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Flute Tone and Timbre:

Unveiling the hidden practices of the one-to-one teaching studio by situating learning as research and the driver for the development of new learner-centred, practice-oriented pedagogy

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JANUARY 2024

I, Steven Antony Cupitt, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

This research set out to inform the improvement of instrumental pedagogy by investigating and unveiling some of the hidden practices of several one-to-one teaching studios at conservatoire level. It aimed to engage expert practitioners in a collaborative exploration of their own know-how and widen access to that know-how. It explored expert know-how by situating the researcher as learner, and the practice of learning as research, making the act of learning the nexus for the development of new theory and new practice-oriented pedagogical materials.

The insights gained fed a process of researcher-participant critical reflexion-in-action, based in learning-through-doing, combined with reflection-on/for-action, based in learning through collaborative dialogue, thinking and reasoning. These processes have informed the creation of practice-oriented pedagogical materials designed to empower exploration and discovery so that learners can become researchers of their own practices and originators of their own personalised know-how. The materials to emerge from this inquiry, in the form of two student/teacher-facing manuals, aim to promote personalised modes of experiential learning-through-doing designed to develop student agency, autonomy, motivation, authenticity, imagination, and individuality.

This investigation utilised a Practice as Research (PaR) methodology, reorienting Robin Nelson's model of PaR to create Expert Learner Practice as Research (ELPaR). ELPaR represents a new model of learner-centred inquiry that situates the researcher as an active learner, instrument-in-hand, within multiple one-to-one teaching studios, to be the driver of new knowledge and practices.

Whilst the specific focus of this investigation was new pedagogy related to tone and timbre in flute playing, ELPaR establishes a way of working with professional experts that can be replicated and adapted by other researchers to further investigate both instrumental pedagogy and other domains of professional expertise. Working in this way within the expert-practitioner domain, academics can build trust, form partnerships, and serve as a bridge between professional practice and expertise and a wider community of practice.

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Secondly, I owe a huge debt of gratitude to all the expert performer-teachers who have so generously shared their time, ideas, and years of experience, so that I may then go on to share what I have learnt with others. In particular, Patricia Morris, who encouraged me to pursue my idea of doctoral study before I had even written a draft proposal, Anna Pope, Kate Hill, Gitte Marcusson, Emma Halnan, and Thies Roorda for their insights and feedback, and Juliette Bausor, Abigail Burrows, and Zoya Vyazovskaya for their participation in my primary research activities.

Thank you also to the students who took time to trial The Tone and Timbre Toolkit, and who were so positive in their feedback.

Additional thanks go to my 'PhD buddy', Thaïsa Hughes, who was simultaneously working on her own investigation, in a different domain but with the same passion and integrity; thanks for all the tea and chats.

Finally, I could not have undertaken this project without the love and support of my husband Clive Nicholas, who has always believed in me and encouraged me to follow my dreams and passions; he is a true believer in the best of me.

Chapter 1: Introduction

1.1 Aims: The ‘What’, ‘Why’, ‘How’ and ‘Who’

This research set out to inform the improvement of instrumental pedagogy by investigating and unveiling some of the hidden practices of several one-to-one teaching studios at conservatoire level. It explored expert know-how by situating the researcher as learner and the practice of learning as research, facilitating the act of learning to be the driver for the development of new theory and new practice-oriented pedagogical materials.

In this way a model of learner-centred inquiry was established, situating the learner-researcher as the author and driver of new knowledge by working collaboratively with professional expertise within the one-to-one teaching studio. The insights gained have been used to create learner-centred materials designed to empower learner exploration and discovery, promoting personalised modes of experiential learning-through-doing designed to develop student agency, autonomy, motivation, authenticity, imagination, and individuality.

The specific focus of this research was the investigation of tone and timbre within flute playing. This focus demarcated the scope of the investigation and created a focal point that anchored the inquiry. I situated myself, as ‘learner-practitioner-researcher’¹, as the nexus within a group of expert ‘performer-teachers’ (Collens, 2015, Gaunt, 2006, Mills, 2004), building on Mill’s definition of performer-teachers to define ‘expert performer-teachers’ as elite performers for whom instrumental teaching at conservatoire level is integral to their professional identity.

The investigation engaged ten ‘expert performer-teachers’, all from a classical music background, in academic research. The following ‘family tree’ illustrates connections between participants, with the arrows indicating where one was taught by another². It is followed by short biographical details of each expert performer-teacher participant.

¹ See Chapter 4.2.

² Teacher-student relationships indicated might reveal elements of ‘apostolic succession’ – see Chapter 1.3.2.

Expert Performer-Teacher Participants involved in this investigation: ‘A Family Tree’

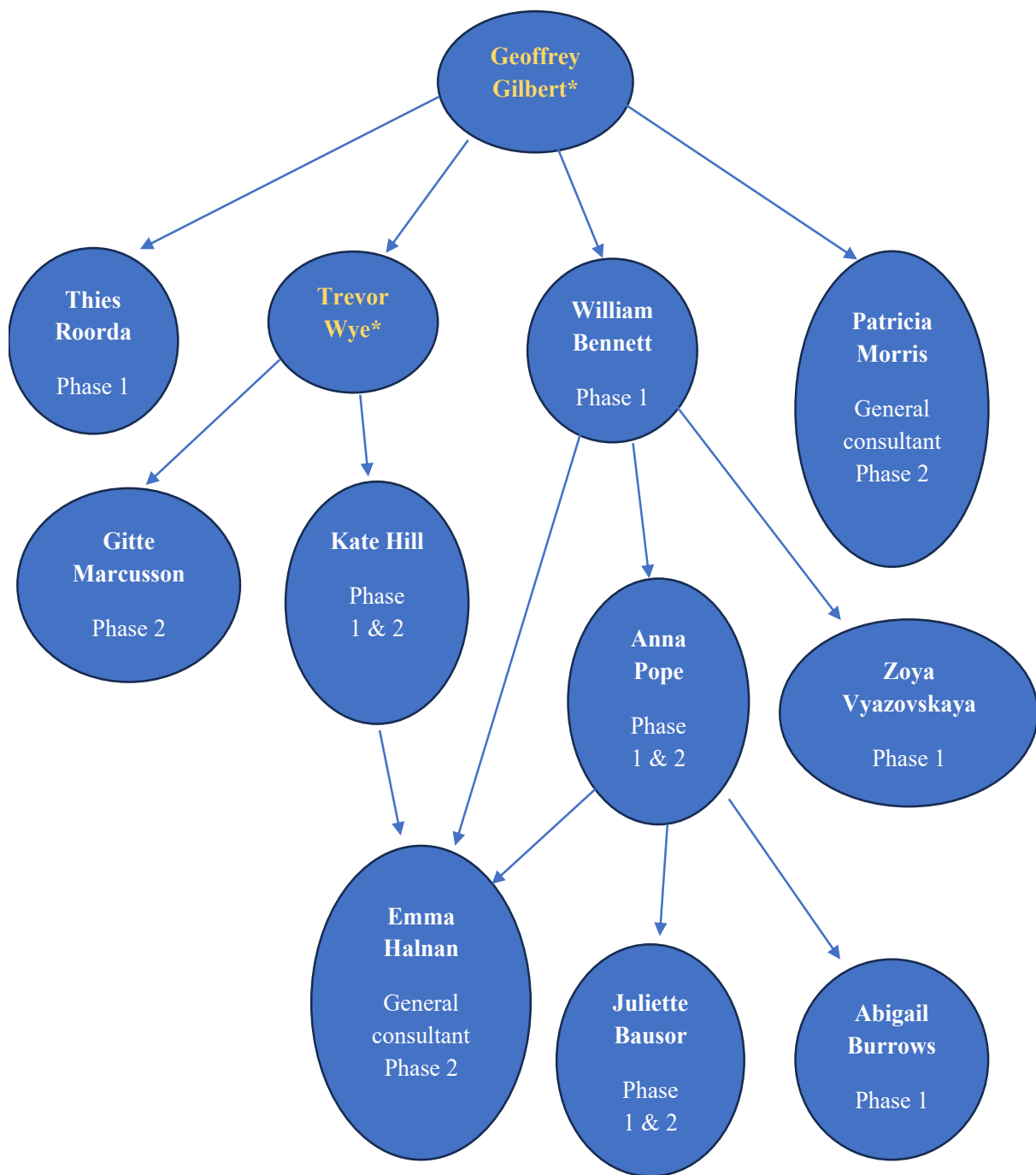


Figure 1: Expert Performer-Teacher Participants involved in this investigation:

‘A Family Tree’

*Neither Geoffrey Gilbert nor Trevor Wye were directly involved in this investigation, but as two of the most revered flute teachers, in the UK, of the 20th century, and being significantly represented in the Literature Review, they are included in this ‘family tree’ to illustrate their impact on the larger cohort of participants.

Short Biographies:

Juliette Bausor: Current Principal Flute with the London Philharmonic Orchestra, ex-Principal Flute with the Royal Northern Sinfonia and London Mozart Players. Gives regular masterclasses at most of the UK music conservatoires.

William Bennett: International soloist and recording artist, ex-Principal Flute of the London Symphony Orchestra, the Academy of St Martin in the Fields, and the English Chamber Orchestra. Ex-professor of flute at the Royal Academy of Music, London.

Abigail Burrows: Flute teacher at the junior department of the Royal Academy of Music, London, and ex flute teacher at The Purcell School for Young Musicians, Hertfordshire, UK. Freelance player, specialising in solo, chamber, orchestral and session work.

Emma Halnan: Flute teacher at the University of Cambridge and Wells Cathedral School. Freelances with orchestras including the London Mozart Players, RTÉ National Symphony Orchestra, BBC National Orchestra of Wales, and English National Opera.

Kate Hill: Retired co-principal flute of the English Chamber Orchestra and principal flute of the Britten Sinfonia. Ex-professor of flute at the Royal Academy of Music, London and the Royal Northern College of Music, Manchester.

Gitte Marcusson: Professor of flute at the Royal College of Music, London, and ex teacher of flute at Chetham's School of Music, Manchester.

Patricia Morris: Ex-principal piccolo of the BBC Symphony Orchestra and the Royal Liverpool Philharmonic Orchestra. Retired professor of piccolo at the Royal Academy of Music, London, and ex-professor of flute and piccolo at the Royal Northern College of Music, Manchester.

Anna Pope: Professor of flute at Trinity Laban Conservatoire, London, and the junior department of the Royal Academy of Music, London. Ex-flute teacher at The Purcell School for Young Musicians, Hertfordshire, UK.

Thies Roorda: Retired principal flute of the Radio Philharmonic Orchestra Hilversum, and professor of flute at the Royal Conservatoire in The Hague, The Netherlands.

Zoya Vyazovskaya: Principal Flute of Classics-Art Ensemble, Moscow, and teacher of flute at the Gnessin Special Music School, Moscow.

The aim was to enable professional experts to contribute to music education research by working collaboratively with me as participant-researcher in an investigative exploration of their professional practice as artists and teachers. My role was to facilitate expert performer-teacher contributions to new knowledge by working with them, within the framework of academic research methods but without the experts having to assume responsibility for the processes required of academia. They were contributors to the research but were not accountable. This collaborative approach, with an explicit understanding that I was the researcher but that they could be credited as the authors of their own ideas and ways of working, was set out clearly in the ethical consent forms that each participant signed.

