3 through 6 of the observation sheet focussing on in-between steps. The observer is presented with the numbers 1 through 4, where 1 indicates

complete agreement with the statement, 2 partial agreement, 3 partial disagreement and 4 complete disagreement. In the explanation of the observation sheets I included instructions how to answer these questions, but it would be better to also include a short instruction on the observation sheet itself.

4.3.2 Expert consultation meeting 2 – April 2019

The second intervention cycle ended with an expert consultation meeting that took place on the 23rd of April 2019. The participants were the same as in the first meeting. In order to limit the amount of time involved in the preparation of this meeting, I decided to select only the six lesson fragments handed in for internship discussion by students C and D (three fragments per student), since they had been attending the methodology class as a mandatory part of their bachelor curriculum, whereas students A and B participated as guest students. Prior to our meeting, all participants had observed these six lesson fragments and filled out the (updated and unified) observation forms.

Our discussion of the observed lesson fragments was focused on evaluating how these students apply teaching strategies for pianistic quality. We noticed that both students frequently applied in-between steps, relatively few listening assignments, and not a single movement metaphor. More importantly, we experienced that they could be more creative in finding relevant and varied teaching strategies; we felt they applied a narrow range of strategies, whereas the learning process of pianistic skills generally benefits from approaching it in various ways. There were considerable differences between students C and D. We observed that student D applied a more activating approach, guiding his pupil by means of questions, whereas student C tended to apply lengthy verbal instructions and no questions at all. Also, student D regularly discussed practice strategies with his pupil; student C largely overlooked this topic. Finally, we observed that student D was better than student C at expressing himself concisely, thereby presenting his pupil with clear ideas on what to improve. We thought student C showed some progress over the three lessons, most notably in finding appropriate in-between steps and presenting his pupil with instructions on how to practice (which he did not do in the first two lessons). Student D exhibited a more or less constant level of performance.

Our discussion of the observed lesson fragments was followed by an exchange of ideas on how to improve upon the current situation. The most problematic aspect of the didactic skills exhibited in the observed fragments was a general lack of creativity in the application of teaching strategies forms. In other words, we would have liked to see a much wider variety of strategies for teaching and learning being applied. We identified two potential directions for addressing this. In the first place, the lesson preparations that students are supposed to make prior to their internship lessons could be used as a tool to trigger creativity in coming up with various teaching strategies. For example, students could be asked to think of three relevant musical metaphors for the same aspect of pianistic quality they anticipate working on in their next internship lesson. Or, when planning to apply in-between steps, they could be asked to think of as many in-between steps as possible, even though in the actual lesson

they will only apply some of them. Exploiting lesson preparations as a tool for triggering creativity obviously implies bringing them to the methodology lessons and discussing them with all students. In the second place, cooperation and peer-learning between classical piano, jazz piano and early music keyboard students could result in broadening the perspective that students have on potential strategies for teaching and learning. Classical piano students have often only had lessons in their own musical genre, and generally do not have an idea of what takes place in a jazz piano or early music keyboard lesson. This might explain the relatively narrow range of didactic approaches classical piano students apply. Observation of jazz piano or early music keyboard lessons could present them with additional ideas. Moreover, cooperation in the internship with students of other musical genres might bring about peer-learning and help them apply strategies for teaching and learning that they do not yet know by their own experience.

4.4 Evaluation of results

4.4.1 Evaluation of first intervention cycle – September 2018

I experienced considerable improvements during the first intervention cycle. In the first place, the prototype of the teaching materials (syllabus, videos, lesson sheets and slide presentation) enabled longer and more informative discussions about how to deal with common aspects of pianistic quality. Secondly, the internship peer-learning discussion yielded good results, and the observation sheets helped to focus the feedback students gave themselves and each other. However, it was impossible to evaluate the development of the students in terms of effective teaching strategies, since none of the students had handed in enough video recordings of internship lessons. Nevertheless, based on the lessons that they did hand in, I concluded that the goals of my research had not yet been reached. Further interventions were required in order to achieve the improvements I pursue.

Based on my experiences in the first intervention cycle, I came up with several additional interventions. First and foremost, I wanted to apply internship peer-learning discussions more frequently and in an earlier stage of the internship. In my view, the internship discussion in the first intervention cycle provided the students with a valuable opportunity to observe and evaluate their own and each other's lessons. It could play a role in activating a reflective attitude towards their own actions if applied structurally. I decided to organise internship peer-learning discussions in December, January and February of the season 2018-2019.

In addition to this, I decided to enhance peer learning by exchanging internship pupils during the season. In other words, at a certain moment in the season, student A takes over the internship pupil of student B, and vice versa. I explained this idea to the students, and they liked it. Knowing that you must take over a certain pupil in the near future might enhance active participation in the discussions about how to approach teaching this pupil that take place in the methodology lessons.

Furthermore, I unified the three observation sheets into one and elaborated its content. Applying it in the internship discussion and expert consultation meeting had pointed out that the effectiveness of teaching strategies depends on more than mere good application of certain teaching strategies. The observation sheet should have a broader perspective and include questions about general aspects of effective teaching. Based on feedback by the experts, I decided to add questions focusing on feedback and practice strategies. These questions are derived from the guidelines for perception-based learning that I formulated in syllabus 1. Including these over-arching items on the observation sheet was intended to enable students to not only reflect on how well they applied specific teachings strategies, but on general aspects of teaching effectivity as well. Additionally, I realised that there were too many subjective questions and not enough objective questions, which I fixed.

4.4.2 Final evaluation – April 2019

The second intervention cycle also yielded many improvements, in my experience. Implementing peer-learning (by means of internship discussions) structurally proved to be a valuable addition to the methodology course. As can be seen in the summaries of the internship discussions in this thesis (paragraph 4.2), students were generally able to identify relevant points for improvement in their own and each other's teaching strategies. Filling out the updated and integrated observation sheet was more time-consuming than using the previous (non-unified) version. However, the broader perspective of the new observation sheet enabled the students to evaluate not only the quality of application of strategies for teaching and learning, but also how these tools relate to more general aspects of pedagogy, such as how feedback is given and how pupils are guided in practicing. Students reported that this made them more aware of these general pedagogic issues. Additionally, watching the videos prior to the lesson (rather than in the lesson, as we did in the first cycle) saved precious lesson time, which we could spend on fruitful discussions.

Even though I experienced the internship discussions to be very productive, there are some elements of it that need improvement. In the first place, the recording quality of the internship lessons was still problematic. Students generally used their mobile phones for recording their lessons. For the observation of a piano lesson, videos should ideally show pupils from the side and slightly from above, allowing the viewer to observe both their overall posture and their playing gestures accurately. Most students struggled to obtain camera positions that result in videos meeting these criteria. In addition, audio quality was sometimes problematic. Apparently, students need support in dealing with these technicalities. More importantly, the second expert consultation meeting made me aware that the lesson preparations students make for their internship lessons were not integrated in the procedure of the internship discussions, which in hindsight I consider to be a missed opportunity.