My intention was to explore the knowledge contained within the conservatoire level one-to-one (flute) teaching studio, isolated and private in nature, described as a ‘secret garden’ (Burwell, Carey & Bennett 2019, Hyry-Beihammer, 2010) or a ‘sacred space, inviolate from external interference’ (Cox, 2014, p.47). I aimed to experience and critically reflect upon the embodied and enactive professional know-how of my group of expert performer-teachers, and to disseminate ideas that are frequently articulated within the walls of the ‘secret garden’ but rarely articulated beyond, acknowledging that ‘the walls that facilitate privilege of access for the individual student are what restrict access for others’ (Burwell et al., 2019, p.5).

The knowledge gained through working with this group of experts was synthesised and moulded into new teaching resources through an iterative cycle of workshopping ideas within multiple ‘secret gardens’, combined with my own researcher critical reflexion/reflection³; exploring, experimenting, discovering, testing, embodying, enacting, adapting, writing and talking about, creating, receiving feedback, and refining, in an ongoing process of iterative collaboration akin to an action research cycle inside the one-to-one teaching studio, acknowledging, as in action research, that ‘to make academic research relevant, researchers should try out their theories with practitioners in real situations and real organizations’ (Avison et al., 1999, p.94), but undertaken within a Practice as Research (PaR)⁴ methodological framework.

This collaborative process involved a practical exploration of expert practice, instrument-in-hand, combined with ongoing dialogue within a two-way feedback cycle. Participants had the opportunity to model their ideas, discuss intentions and possible problems, coach me in enacting their ideas, hear and feed back on my enactments and embodied experiences, and later

³ See Chapter 2.2 for an examination of the differences between reflexion and reflection.

⁴ PaR methodology and my use of PaR in this investigation is examined in Chapter 4.

to read, try out and feed back on my written research findings as they emerged and developed. This took place within a process of iterative critical reflexion/reflection designed to enable the refinement of my own practice and henceforth to inform the development of new pedagogical resources for others.

Part of my motivation for this investigation⁵ was the knowledge that access to one-to-one lessons with expert performer-teachers is competitive and limited. Many learners will never gain direct access to the ‘secret garden’⁶ housed within the walls of the conservatoire, so this research aimed to find a route to disseminate more widely the knowledge held within some of these elite one-to-one instrumental teaching studios to make it available to a wider audience. The intended recipients of my investigation were students and teachers of the flute, and the objective of my research outputs was to empower teachers and students to collaborate in an embodied, enactive, extended, embedded⁷, heuristic⁸ exploration of the issues, both musical and physical, relating to developing the use of tone and timbre in flute playing.

This investigation sought to create two very different outputs: a practical set of ‘tools’ to be used by players and teachers to explore and develop tone and timbre in flute playing in a pedagogical setting, and an academic thesis providing a rigorous account of the thinking and processes that generated new approaches to pedagogy and that might inform future research activities. The approaches that I took are readily transferable by academics and researchers to other domains.

In adopting a PaR methodology, I sought to utilise a practice-based approach to create a one-to-one working partnership between myself as participant-researcher and a group of expert performer-teachers. PaR enabled me to access the knowledge of expert performer-teachers by using my own practice as a means of engaging them, offering a research methodology that was aligned with their professional identity as practitioners, and creating a space in which to explore possible answers to the research questions⁹ that this investigation poses. My practice as an accomplished flute player-teacher-researcher gave me both credibility when approaching expert performer-teachers, and the language/experience necessary to engage in meaningful exploration of their practice, both in discussion and instrument-in-hand. This contributed to building the trust, cooperation, and rapport necessary to enable a genuine working relationship.

⁵ See Chapter 1.2.

⁶ Issues relating to social justice and widening access to knowledge are discussed in Chapter 1.2.

⁷ 4E cognition in the context of musical learning is examined in Chapter 2.6.

⁸ Heuristics are examined in Chapter 2.7.

⁹ See Chapter 1.1.2.

PaR also provided a framework within which to critically reflect on how this explorative process had a transformational effect on my own practice and how these experiences and the knowledge gained might be of use to others. The practices and knowledge under investigation were twofold: the know-how and professional practice of the expert performer-teachers; and my ongoing reflexive/reflective learner-practices within *Expert-Learner Practice as Research (ELPaR)*¹⁰.

1.1.1 Existing Flute Literature and What I Aimed to Contribute

Most of the pedagogical literature related to developing tone and timbre currently in use in flute playing and teaching is not research-based. It was authored by eminent performers and conceived as a vehicle to share and promote their own practices. It either favours the top-down, ‘master-apprentice’¹¹ model of teaching, passing knowledge from the master to the student, which still predominates in much one-to-one instrumental teaching, or it offers exercises and materials with minimal and sometimes confusing guidance for learners, and therefore requires expert teacher input to be of use. An early stage of my project involved reviewing this literature to establish a knowledge base, looking at how tone production was understood, developed, and implemented. Through this process, I identified the various factors that influence and impact the production and use of tone and timbre, more often referred to as ‘colour’ in the flute playing profession, current pedagogical materials and practices, and areas of agreement, disagreement, contradiction, and doubt. Subsequently, I was able to highlight commonalities and differences in practice and identify gaps in knowledge which my investigation could address.

Furthermore, I investigated from an academic standpoint, the pedagogical literature relating to instrumental and vocal teaching. This literature examines issues including practices within the conservatoire and the one-to-one teaching studio, cognitive science relating to developing musical skills, issues relating to student-centred learning, autonomy and motivation, and ethical considerations. The knowledge gained informed my theoretical framework¹² and the lenses through which I explored, influencing: the ways in which I worked with expert practitioners; my critical reflexion/reflection and data analysis processes; the intended outcomes of my research; and the ways in which I present and disseminate my new insights, in particular via The Tone and Timbre Toolkit¹³.

¹⁰ See Chapter 4.2.

¹¹ See Chapter 1.3.3.

¹² See Chapter 2.

¹³ See Chapter 7.

I developed pedagogical resources based on expert performer-teacher practices filtered through my ELPaR that, during the ‘know-what’¹⁴ stage of knowledge formation, empowered me to advance my own practice relating to flute tone and timbre, and as a consequence, enabled me to reflect and create resources that invite learners to explore and discover for themselves. In addition, these resources now facilitate teachers with research-informed approaches and materials that have the potential to permit them to avoid the master-apprentice model and enable exploration and discovery to be ‘learner-centred’ (discussed throughout this chapter) rather than teacher-led. The pedagogical intention was to ensure that the status of the needs of the learner is situated equal to, or perhaps above, the experience of the teacher, so that learner needs, and not teacher habit, intuition, or bias, are the driver. The aim was to create learner-centred pedagogy that promotes experiential learning and develops student agency, autonomy, motivation, authenticity, imagination, and individuality by encouraging personalised modes of learning and knowledge co-construction over a unidirectional process of knowledge transfer.

My research outputs aim to empower students to develop their practice with greater agency, beyond the confines of their one-to-one lesson, enabling the learner to develop know-what and know-how independently of the teacher, whilst acknowledging that a good teacher is an indispensable collaborator in the development of operational knowledge and skills. I believe that students are empowered by being provided with tools that enable self-directed, autonomous exploration and discovery in the absence of a teacher.

1.1.2 Research Questions

The principal questions that this inquiry asked were rooted in the observation that comparatively few students have the opportunity to study with expert performer-teachers. The research questions addressed were:

1. How might flute players be empowered to experiment and learn-through-doing in order to develop and embed personalised, tone and timbre-related, artistic and technical skills that are embodied, enactive, automated, and intuitive?
2. How might academics actively collaborate with expert practitioners within the hidden domain of the one-to-one teaching studio to unveil new insights that might inform the creation of new, learner-centred, practice-oriented pedagogy?

¹⁴ ‘Know-what’ is a term coined by Robin Nelson, and refers to ‘knowing what ‘works’, and ‘teasing out the methods by which ‘what works’ is achieved’ (Nelson, 2013, p.44). See Chapter 4.

Whilst my focus was on developing knowledge and insights related to flute playing, these questions sat within a larger pedagogical context, and demanded that as I explored the practices hidden within the ‘secret garden’ I remained conscious of developing new ways of working that had the potential to positively impact instrumental learning more generally.

My main research question focussed on learner exploration and the potential benefits of widening access to the knowledge and practices hidden in the expert one-to-one teaching studio; my second question focussed on new pedagogical approaches intended to move away from imparting knowledge in favour of empowering learner-centred knowledge discovery and skill development. Focussing my research questions in this way I was hopeful that a new philosophical approach to instrumental learning and teaching might emerge.

1.1.3 Methods Overview

Working within a PaR methodological paradigm, an initial primary data gathering phase of semi-structured interviews¹⁵ with seven expert performer-teachers was followed by a second phase of practical, one-to-one lesson/workshops in which I worked primarily with four expert performer-teachers. These workshops included physical modelling (by the expert performer-teachers), proprioceptive and kinaesthetic experiencing¹⁶ (by me in the position of learner), musical and professional contextualisation, and discussion around the application of ideas and possible problems that learners might commonly experience. Each lesson/workshop was followed by a period of researcher exploration and critical reflexion/reflection centred around the ideas that emerged. These sessions were similar in format to lessons which take place within the one-to-one teaching studio and with which the participants are very familiar, but were more collaborative in nature. Over a period of four years these collaborations enabled an iterative PaR cycle that led to the creation of The Tone and Timbre Toolkit, which is the primary means by which I disseminate the results of my investigation to the flute playing community, and to exploring other core texts frequently used within the expert one-to-one teaching studio.

¹⁵ See Chapter 4.3 for the semi-structured interview questions, discussion of the rationale behind choosing this type of interview format, and the processes involved.

¹⁶ In this investigation, I define kinaesthesia as focussing on sensory awareness of the body’s position and movement. Kinaesthesia sits within a broader concept of proprioception, which additionally provides sensory feedback on issues such as effort, tension, weight and balance (Candau et al., 2017). Combined, kinaesthetic and proprioceptive awareness and sensory feedback help to refine instrumental practices, empowering the development of control that is refined, nuanced, adaptable, and executed with precision and increasing ease.

1.2 Autobiographical Motivation for the Study: Past and present

This is not an autoethnographic¹⁷ investigation, but as learning from (auto) biography is a well-documented qualitative research method I offer here an outline of my personal experiences and my perceptions of the current cultural context in which students access high quality instrumental teaching. I acknowledge the idea of ‘research as a political, socially-just and socially-conscious act’ (Adams & Jones, 2008) in order to explain and contextualise the origins and initial drivers of my investigation.

My motivation for undertaking this research stemmed from reflection on my own experiences as player, student, and teacher. I studied the flute in the 1990s as an undergraduate student at the University of Huddersfield with Alan Lockwood, ex-principal flute Scottish National Orchestra and BBC Philharmonic Orchestra, and as a postgraduate student at Trinity College of Music, London with Ingrid Culliford, London freelance-player and new-music specialist. After leaving Trinity College of Music I continued to take private lessons with, amongst others, Peter Lloyd (ex-principal flute London Symphony Orchestra), Robert Winn (ex-principal flute Royal Philharmonic Orchestra) and Patricia Morris (ex-principal piccolo BBC Symphony Orchestra). I started to develop a career as a professional flautist; I was a member of the Britten-Pears Orchestra in Aldeburgh and I was very active as a chamber musician and in contemporary music. At this time, I also completed the MMUS degree in Performance and Related Studies at Goldsmiths’ College, University of London. I have performed in most of the major London venues, for music societies across the country and at various festivals in the UK. I worked as a freelance player and I did several auditions for orchestral positions, all of which did not go well, as I developed problems with performance nerves and difficulty coping with sudden adrenalin surges in stressful situations. Eventually I decided that the performance path was not for me and to dedicate myself to teaching.

After a period of focusing on teaching, as both an instrumental teacher and as a classroom teacher/head of department in schools, in 2019 I decided that the time had come to reconnect with my playing; not with the objective of playing professionally, but with the objective of refreshing my skills to be the best that I could be and of re-energising my personal music

¹⁷ The inclusion of biographical detail here is in no way meant to position the researcher as subject in this investigation. Whilst my lived experiences do result in data findings, the focus of this inquiry is on creating the best synthesis of researcher/expert-professional practices as a tool for empowering learner exploration and discovery. The learner is always the central focus. In describing my personal experiences within a social and cultural context my sole intention is to contextualise the origins and drivers that originated this investigation whilst highlighting the need for greater equity of access to expert know-how.

making and teaching practice. In my private practice I returned to the pedagogical materials and approaches of my student days; the publications of Marcel Moyse, Trevor Wye, Taffanel and Gaubert and others, which are still today the most commonly used didactic publications in flute teaching.

I was again practising seriously and I felt that my playing was evolving. After four to five months, I decided to contact one of my ex-teachers, still a professor at the Royal Academy of Music, London and ex-member of a major London orchestra, to organise a lesson. This was the first time that I had sought professional feedback on my playing in over a decade. An experienced teacher and a very astute listener, after playing to her for a few minutes, she told me that my sound was very impressive, but very hard, and whilst it would work well in a limited number of musical situations, it was not a sound that was suitable for most situations or most standard repertoire.

I had not anticipated this feedback and it led me to reflect on the tonal qualities of my playing and how I had misjudged them. I considered myself to be a well-trained, knowledgeable, and musical flute player with a good ear, and I was surprised at how, working in isolation, I had developed a hard tonal quality with limited musical applications without realising; I had unwittingly taken myself 'down a rabbit hole'. This led me to examine the approaches and materials that I had used in returning to serious practice and to ask where I had gone wrong. Moreover, I started to consider how the teaching resources most commonly used in flute teaching had barely changed since my youth, and how new resources might be developed to improve pedagogy in this domain. I reflected on the importance of access to expert performer-teacher input, aural feedback, and also the potential dangers of working autonomously and in isolation; after all, if I, with all of my training and knowledge, had unwittingly developed a tone that was not very usable, then surely others were at risk of making similar mistakes.

I started to think about how tone and 'colour' is described and understood within the flute playing community and within the most commonly utilised pedagogic materials. Metaphor is often used to describe colour, but metaphor can be opaque, subjective, misleading, and open to misunderstanding, misinterpretation, and disagreement. Furthermore, I found only limited advice on what to do physically to achieve said metaphorical tonal descriptions, and the advice currently published was sometimes contradictory and confusing; based on professional practice rather than academic research it works for the author but perhaps not for everybody.

There remains a paucity of detailed written advice about how to explore embodied practice relating to developing optimal tone-related flute technique, with the best sources of information

and advice invariably not accessed via books, but rather coming from a teacher in the one-to-one teaching studio. The importance of high level one-to-one instrumental teaching in my personal journey cannot be overstated, and research acknowledges one-to-one instrumental tuition as the preeminent mode of instrumental teaching in the western classical tradition (Gaunt, 2011, Nerland, 2007, Triantafyllaki, 2005). Nonetheless, access to high level one-to-one instrumental tuition with expert performer-teachers, especially that contained within the ‘secret garden’ previously outlined, is limited, privileged, competitive, and expensive. This raises questions regarding social justice and the barriers to accessing high level instrumental teaching and conservatoire entry, which I return to in the conclusion of this thesis.

I grew up in an economically challenged, one-parent family where nobody had been to university and where classical music was totally absent. Luckily for me, through well-funded instrumental lessons at school (in the 1980s) and well organised local authority ensemble provision, I was afforded opportunities that my family would have been unable to otherwise provide, and I progressed through to undergraduate study, postgraduate study, and beyond. As an instrumental teacher I have taught the flute for a number of local authority music services¹⁸ in some of the most underprivileged parts of the country. I have seen the value of learning an instrument and the impact that high quality teaching has on student development, but I have also experienced barriers to accessing teaching at the highest level, both as a young musician myself growing up away from a cultural, urban centre, and in the progression opportunities that have been available to my students.

If I were growing up now, in the current socio-economic climate, I question whether my own path as a musician and educator would have been possible. This has motivated me to engage in academic inquiry in order to unveil and democratise access to expert knowledge for those who might ordinarily lack access. Cost is a major barrier to quality music education for many. Anna Bull (2019) presents a classical music ecology dominated by middle class students from independent schools with parents who want to invest in the cultural capital of learning a classical instrument. She writes of social and economic inequality and the need to diversify the world of classical music through widening access, stating that ‘while individuals may have innate musical ability, this does not have any currency in the classical music world unless it is shaped through tuition and practice’, noting that ‘extracurricular activities...require large

¹⁸ In the UK ‘Local Authorities’ are regional government bodies responsible for the provision of an extensive range of public services, and their ‘music service’ is responsible for the provision of music education opportunities, such as instrumental lessons, instrument hire, ensemble provision and music curriculum support in schools within their regional boundaries.

amounts of parental time and money’ (Bull, 2019, p.27). The majority of students in Bull’s study, set within a ‘typical’ British town, came from privileged middle-class backgrounds, and they were intending to study or were already studying at undergraduate level at either a UK conservatoire or an elite university, including 27% at Oxford and Cambridge.

Bull cites Scharff stating that ‘data from 2012-13 shows that the proportion of those studying at the five top UK conservatoires who graduated from independent and international schools was at least 24.4% (Scharff, 2017, p. 46). Scharff also cites data from the Associated Board of the Royal Schools of Music (2014) which states that ‘74% of children from AB (socio-economic) backgrounds have had instrumental lessons compared with only 55% of children from social grades C1 and DE’ (Scharff, 2015, p.7), and she cites expense and class as being the two main barriers to learning an instrument. Recent research from the Royal Conservatoire of Scotland (RCS) investigates ‘the implicit and explicit ways conservatoire cultures may exclude individuals from under-represented backgrounds’ (Smillie, 2021, p.5), stating that ‘the institution (RCS) largely expects (students) to come equipped with the social and cultural resources to participate in the Conservatoire’s cultural systems without deviation’ (Smillie, 2021, p.23). Perhaps acknowledging Smillie’s findings, the RCS website now has an Equality and Diversity Statement clearly stating that it strives to ensure that no student (or member of staff) receives less favourable treatment on the grounds of a ranges of issues, including social-economic background.

It is clear that access to expert performer-teacher knowledge, by both underprivileged learners and their teachers, might play some small part in redressing these imbalances, and whilst my research does not explicitly address the issues of class raised by Bull and Scharff, it does lead to the creation of new pedagogical resources that are born out of a rigorous exploration of the practices hidden within a number of expert performer-teachers’ one-to-one teaching studios. My research findings, in the form of two user-facing method texts, ‘The Tone and Timbre Toolkit’ and ‘Moyses 24: A Toolkit’, can be easily and inexpensively disseminated, thereby enabling a greater number of students to access professional expertise, knowledge and practice than is currently the case.

1.3 Instrumental Pedagogy: Past, Present and Future

Carey and Grant state that ‘one-to-one teaching has been the backbone of music education for around the last two centuries, and is the model that remains the most familiar to many instrumental and vocal musicians, both student and professional’ (2014, para.1). Within the domain of one-to-one teaching the role of the ‘performer-teacher’ (Collens, 2015, Gaunt, 2006,

Mills, 2004) is well-documented. It is often referred to as the ‘master-apprentice’ model (Reid, Costa & Carrigan, 2020, Burwell, 2013, Gaunt, 2011, Nerland, 2007, Triantafyllaki, 2005), and has been described as conservative and set in its ways, in addition to being an activity that takes place in private, hidden behind closed doors (Burwell et al., 2019, Cox, 2014, Carey & Grant, 2014, Hyry-Beihammer, 2010, Gaunt, 2009).

1.3.1 Hidden Practice

Expert performer-teachers’ approaches and methods are rarely articulated beyond the confines of individual lessons, and even less frequently are they documented. This hidden nature makes expert performer-teacher practice within the one-to-one teaching studio, already described as a ‘secret garden’ (Burwell et al., 2019, Hyry-Beihammer, 2010) or a ‘sacred space, inviolate from external interference’ (Cox, 2014, p.47), difficult to validate and difficult for others to adopt.

Burwell also notes the isolated setting of the studio and cites numerous researchers to say that the studio setting ‘offers privilege of access to individual students’ whilst placing ‘an obvious constraint on the development of shared pedagogies, and has often led to a lack of transparency for other practitioners and researchers’ (2018, p.13). My investigation aims to play a small part in addressing this lack of transparency by unveiling some of the hidden practices for a wider audience, universalising previously undocumented ideas to create a transparent and shared pedagogy out of the isolated and private nature of the expert one-to-one teaching studio.

1.3.2 Apostolic Succession

In fostering best practice in instrumental teaching, we need to acknowledge that many performer-teachers are not trained in pedagogy. Based on their success as performers they begin teaching, modelling their teaching practice on a combination of the teaching they themselves received - an observational model of learning how to teach, where it is assumed that you study with a great teacher, which in of itself will make you a great teacher as you pass the knowledge on to your own students - combined with their professional experience as performers, which provides them with knowledge of what the profession requires and how to achieve it effectively. Cox articulates this observational model as ‘apostolic succession’ (2014, p.47), whereby a set of musical skills and attitudes is transferred from teacher to student and then from student-become-teacher to the next generation of students, a process which he notes is highly resilient to change. Cox states that rather than setting a premium upon innovation, it emphasises the concept of lineage, with each generation of musicians finding an important

element of self-identity in the pedigree they can trace (Cox, 2014). This observational model of teaching was also noted by Lortie (1975) to exert a conservative pressure on the teaching profession in general, and to be particularly common in novice teachers. Lortie describes this way of teaching as intuitive and imitative, foreshadowing similar observations made by Triantafyllaki (2005)¹⁹.

Margret Buchmann describes this approach to teaching as the ‘folkways of teaching’, which she describes as ‘ready-made recipes for action and interpretation that do not require testing or analysis while promising familiar, safe results’ (1987, p.161). All these traditional, lineage-based practices are teacher-oriented rather than learner-oriented and, whilst they will be effective for some students, I would argue that they limit opportunities to promote learner autonomy and individuality or to facilitate collaborative learning and co-discovery of know-how.

1.3.3 Master-apprentice

For many years the ‘master-apprentice’ model of instrumental tuition has dominated western classical music. This model has been practised within the private and isolated world of the one-to-one teaching studio, and is characterised by modelling and imitation, where the master is often the only exemplar source of how to execute a task. As stated by Jørgensen:

Historically, the predominant relationship between teacher and student in instrumental instruction has been described as a master-apprentice relationship, where the master usually is looked at as a role model and a source of identification for the student, and where the dominating mode of student learning is imitation. (2000, p.68)

Master teachers often lack formal training in pedagogy, but by virtue of their own studies, often with a master-teacher of note, combined with their professional standing and experience as performers, together with their accumulated years of teaching experience, they become highly sought-after teachers. Their experiences provide them with a wealth of knowledge to pass on, and they are considered well-placed to teach the performance skills required within their professional domain.