Writing the chapter on the contextualisation of my research (chapter 2) has deepened my knowledge of motor learning and motor control, which in turn led to elaboration of the lesson material for the methodology course. More specifically, the concept of musical imagination has become more concrete, more supported by research and embedded in the paradigms of predictive processing and ideomotor learning. The lesson material (both the syllabus and the slide presentation) now includes chapters on predictive processing and ideomotor learning, which in my experience helps students to better understand the crucial role musical imagination plays in the formation of coordination patterns.

Students in the second cycle made more use of in-between steps than students in the first cycle. Moreover, I find that they applied in-between steps more effectively, in particular because they managed to create more logical progressions of steps. However, usage of listening assignments and movement metaphors was still limited. More importantly, the expert consultation meeting has pointed out that there is a general lack in creativity in coming up with relevant strategies for teaching and

learning. As mentioned in the summary of this second expert consultation meeting, potential ways of addressing this issue are integrating lesson preparations into the procedure of internship discussions, and broadening students' perspective of strategies for teaching and learning by arranging for cooperation with students of jazz piano and early music keyboard instruments.

5. Conclusions

This research has yielded answers to all research questions. Some of these answers match the expectations I had prior to my research; others represent new insights I obtained during the process. I will answer the research questions one by one, starting with the main question:

> *How can I guide the students of piano methodology towards applying effective educational principles for achieving pianistic quality in their internship lessons?*

The interventions I performed in this research have shown to be valuable improvements of the methodology course. In accordance with my expectations, the extended lesson material played a positive role, which I will explain in detail in my answer to subquestion D. Peer-learning (in the form of the internship discussions) was an important addition to the course that I had not anticipated prior to this research. I will elaborate on this in my answer to subquestion E.

A. *Which educational principles for achieving pianistic quality can be derived from current scientific knowledge of motor control and motor skill learning?*

Based on the information summarized in chapter 2, I believe the following research-supported educational principles for achieving pianistic quality can be formulated:

1. Mental auditory anticipations of intended musical outcomes ("musical imagination") initiate and guide motor control processes in musicians. The learning process of pianistic skills ideally starts with pupils acquiring mental auditory representations of target musical outcomes. Teachers can facilitate the acquisition of vivid and accurate musical intentions within their pupils in various ways, for example by means of demonstrations, musical metaphors, playing together and performing clarifying musical activities involving voice, hands and feet.

2. Motor skill learning has been demonstrated to result in superior learning outcomes when facilitated by instructional strategies that aim to reduce verbal knowledge and awareness of movement performance: implicit motor learning approaches. The benefits of implicit motor learning are (among others) better long-term learning outcomes, better stress-resistance and enhanced transfer to related motor skills. Piano teachers can facilitate implicit motor learning by reducing literal and normative movement instructions, replacing these by relevant and well-applied movement metaphors.

3. Motor skill learning and motor performance have been shown to be enhanced by inducing attentional focus towards the intended movement outcomes (rather than attentional focus towards one's own movements) within learners: external focus of attention. Piano teachers can induce external focus of attention within their pupils by means of listening assignments and

goal-oriented feedback.

4. Simplification of target motor skills (in-between steps) has been demonstrated to facilitate motor learning. Piano teachers can support the learning process of pianistic skills by designing relevant in-between steps and conveying these to their pupils. In-between steps can additionally be used by pupils in their practice routines.

5. Nonlinear pedagogy (a research-supported educational concept) advocates manipulation (by teachers) of performer-related, task-related and environmental factors (constraints) that influence motor performance of learners. Piano teachers can exploit constraints in various ways, aimed at facilitating the learning process of pianistic skills. An example of this is the application of handicaps (environmental constraints) that implicitly guide pupils towards discovering fine-motor playing gestures.

B. Why do research-supported views on motor skill learning not typically match practice and opinions regarding motor learning, that are traditionally passed on in music education?

In paragraph 2.7, I have identified three elements of traditional piano pedagogy that potentially conflict with research-supported approaches to motor skill learning, namely the assumed necessity of conscious control over movements, the isolation of movements and their ensuing musical effects, and the value of ideal movement templates. Since students tend to model their teaching after the lessons they had themselves, they may implicitly take over the ideologies of their teachers. This could be one of the explanations for the difficulties students experience in applying research-supported educational principles.

C. What are the conditions under which students of piano methodology can understand and apply their study material properly? Is my presumption that I should have more, and better instruction and training material correct? Are there other factors?

This research has pointed out that, although the extended study material (syllabus and slide presentation) has improved the quality of the methodology course, other interventions are needed in order to achieve my goals. Most importantly, I implemented peer-learning, which has shown to be a beneficial addition to the course. In my experience, the main next step in the improvement process of the course is to enhance students' creativity to come up with teaching strategies in various situations. Potential measures that could bring this about are exploiting lesson preparations as a tool to trigger creativity, broadening students' perspective of strategies for teaching and learning by observing lessons in other musical genres and cooperation and peer-learning with students of jazz piano and early music keyboard instruments.

D. *What are the characteristics of lesson material for the piano methodology course that aims at conveying research-supported principles of motor learning processes applied to piano pedagogy and enabling students to apply these principles effectively and independently in their internship lessons?*

The elaborated lesson material allows for more extensive discussion of lesson content. It provides students with more detailed explanations and underpinnings of research-supported principles of effective piano pedagogy. More importantly, it now includes an extensive, organised set of practical applications of various strategies for teaching and learning aimed at facilitating the learning process of pianistic skills. I believe that the lesson material in its current form is relevant, since it is based on the information reviewed in chapter 2. Also, feedback by colleagues and students has demonstrated that it is internally consistent. I intend to further enhance the practical usability of the lesson material by including more opportunities for students to come up with their own applications of the conveyed concepts. For instance, I aim to add a set of fragments of pieces for which students have to design relevant in-between steps that facilitate the learning process. This could be one of the ways to address the issue of lacking creativity in the application of strategies for teaching and learning. The final goal of this research has not yet been reached: students still exhibit shortcomings in applying strategies for teaching and learning. However, I think this needs to be addressed by additional interventions, such as the ones described in the answer to the previous subquestion.

E. *How can I facilitate peer-learning in the internship?*

The internship discussions have shown to yield good results. During this research, I have made changes in the procedure of these discussions that have enhanced their outcomes. Firstly, the observation sheet has been improved. Also, students now observe lesson fragments prior to the lesson, allowing for more elaborate and productive discussions. Based on my experiences, I intend to continue applying internship discussions and improving their procedure, which I will elaborate upon in the next chapter.