However, practice can be varied; being an expert or elite performer is not a guarantee of being a good teacher. As McCoy notes in his research into 21st century vocal pedagogy, ‘not all great

¹⁹ See Chapter 1.3.3.

singers are equally gifted teachers' (2014, p.14). As early as 1994 Persson distinguished between 'formidable artist[s]' and 'formidable pedagogue[s]', stating that 'they describe different roles as well as different skills in different contexts' (1994, p.89); two years later, Persson 'continued to distinguish commonsense teaching (derived from tradition and lore) from trained or expert teaching (derived from empirical models and knowledge), problematising the former and lauding the latter' (Carey, Grant, McWilliam & Taylor, 2013, p.2). Clearly, a lack of pedagogical knowledge can limit the efficacy of teaching.

Commonsense teaching is usually intuitive rather than pedagogy-based, something that some of the expert performer-teachers with whom I collaborated acknowledged; it is informed by what works well for that particular practitioner. Triantafyllaki affirms this view, citing both Persson and Schmidt when stating 'Teaching is usually based more on intuition, common sense and tradition (Persson, 2000) than on a systematic examination of assumptions (Schmidt, 1992)' (Triantafyllaki, 2005, p.383).

It must be noted that the master-apprentice model of tuition has, for a long time, worked well for many students, and enabled many musicians to develop the high-level skills required of both the western classical music profession and of other music traditions. However, it also has its critics. Burwell et al. cite Manturzevska (1990) to note that in this model it is often the case that master teachers have 'dominated the development of their students' personality, aesthetic attitudes, life philosophy, professional standards and attitudes toward his or her own artistic and professional activity and the role of musician in contemporary society' (Burwell et al., 2019, p.4).

This raises serious questions about the power and influence that master-teachers have over their students, and about whether students are restricted to simply absorbing and repeating the knowledge of their teacher, or whether opportunities for personalisation and individualisation exist. There may be instances where a straightforward imparting of knowledge might be effective, at least for some students or in some circumstances, but we must question whether a lack of methodical pedagogy risks disempowering learners, inhibiting them in developing their own distinctive, personal voice and limiting their personal and professional development.

It is obviously dangerous to generalise about all teaching being master-apprentice and there are signs of change. Investigating the one-to-one piano lessons of Finnish piano pedagogue and artist Matti Raekallio, Hyry-Beihammer describes a teacher who is 'seen as a helper and supporter, as an advisor and counsellor' (2010, p.170). She states that Raekallio sees himself as being 'in the same boat as his students rather than taking a master's authoritative role' (2010,

172), and she notes that he ‘wants to teach different students in different ways in different situations’ (2010, p.168), adjusting his teaching ‘to suit the needs of different students and their different stages of competence’ (2010, p.170). Whilst this description does not yet fully embody the ideals of a pedagogy that might facilitate learners in discovering their own *know-what* to *know-how* through exploration and experimentation, it does place the needs of the learner above the practice of the teacher, and so represents a move in the right direction.

Teaching should aim to empower learners to develop their own distinctive voice, rather than simply imitate; to provide the possibility that some learners might develop into what Holmes (2012) describes as *elite performers*, which the master-apprentice model of knowledge transfer is less likely, or perhaps not designed, to facilitate. Renshaw (2013) has suggested ‘collaborative learning’²⁰ as a potential route to transforming the master–apprentice teaching model in instrumental teaching.

1.3.4 Ethics of One-to-One Teaching in the Conservatoire Setting

There is an increasing body of research investigating the hidden attitudes and approaches to teaching within the one-to-one teaching studio. Through their research, Gaunt (2011) and Juntunen (2014) present two very different observations of conservatoire teaching in practice. The conservatoire performer-teacher participants in Juntunen’s research talk about activating ‘a student’s own thinking’ and offering ‘tools for students to find solutions to problems and challenges themselves’ (Juntunen, 2014, p.166), whilst Gaunt observes that expert performer-teachers are especially effective when teaching high-achieving, talented students, but that they:

...seemed to invest more in the most talented students, but actually as a result tended more towards a transmission model of teaching, rather than facilitating students in taking responsibility for their own learning and developing their own skills of musical interpretation. (2011, p.161)

Here we see two contrasting models of conservatoire teaching; one encourages and empowers student autonomy whilst the other focusses on transmitting the knowledge and skills possessed by the teacher.

Gaunt’s observations present several problems. Whilst some might argue that investing more in the most gifted students is necessary to maintain the highest standards within the institution and the wider music profession, and individual teachers might gain validation from the

²⁰ See Chapter 2.8.

achievements of their star students, it is ethically unacceptable to place the well-being of the institution or the reputation of the teacher above the needs of all students. In a typical conservatoire setting, all students will audition, be offered a place, and pay tuition fees under the same conditions. They may not all enter the music profession, or become expert or elite practitioners, but all students have the right to expect an equitable quality of teaching and the same investment in their development from all teaching staff.

Perkins states that within conservatoires ‘the learning cultures seem to privilege those who are set apart at the top of the hierarchical organisation’ and that ‘the conservatoire publicly advertises its ‘stars of tomorrow’, reflecting the hierarchical nature of the classical music world, with a ‘limited number of spaces for *stars*’ (2013, p.206). These observations highlight the fact that many conservatoire students may not go on to work as high-level performers, and reinforces the need for pedagogy and curricula that cater for all students, develop transferable skills, and prepare them for a portfolio career; they also reflect the fact that developing high level performance skills is generally held in higher regard than developing skills and knowledge in other areas such as pedagogy²¹. Equity of opportunity should be a cornerstone of all educational institutions and creating an environment in which everyone can thrive is essential.

If all students deserve equity of opportunity but a lack of pedagogical expertise in some performer-teachers creates barriers that prevent this, do we need to question the prerequisites for employment as a performer-teacher at conservatoire level? If expert performer-teachers do not have the thorough grounding in pedagogy necessary to deliver teaching suited to a truly diverse range of student needs, is this an issue that institutions should address? Situating these questions within the context of the hidden nature of the one-to-one teaching studio, yet more issues emerge that go beyond the scope of this inquiry but form a backdrop to this investigation.

These questions highlight the antagonism between possessing experience, skills and knowledge based in professional practice as performers whilst lacking corresponding pedagogical knowledge and skills as teachers. As Gaunt (2011) observed teachers investing less in the less talented students and utilising a teaching model based on transmitting their own knowledge rather than engendering student exploration, understanding why these practices persist is a critical first step to change. The most likely explanations stem from a combination of the factors that I have raised. These factors include lack of pedagogical knowledge and training, which leaves some teachers unequipped for the demands of the role, the limited

²¹ See Chapter 1.3.6.

importance afforded to pedagogy in comparison with performing at an institutional level, and matters of individual and institutional reputation. Furthermore, for some teachers maintaining the status quo might seem advantageous, perpetuating a system where they do not need to prepare, read, or learn anything new; they can simply do what they always do or copy what their teacher did.

1.3.5 Empowering Learners

Juntunen writes that ‘to bring about learning is the central task for the teacher’, but states that ‘the teacher can only guide the act of studying, since controlling learning is impossible’ (2014, p.160). Juntunen further writes, as already stated, of activating ‘a student’s own thinking’ and offering ‘tools for students to find solutions to problems and challenges themselves’ (2014, p.166). Nevertheless, Gaunt highlights where pedagogy does not always meet these ideals of student agency and autonomy, stating that:

teachers were conscious of the uniqueness of students' needs in learning, but did not always adapt their teaching accordingly. Whilst they were concerned to support their students, aspects of the teaching techniques which they articulated did not provide a student-oriented learning environment, and in many cases students showed little autonomy and responsibility for their own learning....The one-to-one relationship between teacher and a student clearly had a huge impact on their learning, in some cases constructive, in others inhibiting. (2006, p.1)

Both Gaunt and Juntunen endorse pedagogical practices that are student-oriented rather than teacher-oriented, involving practices that are adaptive and responsive to individual student needs. Lehmann, Sloboda and Woody (2007) describe this model of teaching as the ‘mentor-friend’ model, and contrast this model with the master-apprentice model. They state that:

the mentor-friend model reflects greater exchange between teacher and student. Teachers work to facilitate student experimentation and provide musical ideas for the student to consider. Teaching means guiding the augmentation of students’ own musical experiences (Reid, 1997). This may allow teachers to be more responsive to the individual needs of the students. Elements of the mentor-friend model allow for greater contribution on the part of students and, as a result, stronger feelings of autonomy. This in turn increases the possibility of intrinsic motivation for music learning (Lehmann et al., 2007, p.187)

Carey and Grant (2016) also advocate for a similar model of instrumental pedagogy, which they describe as ‘transformative pedagogy’. They state that:

Transformative pedagogy is characterised by a student-oriented approach to learning, where process is emphasised over outcome, and where the teacher remains responsive and adaptable to the distinct needs of each individual learner. The role of the teacher is to help students to learn how to learn, through exploration, collaboration, and placing new learning in context; in this way, students take an active part in their own learning. (2016, para. 1)

They further state that ‘transformative pedagogy is characterised by greater student engagement in learning, stronger conceptual understanding, and improved learning outcomes overall’ (2014, abstract).

When envisioning a learner-centred approach in the process of developing new flute-related pedagogy, my intention was not only to empower collaborative approaches to working with students, but also to empower learning that scaffolds the building of embodied and enactive know-how of the individual student by giving them a greater role in discovering, unveiling, and authoring their new know-how and skills. The intention was to foster ‘student ownership of lessons and learning’ (Carey and Grant 2016, abstract) rather than focussing on the act of teacher transmission of knowledge. In this way ‘learning and knowledge may be seen as co-constructed in a dialogic process between learners and teachers’ (Huhtinen-Hildén & Pitt, 2018, p.6) and ‘the music pedagogue can be seen as a professional facilitator of another’s creative and artistic processes, learning and expression’ (2018, p.7). Implicit in this approach is a need for research-informed pedagogy to enhance and better inform teaching currently based on intuition, common sense and tradition, and that aids teachers in becoming facilitators of their students’ journeys of technical, creative, and artistic discovery through joint exploration and collaboration.

This approach of ‘facilitating as teaching’ will represent a paradigm shift for many teachers. Carey and Grant state that the role of the teacher will need to fundamentally shift away from ‘authoritative instructor-deliverer to collaborator and facilitator’, and that ‘teachers will need to be willing to renounce their position as expert, and also to accept a greater diversity of learning styles, structures, and outcomes than they may be used to through the more assessment-oriented transfer approach’ (2014, p.48).

For a new generation of teachers to emerge, as imagined by Carey and Grant, conservatoires need to create a curriculum that values pedagogy as much as it values performance, but I acknowledge here that there are many issues which go beyond the scope of this investigation. Conservatoires traditionally deliver a curriculum focussed on preparing the performer (or composer) and pay scant attention to preparing students for roles in teaching, despite well documented evidence that many professional musicians undertake significant teaching roles. As noted by Bennett and Stanberg, ‘despite the presence of educational activities in the portfolio of most musicians, teaching remains on the periphery of many music performance programs’ (2006, p.1). The Association of European Conservatoires (AEC), echoing Bennett and Stanberg, noted that ‘the professional training of performers (not teachers) has been the main concern of the conservatoire sector’ but that as ‘teaching is becoming an increasingly vital component of the portfolio careers of many professional musicians, it would seem appropriate that instrumental/vocal teacher education be high on the agenda of the AEC and its member institutions’ (Lennon & Reed, 2012, p.289).

1.3.6 Pedagogy: A Matter of Status

The research of Bennett and Stanberg, (2006), Nerland (2007), Lennon and Reed, (2012), Juntunen (2014) and Duffy and Broad (2015) combines to confirm that, within higher music education, teaching is often still considered a lesser status activity than performance, and one could argue that this is true within the music industry in general. Indeed, some performer-teachers do not regard teaching as a primary facet of their professional identity. This is noted by Nerland following an interview with a conservatoire teacher where she observes, ‘As to his job at the academy, he regards himself primarily as a musician’, with the academy teacher stating ‘The teaching is to a great extent a function of my [musical] performance. In a way, I don’t consider myself a pedagogue. I consider myself a musician who also does teaching’ (Nerland, 2007, p.404). Juntunen observes similar teacher attitudes regarding the subsidiary role afforded to pedagogy in conservatoire settings, stating:

As teaching was regarded almost as an unavoidable part of the students’ future profession, basic skills and knowledge in pedagogy were considered an important requirement for all graduating students. However...pedagogical studies should not take too much time and focus from instrumental studies, which were considered of primary importance. (2014, p.167)

Citing Renshaw (2010), Duffy and Broad comment on ‘a perceived hierarchy of professional achievement (with soloist at the top and teacher at the bottom)’ leading to a ‘narrow view of achievement and excellence’ (2016, p.35). Duffy and Broad also state that conservatoires are aware of this critique and that some are developing ‘more rounded and realistic’ pedagogical models for undergraduate students (2016, p.35).

In her recent research, Luan Shaw states that undergraduate provision for instrumental teacher education appears to vary considerably between conservatoires in England (2022, p.3), but acknowledges that many UK conservatoires do offer Professional Development strands through their undergraduate and postgraduate courses that include ‘both core and optional further training for prospective community musicians and instrumental teachers, with many modules including some form of professional placement work, in collaboration with external partners’ (Shaw, 2021, p.5). As examples of good practice she cites the Royal Birmingham Conservatoire as offering work placement experience for students in collaboration with the local authority Services for Education Music Service (2022, p.11). She also cites various examples of postgraduate courses that train musicians to teach, such as Trinity Laban’s MA ‘The Teaching Musician’, and the Royal Northern College of Music’s PGCE with specialism in instrumental teaching.

Thus, it appears that most UK conservatories do offer a pedagogical pathway of some description, but it is not always a required module of study, not always high profile in terms of importance or value, and often not advertised or promoted in the same way as performance (Shaw, 2022). In some other countries, for example The Netherlands, it is compulsory to study pedagogy as part of conservatoire training.

Given that ‘the career of a musician today is likely to be a portfolio one, combining several paths’ (Miller & Baker, 2007, p.5), a lack of adequate training in pedagogy risks leaving students ill equipped for the rigours of the music profession and for the future teaching duties that they may undertake. The idea that a student learns how to teach by imitating the teaching of their teacher, the aforementioned ‘observational model’, is clearly a flawed concept. Gaunt notes that ‘although students greatly valued their one-to-one lessons and were developing many instrumental skills, they were not necessarily learning to be able to transfer these skills, for example to a teaching context’ (2011, p.161). The untrained observational model also negates the need stated by the AEC that effective teachers ‘engage in reflective practice and self-evaluation with a view to improving and refining their teaching’ and that they ‘reflect on developments in the profession, expanding their own understanding of pedagogical materials

and methods, keeping up to date with relevant research and literature and developments in their professional associations' (Lennon & Reed, 2012, pp.298-299). It could be argued that merely 'keeping up to date with relevant research and literature and developments' (Lennon & Reed, 2012, pp.298-299) is insufficient and that significant improvements in practice will occur when teachers actively engage in research designed to generate said improvements.

As already stated, my investigation was designed to engage 'expert performer-teachers' in academic research by creating a partnership with them, and my model offers the professional practitioner the possibility to contribute to research-based developments in pedagogy whilst simultaneously developing a more reflective practice of their own. This has the potential to facilitate a transformative journey in their teaching, within a model that can be replicated or adapted to inquire into other aspects of performer-teacher practice, beyond tone and timbre and beyond playing the flute. It is the pursuit of this concept of effective teaching that might enable teachers to address the unique learning requirements of individual students, and improvements in pedagogical practices need to advance simultaneously with improved, research-informed pedagogical materials of the type generated by my research collaborations.

Through my books, 'The Tone and Timbre Toolkit' and 'Moyse 24: A Toolkit', I aim to empower both students and teachers with tools that allow them to work collaboratively to explore, discover and problem-solve according to each learner's needs; tools which embody the ideals set out by Carey and Grant in their description of a 'transformative pedagogy' (2014, 2016). My books offer a new rigorous body of materials, and their creation offers a model of practice that can be further extended over time to expand the already existing body of non-research-based expert performer-teacher authored method texts which currently dominate the domain.

1.4 Timbre and Elite Performance

Flute tone and timbre is the title of this investigation, so I wish to be clear about what I am referring to when I talk about timbre. I have already noted that within the professional domain of flute playing and within the wider flute playing community timbre is more often referred to as 'colour'. Flute players and teachers regularly talk about tone and colour, and the ability to use a variety of colours is considered to be one of the key factors in playing expressively at an advanced level.

Jeanne Baxtresser, ex-principal flute of the New York Philharmonic Orchestra and ex-professor of flute at the Juilliard and Manhattan Schools of Music in New York, gives the

following advice to students hoping to be successful when auditioning for a professional orchestral position:

In your preparation keep in mind that you are alone on a stage and that you have a tremendous opportunity to explore the full range of colours and dynamics available to you. Don't make the mistake of forcing your sound, there's no other sound competing with you, or trying to prove what a large tone you have. It is infinitely more interesting to hear a player with a tremendous tonal range, from an effortless pianissimo to a full, rich, powerful fortissimo. (Baxtresser, 1996)

Here Baxtresser highlights some of the issues that this investigation addresses, including: tonal range, colour and dynamics; issues around resonance, (not) forcing the sound, and understanding the acoustics of the performance space (the stage); and considerations around employability.

1.4.1 Definitions

Tone colour and timbre are often considered synonyms and used interchangeably to mean the same thing. According to Oxfordreference.com (2023), timbre is:

the tone-colour or quality of a musical sound, the property that distinguishes the sound of a continuous tone played on two different musical instruments or sung by two different voices at the same pitch and intensity. In German it is called Klangfarbe, literally sound colour. (*Timbre*, n.d.)

Whilst noting with interest that the German translation of timbre is 'sound colour', this definition is clearly lacking in the nuance required to describe how, for example, one note played in a particular moment by a particular player can change tonal quality and thereby be said to change colour (or timbre).

McAdams, Depalle and Clarke describe a generally accepted scientific definition of timbre as 'the attribute of auditory sensation that distinguishes two sounds that are otherwise equal in terms of pitch, duration and loudness, and that are presented under similar conditions (McAdams et al., 2004, p.190). This definition is again too blunt, too simplistic, and lacks any nuance that might relate to artistry or expression, and Holmes acknowledges that this scientific definition in no way addresses the 'artistic properties and expressive potential of timbre' (2012, p.303) or the importance of timbre as an expressive force in performance by elite musicians.

Perhaps for a better definition we might go back to the 18th century, where, as translated by Dolan, Jean-Phillippe Rameau wrote:

A sound's timbre describes its harshness or softness, its dullness or brightness. Soft sounds, like those of a flute, ordinarily have little harshness; bright sounds are often harsh, like those of the *vielle* or the oboe. There are even instruments, such as the harpsichord, which are both dull and harsh at the same time; this is the worst timbre. The beautiful timbre is that which combines softness with brightness of sound; the violin is an example. (Dolan, 2013, p.56)

Here we start to uncover some of what might be meant when discussing timbre or tone colour. We might say that (tone) colour implies qualities that are artistic, aesthetic, and subjective in nature, often conceived by performers and teachers to convey musical ideas. In contrast, timbre offers a more scientific rationale, whereby the ability to measure the presence and distribution of harmonics (also called partials or overtones), from the initial attack and throughout the duration of a note, in combination with quantifying the dynamic level and the speed and amplitude of the vibrato in the sound, allow for a less subjective, more measurable analysis of tonal properties. From the performer's point of view, I suggest that most learners are not overly interested in a measurable analysis of tonal quality, but they are concerned with the expressive manipulation and application of colour as a means to communicate musical identity and intention.

Wallmark and Kendall state that 'timbre exists at the confluence of the physical and the perceptual, and due to inconsistencies between these frames, it is notoriously hard to describe (2018, p.2). They also note that timbre in music has long been viewed as a secondary parameter (in comparison to pitch and rhythm) that is lacking in domain specific vocabulary, which has led 'some to embrace an impressionistic and poetic approach to description (of timbre), and others to avoid it entirely' (Wallmark & Kendall, 2018, p.2). They cite Walter Piston writing 'adjectives used to describe the tone of [an] instrument, cannot do more than direct the student's attention to certain admittedly general and vague attributes' (Piston, 1955, p.67). It is this impressionistic and poetic use of adjectives which creates the misunderstandings and misinterpretation that I discuss in Chapter 2.7 as a reason for avoiding the use of metaphor in the creation of my new pedagogy. Despite the fact that metaphor plays 'a key role for performers', teachers' and students' musical understanding, especially in relation to musical expression' (Leech-Wilkinson & Prior, 2014, p.2), in my research outputs I leave learners to create their own metaphorical language.

We might usefully differentiate between, on the one hand, a more scientific perspective on the nature of timbre, and on the other, a more artistic: the scientific (psychoacoustic, neuroscience, psychological), which might include Wallmark and Kendall's (2018) idea of the 'physical', and the artistic (in research often more focussed on the experience of the listener than the performer), which might include Wallmark and Kendall's idea of 'perceptual', where metaphor and subjective language often dominate.

In music, factors that sometimes influence timbre or colour can often be specific to the individual player and their instrument, based on a variety of factors including physical characteristics and physiognomy, the materials and construction of the instrument, as well as perception of the acoustic properties of the performing space. Most advanced flute students would have little difficulty identifying some of the differences in timbre when comparing between, for example, the tonal qualities of James Galway and William Bennett, but would find most, if not all, definitions of timbre unsatisfactory when describing what they perceive. Holmes (2012) notes that whilst significant research has addressed timbre as an acoustic phenomenon, and also addressed perceptions of timbre from the listeners' point of view, there is little research that focusses on the role of timbre in expressing individual musical identity or the musical imagination of the performer, which is often considered a key facet of elite performers.

1.4.2 Elite and Student Performers

Holmes refers to Gabrielsson and Lindström Wik's work on SEM (Strong Experiences related to Music) (2003) to state that 'the distinctive sound produced by elite performers is embedded within their musical personalities and is integral to their ability to communicate through music' (Holmes, 2012, p.305). She adds that 'a particular quality of tone is commonly associated with a particular performer, irrespective of idiomatic foundations of style' (2012, p.305) and that 'varying timbre is one of the principal ways through which performers communicate musical structure, ideas, emotions and musical personality' (2012, p.301).