6. Directions for future improvement

This research is focused on qualitative aspects of musical imagination, more specifically on the role musical imagination plays in the learning process of pianistic skills. However, musical imagination also relates to musical syntax, in the sense that musical intentions are (also) anticipations of intended musical outcomes in terms of rhythm, melody and harmony. Additionally, both the perception of musical syntax and the "online" generation of musical structures (for example in improvisation) take place in the brain as a result of predictive processing: the brain continuously predicts "what comes next", based on prior experiences (Schaefer 2017, 31). More importantly, learners need to develop links between perceived or imagined pitches and actions on their instrument (ideomotor learning). Put simply, pianists (also) need perception-action couplings for enabling them to quickly and accurately translate physically perceived or imagined music into playing gestures ("hitting the right keys"). As Harris and de Jong have demonstrated, improvising musicians exhibit activation of dorsal connections between auditory and motor cortex, whereas score-dependent musicians activate ventral pathways (Harris and de Jong 2015). In conjunction to these findings, improvising musicians have been found to outperform score-dependent musicians in playing by ear (Harris, van Kranenborg and de Jong 2016). Dorsal connections between auditory and motor brain areas have been hypothesized to allow for quick transformation of perceived or imagined musical sounds into motor control (Goodale and Milner 1992). Based on these findings, Harris advocates improvisation and playing by ear for the acquisition of (implicit and procedural) knowledge of musical syntax, rather than the (for classical musicians) traditional approach which generally starts with extensive declarative learning (such as factual knowledge of scales and intervals) (Harris, 2017).

I believe that the syntactical aspect of ideomotor learning in piano pedagogy is such a complicated phenomenon that it should be studied on its own. Therefore, I have decided not to include this topic in my research. However, the acquisition of musical syntax is an element of my piano methodology course. More specifically, the course includes information about how auditory, song-based piano pedagogy can be organized, and how improvisation can be applied as a tool to discover the musical language. Given the difficulties students experience in applying auditory teaching strategies and improvisation in their internship lessons, I intend to enhance this part of the course in a similar fashion to the topic of this research in the near future. Concretely, I aim to develop extensive lesson material and deepen my knowledge of this topic.

As mentioned in the conclusions, the main point of improvement for my piano methodology course is to create learning opportunities that broaden students' perspectives on strategies for teaching and learning and trigger their creativity in applying them. There are several additional interventions I intend to perform, aimed at achieving this. In the first place, I aim to integrate the lesson plans that students design into the discussions of internship lessons. The discussions can thus be focused on the

lesson goals and teaching strategies that students formulate in preparation of their lessons, evaluating whether these goals were relevant and logically connected to the teaching strategies. Secondly, I want to develop a wider variety of observation sheets, in order to cover several aspects of didactic quality. For instance, I think it would be helpful for students to observe and evaluate how they provide pupils with demonstrations of target pianistic skills. Most importantly, I intend to arrange for peer-learning with students of other musical genres, in order to present students with a wider variety of strategies for teaching and learning than those they know from their own experiences. Luckily, these intentions coincide with the development and introduction of a new program of music educational subjects that will be implemented in the bachelor curriculum of the KC as of September 2019. Peer learning will be a core element of this program. Furthermore, it will allow of opportunities to couple students of classical piano with students of jazz piano and/or early music keyboard instruments in the internships. More specifically, these "mixed" duo's have to cooperate in the sense that they alternately teach the same pupil(s) (the non-teaching student has the role of observer) and have to develop lesson content together. Their goal is to arrange for a wide variety of repertoire and not limit themselves to their own musical genre. My colleagues who teach methodology of jazz piano and early music keyboard instruments support this approach to the internships, and we have already made preliminary plans for it.

As for the syllabus, as mentioned in the conclusions, I intend to add more opportunities for students to come up with their own applications of educational concepts. In addition to this, I plan to include information on fine-motor control. I believe that knowledge of this topic may enable students to further identify which teaching strategies promote fine-motor control playing gestures, and which strategies might hamper this.

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Appendix 1A: Prototype observation sheet listening assignments

Observation sheet "Pedagogical approach of pianistic quality"	
Name observer	
Name observed student:	
Video fragment number:	
A. Listening assignments	
1 Which listening assignment(s) does the teacher give?	
2. Which aspect(s) of pianistic quality does the teacher address by this/these listening assignment(s)?	
3. Does the teacher ask the pupil to explain in his/her own words what he/she heard?	Yes / No
4. *"The pupil gets enough opportunity (time) to apply the listening assignment before getting feedback from the teacher"*	1 2 3 4
5. *"The pupil has a clear idea of what to listen for"*	1 2 3 4
6. *"This listening assignment was a well-chosen tool in this situation"*	1 2 3 4
7. Explain your answer to question 6.:	
8. Do you have suggestions for enhancing the effectivity of listening assignments for this teacher?	

Appendix 1B: Prototype observation sheet in-between steps

Observation sheet "Pedagogical approach of pianistic quality"	
Name observer	
Name observed student:	
Video fragment number:	
B. In-between steps	
1. Which in-between steps does the teacher apply?	
2. Which pianistic skill does the teacher address by these in-between steps?	
3. *"The teacher gave the pupil enough opportunity (time) to perform each step before going to the next step"*	1 2 3 4
4. *"The level of difficulty progressed in a logical way across the sequence of steps"*	1 2 3 4
5. *"The pupil is capable of applying the in-between steps independently in his practice"*	1 2 3 4
6. *"These in-between steps are a well-chosen pedagogical tool in this situation"*	1 2 3 4
7. Please explain your answer to question 6.:	
8. Do you have suggestions for enhancing the effectivity of in-between steps for this teacher?	

Appendix 1C: Prototype observation sheet movement metaphors

Observation sheet "Pedagogical approach of pianistic quality"	
Name observer	
Name observed student:	
Video fragment number:	
C. Movement metaphors	
1. Which movement metaphor(s) does the teacher apply?	
2. Which aspect(s) of pianistic quality does the teacher address by this/these movement metaphor(s)?	
3. *"The pupil has a clear idea of the improvement in terms of sound he is pursuing by this movement metaphor"*	1 2 3 4
4. "*This movement metaphor aims at triggering a movement sensation"*	1 2 3 4
5. *"This listening assignment was a well-chosen tool in this situation"*	1 2 3 4
6. Please explain your answer to question 5.:	
7. Do you have suggestions for enhancing the effectivity of movement metaphors for this teacher?	