Many genre-based traditions, such as historically informed performances in baroque, classical, and romantic music, often dictate what is required in performance relating to issues such as tone quality, articulation, vibrato, and phrasing; informed by treatises of the period such, as J.J Quantz's 'On Playing The Flute', published in both German and French editions in 1752, correct interpretation might sometimes be said to be policed (Leech-Wilkinson, 2020, Holmgren, 2022). In these cases use of timbre is one of the areas where performers can more

freely express themselves, their musical ideas, and their individual voice. In my experience, personalised, individual timbral traits are best developed and honed through a combination of heuristic discovery and deliberate practice²², and this is something which my heuristic approach to pedagogy aims to empower in emerging performers.

Holmes (2012) acknowledges the technical difficulties that students face in developing a wide tonal range and that the need to motivate students (the ‘motivational constraint’²³) to develop technical control of timbre is often not prioritised in instrumental teaching. Moreover, she states that teachers could begin to introduce awareness and development of timbre at an earlier stage of students’ development. Enabling students to explore timbre in a personalised, heuristic way, and embedding this exploration early in a student’s studies could serve to elevate the importance of timbre in pedagogy whilst simultaneously motivating students to engage in the required deliberate practice (Holmes, 2012), and giving students appropriate research-based materials that empower greater agency in the development of their own personal range of expressive heuristic tools might act against the motivational constraint.

When pedagogy seeks to focus on developing timbre or colour as an expressive tool, both the physical manipulation of timbre and its artistic application need to be addressed. Holmes states that:

An advanced performer will have developed sufficient technical command to be able to draw on a wide range of tone colours, evolving from a continuum of large and small-scale physical movements that embody Seashore’s concept of ‘sonance’²⁴. (2012, p.304)

According to Kanno, ‘the musical significance of timbre resides in its imaginative manipulation rather than in its physical property’ (2001, p.31). Kanno states that a master of an instrument ‘is someone who knows what the instrument is, and how it can be employed for the service of expression’ (2001, p.25). Here Kanno highlights the symbiotic relationship required between technical knowledge and skill, combined with musical imagination and artistry, that my concept of heuristic pedagogy aims to empower.

²² Both of these issues are addressed in Chapter 2.

²³ See Chapter 2.9 (Ericsson et al., 1993).

²⁴ Seashore defines the term “sonance” as ‘the successive changes and fusions which take place within a tone from moment to moment’ (Seashore, 2012, p.9).

The importance of musical imagination in conceiving timbre before it is produced is observed by Holmes, who writes that ‘the physical production of tone is guided by imagery’, further stating that ‘expert performers appear to perceive timbre through the creation of mental images (conscious internal representations) that inform and guide technical decision-making as an interpretation develops’ (2012, p.304). She further notes, based on observations of elite performers, that before playing, performers ‘image, either physically or mentally, the character of the sound they wish to produce’ (2012, p. 304). This foreshadows the observations about use of imagery as a tool for developing and employing heuristics made by Leech-Wilkinson & Prior (2014)²⁵.

Given the personal nature of metaphor and imagery, combined with a relative lack of research in this domain, it is unsurprising that even less knowledge exists about how these qualities of personalised, distinctive timbres might be effectively taught. Clearly, timbral qualities that are embedded within the individual musician are not something that the ‘master’ can pass on to the student; they need to be teased out and nurtured with the master seeing the student’s potential and facilitating the student’s exploration.

Some of the existing pedagogical approaches and materials in current use attempt to scratch the surface of this approach but many avoid the issue entirely. To advance pedagogy in this domain the embodied and imagistic heuristic approach proposed by my investigation offers a way to explore these ideals in a significant and transformative way.

²⁵ See Chapter 2.7.

Chapter 2: Theoretical Framework: A Model for Musical Learning and Cognition

The methods utilised in this inquiry plot a journey through several investigative phases: literature review, primary interviews; face-to-face lessons/workshopping sessions; case studies; ongoing and iterative critical reflexion/reflection²⁶; and PaR resource-creation cycles. Throughout each phase of the investigation I explored the practices of a group of expert performer-teachers; I worked to experience, enact, and put into practice their varied approaches and ideas, and I critically reflected on how interacting with them and their practices informed and transformed my own practice.

I viewed each phase of the investigation through six different lenses that formed my theoretical framework, each of which are examined throughout this chapter. These lenses are:

1. 'Flow' Theory;
2. 'PAPAPI' = Perception, Action, Production, Attention, Prediction, Interaction ;
3. 5E Cognition;
4. Heuristics and Imagery;
5. Collaborative Learning; and
6. Deliberate and Enjoyable Practice.

Through these lenses I engaged, instrument-in-hand, in an iterative *Expert-Learner Practice as Research* (ELPaR)²⁷ cycle of exploring, experimenting, discovering, testing, receiving feedback and engaging in ongoing dialogue, and refining expert ideas and approaches, and this ongoing cycle informed my understanding of previously undocumented expert approaches to flute pedagogy. As my lived experiences engaging with expert practices transformed my own practice, they enabled me to test, document and synthesise ideas and approaches into new flute-related pedagogical materials.

The process of exploring, experimenting, discovering, etc. was not a linear sequence of activities that took place as the investigation unfolded; each activity imbricated iteratively within the various stages of my investigation, over time creating an entangled web of discovery

²⁶ See Chapter 2.7.

²⁷ See Chapter 4.2.

and knowledge production that I came to label *The Entangled Web of Musical Learning*²⁸. *The Entangled Web of Musical Learning* represents a model, based on my lived experiences of ELPaR, for understanding and engaging with the learning stages and ‘ingredients’ involved in developing and embedding new skills as an instrumentalist.

2.1 The Entangled Web of Musical Learning

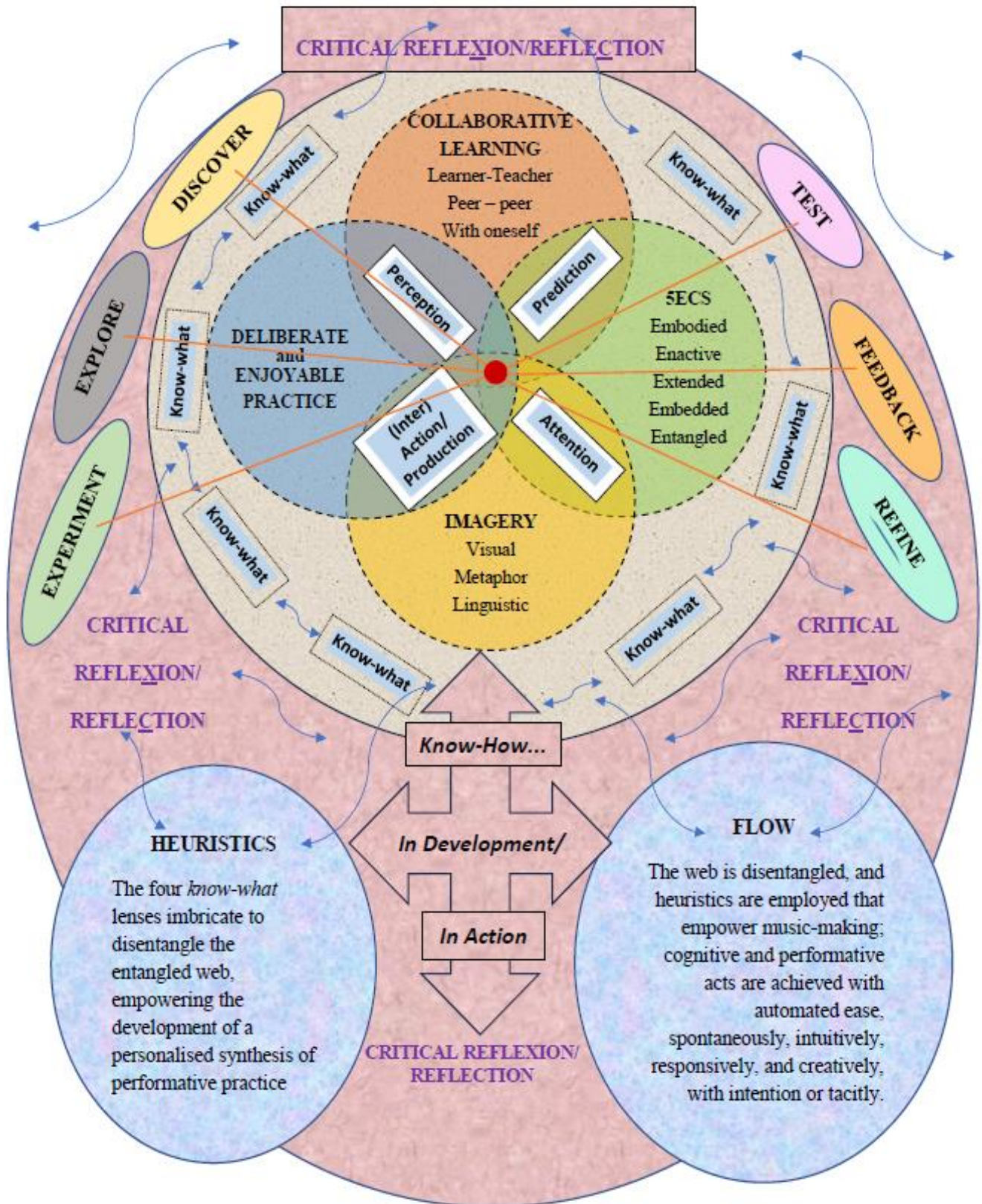
In *The Entangled Web of Musical Learning* the six lenses of my theoretical framework are each embedded within an overarching framework of active critical reflexion/reflection²⁹, where they overlap and intertwine to create a new model/conceptual framework for musical instrumental/vocal learning. This sub-chapter presents my thinking relating to *The Entangled Web of Musical Learning*, situating each of my theoretical lenses within a holistic schema. Each successive sub-chapter of Chapter 2 then explores each lens individually, to better understand how each contributes to the whole. I explore the six lenses, reflecting on: how they contributed to my ongoing evolution as a practitioner; how they informed my processes of critical reflexion/reflection within ELPaR; how I experienced them as a learner-centred form of exploratory instrumental pedagogy; and how they served to frame my view of expert practice and my lived experience working with expert practitioners. I further explain how *The Entangled Web of Musical Learning* might be employed as a model to scaffold and inform the learning of others.

²⁸ See Chapter 2.1.

²⁹ See Chapter 2.2.

Figure 2: ‘The Entangled Web of Musical Learning’

Conceptual Framework for developing know-what to empower know-how³⁰.



³⁰ Nelson describes *know-how* as knowledge that is embodied, tacit, performative, and experiential, and he describes *know-what* as a knowledge creation mode that makes the tacit explicit through critical reflection. Whilst I agree with Nelson’s definition of know-how, I define *know-what* as a generative, skill building mode that works to develop and embed newly acquired tacit, intuitive skills. Our definitions of know-what are not the same. The differences are explored in Chapter 4.1.

The Entangled Web of Musical Learning is born of a personal epistemology (Hofer, 2001, 2008, Hofer & Bendixen, 2012) developed through my own lived experiences of ELPaR and conceptualised to empower the personalised learning journey of instrumental/vocal musicians. In my model all activity is nested within an overarching iterative cycle of critical reflexion/reflection, within which four of my theoretical lenses, Collaborative Learning, Deliberate/Enjoyable Practice, Imagery, and 5E Cognitive Science (5ECS), imbricate to empower the personalised authoring of know-what through entangled processes involving exploration, experimentation, discovery, testing, feedback, and refinement. These four lenses are generative, ability-building modes; they build know-what, which feeds into the development and enactment of ‘know-how-in-action’, where heuristics developed in the know-what stage are deployed, both knowingly, with intent, and tacitly, through instinct, intuition, and feeling, to empower a state of flow.

In my model, all the lenses of my theoretical framework combine, like a kaleidoscope of interrelated activities, to develop, inform, and refine what van der Schyff, Schiavio, and Elliot describe as ‘the synthesis of the multimodal dimensions of experience (e.g., visual, auditory, bodily, spatial, emotional)’ (2022, p.66). For instrumentalists, these multimodal dimensions of experience include the skills of ‘perception, production, and interaction’ (Pearce & Rohrmeier, 2012)/‘perception, action, and attention’ (Clark, 2013)³¹, henceforth combined and referred to as PAPAPI (**P**erception, **A**ction, **P**roduction, **A**ttention, **P**rediction, **I**nteraction)³², within a ‘brain-body-world’ (Beer, 2000)³³; they are the skills utilised by musicians whilst engaging in simultaneous multimodal processes involving: *Doing; Reacting/Adapting/Interacting*³⁴; *Imagining; Planning; and Listening*³⁵. I have combined PAPAPI with the multimodal core processes and I show this newly synthesised rendering in the Venn diagram below. The full journey to this point is explored and explained in Chapter 2.5.

³¹ See Chapter 2.5.

³² See Chapter 2.5 to understand how I have synthesised the ideas of Schyff et al. (2022), Pearce & Rohrmeier (2012), and Clark (2013).

³³ See Chapter 2.6.

³⁴ I note the imbrication of ‘interaction’ in the skills of PAPAPI and the multimodal processes. This is further explored in Chapter 2.5.

³⁵ See Chapter 2.3.

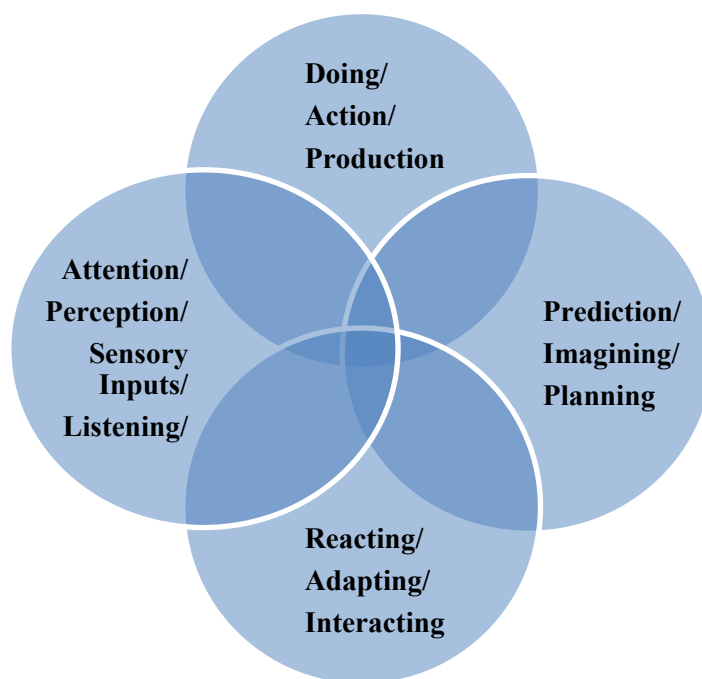


Figure 3: Synthesis of Multimodal Musical Cognitive Processes and PAPAPI Skills

In my model of developing know-what, critical reflexion/reflection need not necessarily take place in complementary writings. In his model of PaR, Nelson³⁶ suggests that complementary writings, which he lists as including written accounts of artistic processes, location in a lineage by way of a practice review, and a conceptual framework (2013, p.34), are a key part of the process of generating know-what through critical reflection. For musicians, I posit that know-what is most likely to be generated through instrument-in-hand critical reflexion, supported by critical reflection in the form of complementary writings; working instrument-in-hand, both independently and collaboratively, to develop 5ECS awareness of sensorimotor, kinaesthetic, and proprioceptive feedback combined with PAPAPI within a ‘brain-body-world’ (Beer, 2000) through acts of deliberate/enjoyable practice and collaborative learning. In addition, the literature shows that for most musicians and teachers this process often involves the use of visual, metaphorical, and linguistic imagery (Howard, 1982, Barten, 1992, Barten, 1998, Leech-Wilkinson & Prior, 2014). Wöllner and Williamon state that:

Musicians experience various forms of sensory feedback when practising and performing. By studying the extent to which musicians rely on such auditory, visual

³⁶ See Chapter 4.1.

and kinaesthetic information, insight can be gained (albeit indirectly) into the content and strength of their mental imagery for the music they play. (2007, abstract)

Issues regarding Wöllner and Williamon's 'various forms of sensory feedback when practising and performing' (2007, abstract) are explored throughout this chapter.

2.2 Critical Reflection: From Researcher Reflexion/Reflection to a Pedagogy of Reflective Learning

It is clear from the literature that reflection is a powerful tool for musical learning (Gaunt, 2016, Guillaumier, 2016, Carey et al., 2017, Georgii-Hemming et al., 2020). In reviewing literature on strategies for planning practice sessions, identified as a core and mostly solitary activity for all learners of musical instruments, Williamon states that 'the performer is alone, with his or her instrument, and must rely on personal skill to achieve progress throughout the practice session' (2004, p.85). In this context, Williamon identifies self-reflection and self-evaluation as key skills, and he references Galamian³⁷, who states that students should 'view practicing as a means of "self-teaching", where in the absence of the teacher, students must act as the teacher's deputy, assigning themselves definite tasks and supervising their own work' (Galamian, 2013, p.93).

Critical reflection, as a central feature of PaR, was not only a crucial element in my methods of inquiry, but also of the new pedagogy that I sought to offer learners. Firstly, I aimed to uncover new insights and generate new pedagogy via critical reflexion/reflection both within the one-to-one teaching studio, reflecting collaboratively with expert performer-teachers, and individually within my own practice studio; and secondly, I aimed to create research outputs that would empower learners to explore, discover, and critically reflect on what works (and does not work) for them, facilitating the process of becoming heuristic researchers³⁸ of their own practice as they develop know-what to know-how.

Throughout this investigation I engaged in processes of critical reflexion and critical reflection, and I invite learners to do the same. Here I outline how I differentiated between reflexion and reflection, the purpose of each, and how they might empower learner autonomy, exploration, and discovery. Drawing on definitions from the domain of Social Cognitive Neuroscience,

³⁷ Noted violin pedagogue whose students included Itzhak Perlman and Pinchas Zukerman.

³⁸ See Chapter 2.7.

where reflexion is called the ‘x-system’ and reflection is called the ‘c-system’, it is said that these two systems are:

instantiated in different parts of the brain, carry out different kinds of inferential operations, and are associated with different experiences. The X-system is a parallel processing, sub-symbolic, pattern-matching system that produces the continuous stream of consciousness that each of us experiences as “the world out there.” The C-system is a serial system that uses symbolic logic to produce the conscious thoughts that we experience as “reflections on” the stream of consciousness. While the X-system produces our ongoing experience of reality, the C-system reacts to the X-system. When problems arise in the X-system, the C-system attempts a remedy. (Lieberman, Gilbert, Gaunt & Trope, 2002, p.4)

Within my investigation I took the x-system to refer to the processes of critical reflexion involved in the discovery of know-what³⁹ that took place within my own practice as I engaged in learning-through-doing, flute-in-hand, with *The Entangled Web of Musical Learning*. In contrast, the c-system represented the processes of critical reflection involved in thinking, writing, and talking about my experiences, as seen through my theoretical lenses⁴⁰, acknowledging that writing ‘is a vital part of the research process’ (Kamler & Thomson, 2014, p.3). Healey, Vuori and Hodgkinson similarly differentiate ‘reflective (i.e., C-system) mental models formed through reasoning and deliberation from reflexive (i.e., X-system) representations that are more automatic, intuitive, and affective in nature (2015, abstract). Both reflexion and reflection were regular features of my one-to-one sessions with expert performer-teachers, instigated by flute-in-hand activities and developed via an iterative learner-researcher/professional practitioner dialogue.

Writing as part of the research process includes a multitude of activities, listed by Kamler and Thomson (2014) as including: keeping notes, jotting down ideas, recording observations, summarising readings, transcribing interviews, and developing pieces of writing about specific aspects of the investigation. They further state that ‘these writings are not simply getting things down on paper, but are making meaning and advancing understandings through these various writings’ (2014, p.3). These various writings represent the complementary writings that Nelson identifies as a key part of critical reflection within PaR, and they entangle with instrument-in-

³⁹ ‘Know-what’ is a term coined by Robin Nelson, and refers to ‘knowing what ‘works’ and ‘teasing out the methods by which ‘what works’ is achieved’ (Nelson, 2013, p.44). It is a term examined in detail in Chapter 4.1.

⁴⁰ See Chapter 2.

hand reflexion-in-action to form what Nelson (2012) denotes ‘praxis’, which he describes as the imbrication of theory and practice.

Throughout my investigation I engaged in developing my own personal praxis with the intention of informing research outputs that might empower others to do the same. Having acknowledged Nelson’s (2012) ideas of critical reflection as a means of developing ‘doing-knowing’ and ‘know-what’, and Schön’s (1983) ideas of ‘knowledge-in-practice’ and ‘reflection-in/on/through-action’, I was drawn to how Coulson and Harvey had expanded these ideas further. They created a framework, not specifically for music learning, for scaffolding the processes involved in what they call ‘Reflection for Learning’, designating four phases, as shown in the illustration below.