Appendix 2: Revised and unified observation sheet

Pedagogical approach to improving pianistic quality **Observation sheet**	
Observer:	Pupil:
Teacher:	Date:
A. Description of lesson content	
1. Please describe which aspect(s) of pianistic quality was/were addressed during the lesson fragment.	
B. Musical imagination	
1a. To what extent does the teacher demonstrate (parts of) the piece by playing and/or singing? **A LOT** ☐☐☐☐☐☐ **NOT AT ALL**	
1b. To what extent does the teacher provide the student with (an) auditory point(s) of attention in relation to the demonstration(s)? **LARGELY** ☐☐☐☐☐☐ **NOT AT ALL**	
1c. Please describe the auditory point(s) of attention that the teacher provides.	
2a. Does the pupil perform (parts of) the piece away from the piano, for example by singing, whistling, clapping or silently imagining it?	**YES/NO**
2b. Please describe the guidance or feedback that the teacher provides for these activities (for example prior demonstration, play/sing along, clap the beat).	
3a. Does the teacher provide the pupil with a musical metaphor related to the intended improvement in pianistic quality?	**YES/NO**
3b. If yes, please describe the musical metaphor the teacher makes use of.	
4. Please indicate to what extent the pupil has a clear musical image of the intended improvement of pianistic quality: **VERY CLEAR** ☐☐☐☐☐☐ **UNCLEAR**	
5. Please provide suggestions for improving the clarity of the pupil's musical (auditory) image for the intended improvement of pianistic quality.	

C. Listening skills	
1a. Does the teacher give the pupil (a) listening assignment(s)?	**YES/NO**
1b. Please describe the listening assignment(s).	
2a. Does the teacher ask the pupil to describe the intended improvement of pianistic quality in his own words?	**YES/NO**
2b. How does the pupil describe the intended improvement of pianistic quality?	
3. Please indicate to what extent the listening skills of the pupil are sufficient for achieving the intended improvement of pianistic quality: **SUFFICIENT** ☐☐☐☐☐☐ **INSUFFICIENT**	
4. Please provide suggestions for improving the listening skills of the pupil in relation to the intended improvement of pianistic quality.	
D. Fingering	
1a. To what extent does the fingering that the pupil employs contribute to the achievement of the intended improvement of pianistic quality? **LARGELY** ☐☐☐☐☐☐ **NOT AT ALL**	
1b. If necessary, please provide suggestions for alternative fingering options.	
E. In-between steps	
1a. Does the teacher apply in-between steps?	**YES/NO**
1b. Please describe the in-between steps the teacher is applying:	
2. Please indicate to what extent the pupil was given sufficient time to perform each step before moving to the next step, by the teacher: ☐ ☐ ☐ ☐ ☐ **TOO MUCH** **SUFFICIENT** **TOO LITTLE**	

3. Please indicate to what extent the level of difficulty progressed fluently across the sequence of steps: **FLUENT** ☐☐☐☐☐☐ **NOT FLUENT**
4. Please provide suggestions for extra or alternative in-between steps.
5. Please provide suggestions for enhancing the effectiveness of the teacher's use of in-between steps.
F. Playing gesture
1a. Does the teacher make use of a movement metaphor? **YES/NO**
1b. Please describe the movement metaphor.
2. Please indicate to what extent the movement metaphor is relevant to the pupil: **RELEVANT** ☐☐☐☐☐☐ **NOT RELEVANT**
3. Please indicate whether the movement metaphor is more aimed at triggering a movement sensation or at describing a movement norm: **TRIGGER SENSATION** ☐☐☐☐☐☐ **DESCRIBE NORM**
4. Please indicate to what extent the movement metaphor elicits an image of movement, or a more static image: **MOVEMENT** ☐☐☐☐☐☐ **STATIC**
5. Please provide suggestions for enhancing the effectiveness of the teachers use of movement metaphors.

G. Practicing	
1a. To what extent does the teacher provide the pupil with instructions about how to approach practicing in relation to the intended improvement of pianistic quality? LARGELY ☐☐☐☐☐☐ NOT AT ALL	
1b. Please describe the instructions, regarding the practice strategy(ies), that the teacher provides.	
2a. To what extent does the pupil try out the suggested practice strategy in the lesson? LARGELY ☐☐☐☐☐☐ NOT AT ALL	
2b. If so, to what extent does the teacher provide feedback on the practice strategy trial? LARGELY ☐☐☐☐☐☐ NOT AT ALL	
2c. If any, please describe the feedback that the teacher provides with regard to the practice strategy trial.	
3a. Is a short-term practice goal for improvement of pianistic quality formulated during the lesson?	**YES/NO**
3b. If yes, please describe the practice goal.	
4. Are practice goal(s) and/or practice strategy written down during this lesson fragment?	**YES/NO**
5. Please indicate to what extent the pupil is capable of practicing effectively with regard to the intended improvement of pianistic quality. VERY CAPABLE ☐☐☐☐☐☐ UNCAPABLE	

H. Feedback/Reflection
1a. To what extent did the teacher ask the pupil to reflect on his/her own playing? **LARGELY** ☐☐☐☐☐☐ **NOT AT ALL**
1b. Which aspect(s) of his/her playing was the pupil asked to reflect on?
2. Please indicate whether the pupil was given sufficient time to practice the aspect(s) being addressed before receiving feedback from the teacher. ☐ ☐ ☐ ☐ ☐ **TOO MUCH** **SUFFICIENT** **TOO LITTLE**
3. Please indicate whether the teacher's feedback was more **goal-oriented** or more **movement-oriented**: **GOAL** ☐☐☐☐☐☐ **MOVEMENT**
4. Please indicate how specific the teacher's feedback was: **VERY SPECIFIC** ☐☐☐☐☐☐ **VAGUE**
5. Please provide suggestions to improve the effectiveness of the teacher's feedback.

Appendix 3: Design criteria for teaching materials

The teaching materials must:

- convey to students a vision on the learning process of pianistic skills in which musical imagination and listening play a central role
- present students with concrete examples of potential teaching strategies for common aspects of pianistic quality
- demonstrate to students the logical connection between the conveyed vision on learning processes and concrete teaching strategies
- present students with very clear descriptions of practically applied teaching strategies, so that students can visualize them
- allow students to experience autonomy in finding their own way of applying it
- express respect for personal convictions regarding music pedagogy that result from how students "grew up" musically
- challenge students to apply strategies for teaching and learning that represent an addition to those they already know and trust as a result of their own musical upbringing
- encourage students to come up with their own applications of described strategies for teaching and learning and exchange these with fellow students within the methodology course
- generate enough opportunities for students to practically apply its content
- function as a "toolkit" offering students various strategies for teaching and learning, from which they can choose appropriate ones according to lesson circumstances
- invite students to read and re-read its content as a result of high-quality content and layout

Appendix 4: Questionnaire feedback on teaching materials

My aim is to create lesson material for the following aspects of pianistic quality:

1. Posture
2. Make ten fingers available
3. Legato and staccato
4. Playing with both hands
5. Differentiating in dynamics
6. Playing forte and fortissimo with a nice sound
7. Playing piano and pianissimo with a clear sound
8. Playing like you sing
9. Different articulations between the hands
10. Wide intervals and chords
11. Dynamic balance between melody and accompaniment
12. Connecting sounds with the right pedal
13. Touché perlé
14. Trills, ornaments and appoggiaturas
15. Repeated notes
16. Position changes (lateral shifts on the keyboard)
17. Dynamic balance between two or more notes within one hand
18. Experimenting with and choosing of fingerings

For every aspect, the lesson material will contain:

1. A detailed text that describes possible approaches, exercises, instructions and in-between steps. Creating this text helps me to get a precise idea of what I want to transfer in the methodology lesson. Also, it enables the students to read the discussed information again, if necessary.
2. If possible: video fragments of lesson situations in which pupil and teacher work on the discussed aspect of pianistic quality
3. Assimilation assignments that require the students to actively apply the information

Questions:

1. Do you have suggestions for aspects of pianistic quality that are not listed above?
2. Do you have suggestions how the material could offer students more concrete examples of potential teaching strategies for pianistic quality?
3. Do you have suggestions for changes/additions to the lesson material that could help students to see a logical relation between the general vision on developing pianistic quality and the presented practically applied teaching strategies?
4. Do you have suggestions for changes/additions to the lesson material that could help students to experience freedom to apply the information in a way that suits him?
5. Do you have suggestions for changes/additions that could increase the amount of respect the lesson material expresses for the ideas regarding pianistic quality that students have as a result of (piano) lessons they had in the past, and are currently having?
6. Do you have suggestions for changes/additions to the lesson material that could stimulate students to apply strategies for teaching and learning that form an addition to the ones they know and trust based on their personal musical development?
7. Do you have suggestions for changes/additions that could invite students to create variants of the described teaching strategies, to apply them and to exchange them with fellow students within the methodology lessons?

8. Do you have suggestions for additional assimilation assignments, in which students have to actively apply the lesson information?
9. Do you have suggestions for improving the readability of the lesson material?

Do you have other suggestions/ideas that could help me to reach my goal?

Appendix 5: Internship Guidelines

Introduction

This document is supplementary to the information about the internship you can find in the brochure "Courses in Education", page 6. In some instances, the requirements described in this document are higher or more detailed than those in the brochure, for instance the number of lessons to record on video.

The purpose of this document is to provide you with clarity about what is required of you. At the same time, we want you to develop a teaching approach that suits your character and educational background. In other words, we aim to give you clarity about requirements and space for personal choices at the same time.

If you experience a problem regarding the internship lessons (for instance: too much absence of your pupil), please immediately notify the teachers of methodology and educational skills 3. *If we don't hear from you, we assume that everything is going all right.*

Since [Student A] is not doing her internship within the conservatoire, she will use some of her private pupils. She will record lessons with them on video in the same way as [Student C] and [Student D]. Also, the same guidelines concerning didactic skills apply to her internship lessons.

The internship lessons for piano will start in week 38 (Monday 17 September 2018). The individual lessons can be planned at any time convenient to you and your pupil. You must reserve a room for this yourself. Make appointments for the first lessons timely, using the contact information you have received from me. The group lesson takes place at Friday afternoon, from 15:30 until 16:15 pm, the first one will be on Friday 21 September. There will be a permanently reserved room with two pianos for the group lesson. We will be informed which room this is by the planning department after the summer holiday. The internship lessons continue on a weekly basis until April 2019. In total, you should give 25 lessons to both your individual pupil and the group.

In the group lesson, [Student C] and [Student D] are always both present. For every lesson, one of you is teacher, the other one observer/assistant. The next week you reverse roles. You must do the planning of short-term and long-term goals together. The lesson planning can be done individually. The observer gives the teacher feedback after the lesson. Also, the observer records the lesson on video and sends these recordings to me immediately after the lesson, so that I can see how it went and we can discuss the lesson in the methodology lesson together.

I want you to be actively involved in each other's individual lessons. To allow for good knowledge of each other's pupils, I will ask you to switch pupils once or twice throughout the season.

You will receive feedback from three sources:

- The teachers. [Teacher 1], [Teacher 2] and I will provide you with feedback based on the videos you send in.
- Each other. You will receive feedback from each other after the group lesson and within the methodology lesson
- Yourself. There will be moments on which you are asked to evaluate your own lesson, structured by an observational form.

Evaluation of the internship

The internship will be evaluated in the educational exam, which takes place in April/May 2019. The teachers of subject methodology and educational skills 3 each give a mark for the internship. The evaluation of the internship will be based on the following elements:

Didactic skills

- Application of the instructions, advises and feedback regarding your didactic approach you received from the teachers of subject methodology and educational skills 3
- Regarding the beginning pupils (group lesson): preparation and application of *auditory music education*
- Regarding the more advanced pupils: adjustment of the content of the lesson to the *learning question* of your pupil

Communication and Organization skills

- Active and timely communication about lesson planning, lesson content and homework with your pupils and (in case of children) his/her parents
- Timely preparation for the public performances of your pupils
- Quality of the logs (lesson preparations and evaluations) in your portfolio

Note: As you can see, your internship will not be evaluated based on the level or speed of progress of your pupil, but on your skills and development as a teacher.

Video recordings of lessons

In order for the teachers of subject methodology and educational skills 3 to evaluate your internship and provide you with feedback on your lessons, please record on video:

- the first lesson to your individual pupil
- the first **four** group lessons

- the first lessons (both individual and group) taking place in the months December, January and February

Transfer the recorded lessons to the involved teachers, using for example WeTransfer, Dropbox or a memory stick. Do this *immediately after giving the lesson*, so that the teachers can supply you with feedback in the next methodology/ES3 lesson. In this way, you can already apply the feedback in your next internship lesson.

The video quality does not have to be HD, make sure that we can hear what is said and played, and that we can see what takes place.

Auditory music education

Apply auditory, song-based music making in the group lessons with your novice pupils. Start by singing songs, let them find out these songs by ear on the piano. In the methodology lessons we will quickly refresh how you can approach this type of piano lesson.

Make use of the songs and musical skills that the pupils have already learned in their music lessons in the HSV, international department, location Koningin Sophiestraat 24a. We have been there last season. Their music teacher is [Teacher 3].

We will plan for at least one more observation of their music lessons right at the start of the season. By doing this, you have seen and heard what they are capable of musically, and you can adapt to this in your lessons.

In your lessons Musicianship Methodology (1st semester) you will also learn a lot about auditory music education. Apply what you learn in your internship.

Didactic approach of pianistic quality

Pianistic quality means: not “What” the pupil is playing (pitches, rhythms, chords) but “How” it sounds in terms of piano playing: dynamics, articulation, rhythmic fluidity and stability, pedalling, balance between melody and accompaniment, phrasing, etcetera. In the methodology lessons we will discuss extensively how you can approach pianistic quality in the lessons. Here you'll find a brief summary of points of attention for your internship.
Whenever you work on pianistic quality in the lesson, make sure the pupil knows how something can/should sound and is *listening actively*. Take the diagram that we discussed in the methodology lesson *[Musical Imagination – Motor Control – Body – Instrument – Listening]* in mind. When working on a pianistic difficulty, you may use the following checklist:

- Does the pupil have a clear idea of how it might sound (musical imagination)?

- Does the pupil recognize the difference in sound between how his/her playing and the intended outcome/improvement (listening)?
- Does the pupil need in-between-steps for this pianistic element?
- Is the pupil practicing in an appropriate tempo, with concentration and a positive mindset?
- Does the pupil need guidance in finding an appropriate playing gesture for this situation?

The rule of thumb for assisting the pupil in finding a suitable playing gesture is:

- *If it sounds better and/or feels easier (in the experience of your pupil), it is good*

If you give your pupil an advice/instruction that does not make it sound better or feel easier (or even make it harder), look for another approach.
As much as possible approach pianistic quality *without* giving literal movement instructions. In the methodology lessons we will discuss practical examples of approaching pianistic quality without giving literal movement instructions, such as: movement metaphors, external focus of attention, creating musical challenges, in-between-steps, demonstrations. *Try these out in your internship lessons!* Since literal movement instructions are quite common in music education it might feel odd at first to refrain from them. Use the internship as an opportunity to try out approaches that might be unfamiliar for you.

Adjusting to the learning question

Every pupil has a learning question: something that inspires him musically, something he wishes to learn or improve, a style of music he wants to master, a piece that he wants to play. Sometimes this learning question is clear, and the pupil is capable of explaining it to you. Generally, the older a pupil gets, the better he is capable of recognizing and expressing his learning question. Sometimes the learning question is unclear at the start of the lessons, this happens often with beginning children. During their development, more and more the pupil and you discover what suits him and what doesn't, in terms of style (repertoire), learning speed, practicing approach, etcetera.

In the individual lessons with your advanced pupil, base the content and approach of the lesson to their learning questions. In the first lesson, have a chat with them, take time to discuss what they have done musically in their lives, and what they wish to learn or develop from now. Perhaps they already have ideas about what to play. If not, you choose something that matches their learning question.

In the methodology lesson immediately after their first lesson, we will discuss their learning questions. Together we can exchange ideas about what repertoire would suit them, and other aspects of their lessons.

Lesson preparation, reflection and feedback

In the ES 3-lessons (Adri and Julia) you will get information how to use the logbook, in which you prepare and reflect on your internship lessons. Also, you will learn about topics like giving feedback and dealing with differences between pupils.

In the methodology lessons we will use the logbook as well. So, make sure that we can take a look at your lesson preparations in the methodology lessons.

Note: the ES 3-lessons about the following topics are not mandatory (but optional) for you.

- Lesson planning
- Group lessons
- Graphic notation

If you choose to, you can attend these lessons, but you don't have to. The reason for this is that these topics will be dealt with within the piano methodology lesson. This only applies to the students of classical piano methodology and only to the lessons about the indicated topics.

Video recordings

As you know, I am conducting a research, focusing on the question “How can I improve my guidance of the methodology students, particularly related to the pedagogical approach of pianistic quality?”. In my research, your recordings of internship lessons function as “data”. I will focus on your application of movement metaphors, listening assignments and in-between steps. I will observe selected fragments of your recorded lessons with a panel of colleagues. I would like to use samples of your internship lessons (in particular moments in which the aforementioned teaching strategies are applied successfully) for future methodology lessons and presentations of my research. If you do not want me to use certain fragments of your lessons, please inform me, then I will not use them. You don't have to mention the reason.

Appendix 6: Lesson sheets

Lesson sheet pianistic quality – Chapter 1: Posture

- Brainstorm: *How did your teacher(s) approach posture in your childhood?*
- Brainstorm: *After birth, children go through motor development: the way they move gradually changes and they learn skills. Being able to stand without support (around 1-year-old) is a landmark or milestone. What are other landmarks is motor development?*
- Brainstorm: *Why and how does this development occur?*
- Brainstorm*: Sometimes you see a person that you do not know, and you can tell by their posture that that person is depressed. Which other emotions can you recognize in posture? Can you imitate these postures?*
- Brainstorm*: Which other factors (besides social-emotional ones) influence posture?*
- Health factors: Rheumatism, Asthma, Muscle weakness due to ageing
- Postural deviations: scoliosis, hyperlordosis, loosed posture, backward carriage, Scheuermann's disease, short hamstrings. Show pictures.
- Show picture short hamstrings
- Task factors. Demanding → Active
- Experiment 1: Throw an object (f.e. an eraser) over a small distance to a large target
- Experiment 2: Throw the same object over a large distance to a small target (a cup). You have one chance. You can do it in any way you like. If you succeed you get € 0,05.
- Did you notice the change in posture and gesture? This change is induced by the challenge.
- Brainstorm: *Is it all right when a pupil changes posture throughout the lesson, depending on the situation?*
- Brainstorm: *It is desirable that a suitable posture emerges spontaneously. Which conditions do we need for this to happen?*
- Safety, Challenge, Concentration
- Brainstorm: *How can you tell a pupil is feeling unsafe? [Mind you: can look like bored]*
- Brainstorm: *How can you do something about a pupil feeling bored?*
- Brainstorm: *An overly enthusiastic pupil generally has a suitable posture but has an exaggerated playing gesture. What can we do?* → Focus on pianistic quality, musical demands
- Watch video “Pianistic Challenge”
- Brainstorm: *Sometimes all the conditions are right, but you still feel a pupil could benefit from finding a better posture. What can we do?*
- “Sit like a real pianist”, “Sit like a king” ⟹ Other metaphors?
- Sliding game
- “When I clap, you have to stand up as quickly as you can.”
- Brainstorm: *Can you think of other physical exercises or games that might trigger a suitable posture?*
- “Helping hands”.
- “*Wiggle on your sitting bones”*
- Game for finding a suitable distance to the piano

Preparatory question

- How did your teacher(s) approach posture in your childhood?

Lesson sheet pianistic quality – Chapter 2: Fingerings

Introduction

- Brainstorm: *Is fingering a goal or a tool?*
- Brainstorm: *Is fingering personal or generalized?*
- Brainstorm*: Did you experience difficulties with fingerings in your development?*
- Tip: Describe fingerings as suitable or unsuitable, for a certain person in a certain context

Young children

- Brainstorm: *What are typical fingerings that young children use spontaneously?*
- Triads in root position with 125: I recommend not to force them to play with 135. It will change over time, according to their motor development.
- Avoid the thumb, play on the edge with a "pushy" gesture: encourage usage of the thumb

Make ten fingers available

- Brainstorm: *How would you encourage a young pupil to play with 10 fingers?*
- Introduce staccato and legato. Legato=musical necessity to use 5 fingers.
- Formulate challenge: "Let's see whether you even play it with 5 fingers..."
- Alternate
- Brainstorm: *Do you know activities (games, exercises) to support playing with 10 fingers?*
- Finger-tapping, the spider, wiggling
- River – Path – Forest. Constraints-led approach.

Play melodies with two hands

- Mirror motion and parallel motion

Learning finger numbers

- Brainstorm: *What is the purpose of learning finger numbers?*
- Brainstorm: *How would you approach teaching the finger numbers?*
- Singing the fingering
- Learning to select a suitable fingering independently
- Brainstorm: *How we can we make sure a pupil develops this ability?*

Change old fingering into more functional one

- Brainstorm: *Did you experience this with your pupils? How did you approach it?*
- Present example Für Elise, descending chromatic scale
- Brainstorm: *How would you approach this situation?*
- Correct rhythm in MI: *How can we make sure?* Scat and clap.
- Make pupil aware of gap Imagination-Capability
- Try out BOTH fingerings
- Apply variability practice (rather then ordinary repetition)
- Brainstorm: *Which variations would you let your pupil play?*

Lesson sheet pianistic quality – Chapter 3: Articulation

Preparatory assignment

- Find an easy piece (comparable in difficulty to the middle part of Die Russische Klavierschule, book I) that requires a different articulation by both hands. Bring a copy of this piece to the lesson.

Preparatory questions

- *How did/do you approach articulation in your lessons?*
- Why is it a good idea to introduce articulation relatively early in pianistic development?
- How can we approach learning and improving articulation based on the **perception** of the pupil (rather than on instructions what to do)?
- Which movement metaphors can we use to support staccato playing?
- Do you know exercises or instructions that help your pupil to improve his legato?

Introduction

- Brainstorm: *How did you approach articulation in your lessons?*
- Brainstorm: *Why is it a good idea to introduce articulation relatively early in pianistic development?*
- Brainstorm: *How can we approach learning and improving articulation based on the perception of the pupil?*
- Experiences → Concepts, Learn by Doing, Goal-oriented feedback and instructions, avoid literal and/or normative movement instructions (IBL in general)

Learning process legato-staccato differentiation

- Brainstorm: *How would you introduce legato and staccato playing to your pupil?*
- Brainstorm: *Do you know additional exercises for pupils who find legato and staccato playing hard?*
- Prepare by singing
- Demonstrate on piano
- Gestures
- Additional exercise: Legato-man

Improving staccato

- Brainstorm: *Which movement metaphor can we use to support staccato playing?*
- "Out of the keys", "Upwards", "like a frog", "key is hot"
- Brainstorm: *What could be a downside of the metaphor of "hot keys"?*

Improving legato

- Brainstorm: *How do you call legatissimo (synonyms) and other forms of legato?*
- Brainstorm*: Do you know exercises or instructions that help your pupil to improve his legato?*
- Demonstration + Reflection different types of legato. Try it out!
- Brainstorm: *Can you formulate a listening assignment that helps your pupil to focus his attention on the connection between the notes (EF)?*
- "Listen for the clarity of the connection between the notes
- "Listen for the overlap between the notes"
- Preparatory exercise for overlapping legato: let all the notes sound

Differentiating staccato, staccatissimo and portato

- Brainstorm: *Which words do you have to describe different types of staccato?*
- Brainstorm: *Can you think of a musical metaphor to describe staccato, staccatissimo and portato?*
- Hail – Rain – Snow

Touché perlé

- Brainstorm: *How do you call this sound?*
- Brainstorm: *How would you teach this sound? Do you know helpful instructions or exercises for learning this sound?*
- The One-finger game: Constraints-led approach

Different articulation between both hands

- Present example of Minuet in D minor by L. Mozart
- Brainstorm: *How would you approach this situation?*
- Watch video together
- Brainstorm: *Imagine a pupil who finds it hard. What would be the easiest way to apply this skill?*
- Go through additional preparatory exercises, starting from a single note

Lesson sheet pianistic quality – Chapter 4: Dynamics

Preparatory assignment

- Find an easy piano piece (comparable in difficulty to the middle part of Die Russische Klavierschule, book I) that you find challenging in terms of dynamic differentiation. Bring a copy of this piece to the lesson.

Preparatory questions

- Why is it important to introduce dynamic differentiation relatively early in pianistic development?
- How did you introduce dynamics to your pupils?
- Do you recognize that it can be challenging for a pupil to play with dynamic differentiation and a stable pulse at the same time? What generally happens with the tempo when playing louder? How did or would you approach this with a pupil?

Introduction

- Brainstorm: *Why is it important to introduce dynamic differentiation relatively early in pianistic development?*
- Brainstorm: *How did you introduce dynamics to your pupils?*

Prepare by singing

- Learn by doing, avoid explaining. Experience → Concept
- Quality of singing: shouting→nice voice, whispering→clear melody
- From f/p to full differentiation pp/p/mp/mf/f/ff

Combine dynamics and articulation

- Sing combinations
- Listening games
- Card system
- Play on the piano
- Listening questions: “Did you hear piano?”, “Did you hear legato?”

Crescendo and diminuendo

- Teach by ear

Forte with a pleasant sound

- Brainstorm: *Do you recognize that playing forte with a pleasant sound can be hard for certain pupils? How did or would you approach this learning goal?*
- Brainstorm: *How can we approach the skill of playing a pleasant sounding forte in such a way that we stimulate the perceptual skills (listening and feeling) of the pupil?*
- Brainstorm: *How can we use our choice of words in our instruction to guide our pupil towards a pleasant-sounding forte? Which words would work negatively? Which words would work positively?*
- Word choice in instruction: Loud → A big and beautiful sound, or: A lot of sound
- Demonstrations! Respectful imitation. Reflection. Goal-oriented feedback.
- Use a whole phrase or piece, not a single note
- Brainstorm: D*o you know helpful movement metaphors that make it easier for a pupil to realize a pleasant-sounding forte?*

Piano with a clear sound

- Brainstorm: *Why do you think it can be hard to play softly and clearly at the same time?*
- Brainstorm: *Can you formulate a musical metaphor for the phenomenon of muffled or non-sounding notes when you compare this sound to speech?*
- Demonstrations. Comparisons. Reflection. Pick our favourite. Goal-oriented feedback.
- Brainstorm: *Formulate specific listening assignments that help your pupil focus on this pianistic skill.*
- "Listen for the continuation of the melody", "Listen for the long line of the melody", "Listen whether the notes have the same sound/intensity"
- Brainstorm: *Formulate movement metaphors that facilitate the production of a clear piano sound*
- The spider (!), The itchy piano, Touch a pet, Drumming, Soft and quick repeated notes, The caterpillar, Narrow and broad part of the fingertip (!).

Dynamics and rhythmic stability

- Brainstorm: *Do you recognize that it can be challenging for a pupil to play with dynamic differentiation and a stable pulse at the same time? What generally happens with the tempo when playing louder? How did or would you approach this with a pupil?*

Lesson sheet pianistic quality – Chapter 5: Scales

Introduction

- Brainstorm: *Which preparatory exercises and in-between steps for playing scales do you know?*
- 2-, 3- and 4-finger patterns. Improvisation (informal practice)
- Brainstorm: *How can we create a pianistic challenge for these preparatory exercises?*
- Applying lots of variations in dynamics, articulation and rhythm
- Giving your pupil demonstrations of how beautiful these patterns can sound
- Giving him listening assignments such as: “Listen for the evenness of the rhythm”, “Listen whether the notes form a line”, “Listen for the connections between the notes”
- *Giving him pianistic challenges such as: “Let's see whether you can play this even softer”, “Maybe you can do it even more fluently”*

Movement metaphors to facilitate the quality of scale playing

- The bicyclist in the tunnel
- Happy fingers.
- The tail of the squirrel

Rules for finding the standard fingering of scales

- Brainstorm: *Which set of rules can we formulate for finding the standard fingering of any scale (major and minor)?*
- Black keys are played by a long finger: 2, 3 or 4
- The thumb plays a white key
- The 5th finger is only used on a turning point, only when it is a white key
- The fingering you choose for the 1st octave is also used for the 2nd octave
- The fingering for the way up is the same as for the way down
- Doodle!
- Two hands in parallel motion: not too early, time-consuming

Preparatory question

- Which preparatory exercises and in-between steps for playing scales do you know?

Lesson sheet pianistic quality – Chapter 6: Playing like you sing

Introduction

- Take a look at pieces they brought
- Brainstorm: *Did your teachers use singing as a tool? How?*
- Brainstorm: *How can we apply singing as a tool for pianistic quality?*
- Play + Sing along
- Play + Sing along mentally ("in your head")
- Deliberately monotonously
- Focus on one aspect (f.i. breathing points)
- Build up and finish a phrase: Present example Sick Doll
- Brainstorm: *How would you play this phrase?*
- Brainstorm: *How would you approach teaching this?*
- Add lyrics: present example of Minuet by Petzold
- Individual lines: fugue. *Do you do this?*
- Listen to harmonic tension and release: present Arietta by Grieg
- Brainstorm: *How would you play this phrase?*
- Brainstorm: *How would you teach this?*
- Reduction: Play example of Grieg
- Song transcriptions. Play Wiosna.

Preparatory assignment

- Find an easy piece that you find suitable for developing the skill to play like you sing.

Preparatory questions

- Did your teachers use singing as a tool? How did they apply it? Which musical purposes did they have for letting you sing?
- How can we apply singing as a tool for pianistic quality? Which "teaching strategies" can you think of?

Lesson sheet pianistic quality – Chapter 7: Dynamic balance melody and accompaniment

Introduction

- Brainstorm: *Do you remember the moment that you learned or discovered that you can change the dynamic balance between melody and accompaniment (in other words: that you can bring out the melody to the foreground)?*
- *Did you discover it by yourself, or did your teacher explain it to you?*
- *Do you still remember how your teacher approached learning this pianistic skill?*
- *Have you taught this pianistic skill to one of your own pupils? How did you approach it?*

Dynamic balance between both hands

- Show example Clementi. Brainstorm: *How would you approach teaching your pupil to make a dynamic balance in this piece?*
- Recognize by ear – In-between steps – Apply in piece
- Musical metaphor: foreground and background of a drawing
- Demonstrations and reflections
- Ensemble playing
- Brainstorm: *Which in-between steps can we use?*
- One note. One by one → Together.
- Church Bell Game.
- Exaggerate gesture
- Tip: Focus on difference
- Alternate
- Apply in piece. Also do it “the wrong way”.

Dynamic balance between two or more notes within one hand

- Brainstorm: *How would you explain how you accomplish this skill physically?*
- Fortunately, we can teach this skill **without** explaining how to move!
- Show examples Burgmüller and Schumann.
- Brainstorm: *Which in-between steps are possible?*
- Ensemble playing
- Divide over two hands
- Church Bell Game
- Alternate
- Watch lesson excerpt Schubert

Preparatory questions

- Do you remember the moment that you learned or discovered that you can change the dynamic balance between melody and accompaniment (in other words: that you can bring out the melody to the foreground)? Did you discover it by yourself, or did your teacher explain it to you? Do you still remember how your teacher approached learning this pianistic skill?

Lesson sheet pianistic quality – Chapter 8: Pedalling

- Brainstorm: *Many adult pupils have difficulties with the timing of the pedal. Especially the phenomenon of creating a "gap" between chords that are supposed to sound connected can frequently be observed amongst adult pupils. What could be the reason(s) behind this difficulty?*
- Brainstorm: *Which in-between steps can we use to assist our pupil in developing the skill of connecting sounds (chords, bass notes) with the pedal? This technique is called "legato pedalling".*
- Show example Satie
- One-finger scale
- Sequence: Play, Up, Down, Release

Chapter 9: Ornaments

- Show example mordent in Petzold
- Brainstorm: *Which in-between steps can we use for teaching this mordent?*
- In general: Metric performance
- Show in-between steps mordent, both on the beat and before the beat, turn and trill
- Appoggiaturas: Play together

Chapter 10: Position changes

- Show example Chopin Nocturne
- Brainstorm: *Did you encounter pupils who find it difficult to get the right balance in similar situations? How did you approach this? Can you think of in-between steps? Can you think of movement metaphors that might help?*
- Division over two hands
- Magnetic train, Dust

Chapter 11: Wide intervals and chords

- Introduce the problem
- Brainstorm: *Can you think of movement metaphors that could help your pupil to find an easier gesture of "opening" his hand?*
- Wave, Shake hand

Preparatory question

- Many adult pupils have difficulties with the timing of the pedal. Especially the phenomenon of creating a "gap" between chords that are supposed to sound connected can frequently be observed amongst adult pupils. What could be the reason(s) behind this difficulty?