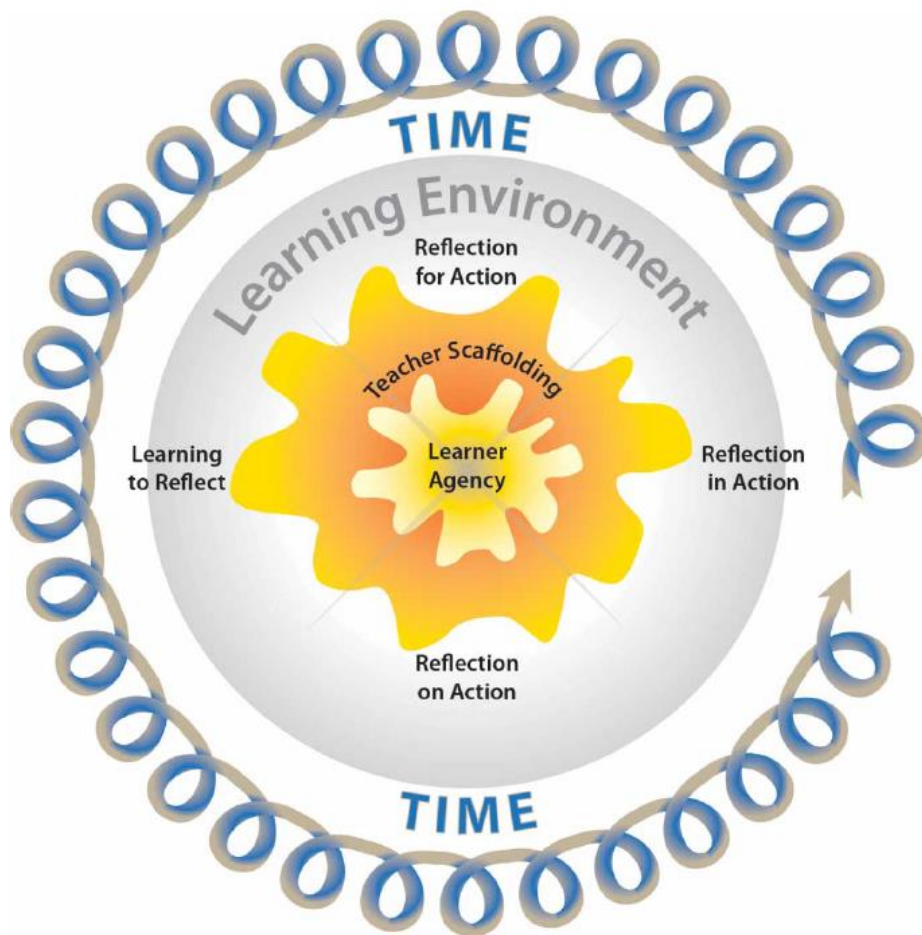


Figure 4: ‘Reflection for Learning’

(Coulson & Harvey, 2013, p.405)

According to Coulson and Harvey, *Reflection for Learning* is an ongoing process ‘that may occur at any or all points prior to, during and after the (learning) experience’ (2013, p.404); ‘Reflection for Action’ takes place beforehand, ‘Reflection in Action’ takes place during, and ‘Reflection on Action’ takes place after an act or experience designed to aid learning.

In musical instrument learning, acts that are designed to aid learning include one-to-one lessons, practice sessions, rehearsals, and attending masterclasses. For learners, I see *Reflection for Learning* as representing an interactive cycle of:

(1) Reflection for Action = planning and goal setting, which may be learner-led or may involve learner-teacher collaboration.

(2) ~~Reflection~~ *Reflexion*⁴¹ in Action = may occur at any time when working instrument-in-hand, including during individual practice sessions, in collaboration with teachers in the one-to-one teaching studio, and during rehearsals and performances. *Reflexion* in Action may involve feedback from aspects of 5ECS, such as embodied/enactive sensorimotor, kinaesthetic, and proprioceptive awareness, combined with PAPAPI within a situated ‘brain-body-world’ (Beer, 2000) context, and leads to the formation of know-what to know-how.

(3) Reflection on Action = thinking, talking, and writing about the results of having acted. This process might include making notes or keeping a journal, analysing audio recordings or video footage of practice sessions, lessons, or performances, discussion with teachers/peers/audience about what went well and next steps for development. This stage will sometimes inform the setting of new goals, returning us to Reflection for Action and hence the iterative nature of this cycle.

Reflecting on Coulson and Harvey’s schema above, I was confused by the anticlockwise direction of the arrow. In my model, as described above, working from 12 o’clock to 6 o’clock, the arrow in the schema should move in a clockwise direction, although as reflection may take place at any point in the cycle, reflection-for-action need not always be positioned at the 12 o’clock starting point as it is not always the planning that takes place first. Indeed, planning might often be the result of deficiencies identified during *reflexion*-in-action and reflection-on-action, although this is not an issue which Coulson and Harvey address. I have adapted Coulson and Harvey’s schema below to reflect a more entangled reality, inserting arrows in both directions, clockwise and anticlockwise, and additional arrows that show other possible sequences of events, and I recommend imagining the schema as a wheel where the 12 o’clock

⁴¹ Researcher edit.

point might be occupied by any stage of the process; my adapted model offers a more realistic schema for the entangled way in which musical reflection works in practice.

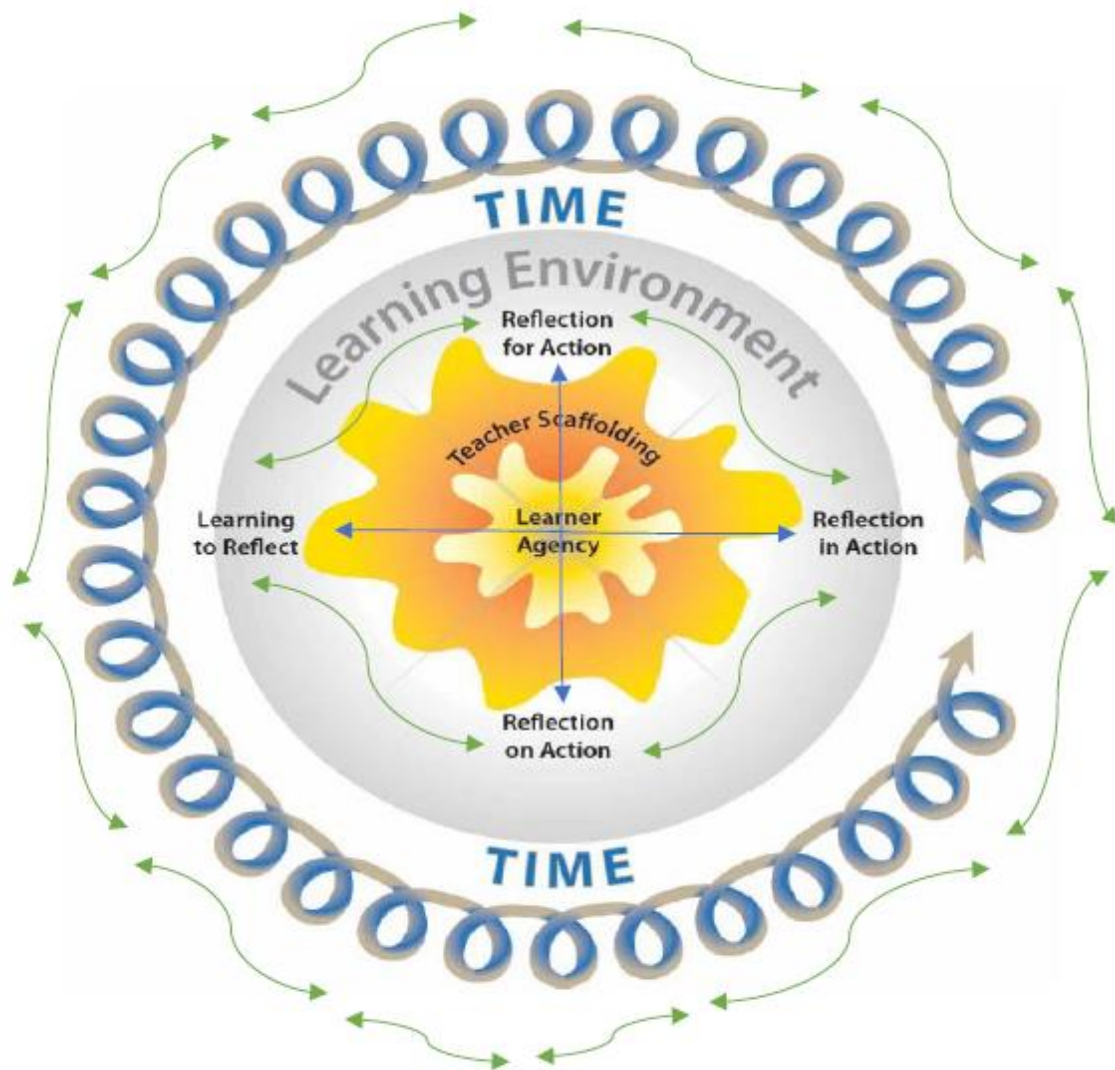


Figure 5: Adapted model of Coulson and Harvey's 'Reflection for Learning'

(Coulson & Harvey, 2013, p.405)

The efficacy of reflective practice as a learning tool is well documented, but it was suggested to me privately by a conservatoire-based academic that it is often not embedded at curriculum level because it is neither time nor cost effective. This led me to search for examples, in tertiary music education, of courses or modules where reflective practice is both embedded and assessed. One example where undergraduate courses in both popular and classical music

performance have an ongoing and assessed component can be found at the University of Liverpool. Esslin-Peard, Shorrocks and Welch state that:

This university is unique in assessing students not only through performance, worth 70% of the marks, but also by requiring them to write a reflective essay, based on a practice diary, about their experiences of practice and performance, which is worth 30% of the marks. (Esslin-Peard et al., 2016, p.96)

In a research project analysing the data contained in 141 students' reflective essays, Esslin-Peard et al. suggest that 'reflection as an integral part of assessment promotes musical learning and the development of metacognitive practice strategies' (Esslin-Peard et al., 2016, p.95).

Written reflective tasks that include reflective journals, diaries, and essays can also be found embedded in courses at other tertiary institutions. Carey, Harrison and Dwyer (2017) investigated journaling as one possible way to encourage reflective practice in conservatoire students. In their study, students' journal responses revealed three main themes: 'the development of student autonomy; a sense of shared responsibility and collaboration; and increased clarity and confidence in the direction of their learning' (Carey et al., 2017, abstract). They list additional benefits as increased student independence and motivation, and a fuelling of student-teacher dialogue that prompts deeper levels of reflection. These findings suggest that journaling can be an effective reflective tool, but I was left wondering where other examples of embedded and assessed examples of reflective practices are to be found within curricula at an institutional level.

Many academics argue for the benefits of increased reflective practices in conservatoire education. For example, Gaunt links reflective practice to lifelong learning, stating that 'many of the best artists are highly reflective, and growing evidence suggests that these practices are central to sustained career development' (2016, p.273); Georgii-Hemming, Johansson and Moberg describe reflective practice 'as a method for professional growth and lasting learning outcomes' (2020, abstract); and Guillaumier states that 'reflection is given pride of place within our curricula' and that a Royal Conservatoire of Scotland (RCS) graduate 'should be an excellent and reflective arts practitioner who leads, creates, achieves and innovates', further stating that 'reflection is considered essential for the growth and personal development of an artist, and indispensable in helping students plan their artistic trajectory. It enables them to map their development within an ever-shifting landscape' (2016, p.354).

I searched (in August 2023) the websites of all the main UK conservatoires to investigate the prominence given to reflective practices within their course descriptions. I found that the Royal Scottish Conservatoire (RCS) was the only conservatoire that specifically details, in their online course descriptions, reflective components to courses that are assessed. Examples found on the RCS website (<https://www.rcs.ac.uk>) include: the ‘Introduction to Opera Directing – Credit Rated Summer School’ course, for which ‘learning throughout the module is supporting by a structured reflective report that itself forms part of the assessment for the module’; the BA Production Technology and Management undergraduate degree description, which states that ‘reflective blogs and summary statements form a key component of assessment in Personal and Professional Development modules’; and all of the MMUS courses, which refer to a ‘portfolio of documentation and reflective writing that interrogates a self-chosen research focus and communicates your findings’. This internet search, whilst admittedly limited in scope, does seem to support Guillaumier’s assertions regarding reflection within the RSC curricula, and demonstrates that some conservatoires are beginning to highlight the importance of reflective practice. It may be that other UK conservatoire courses do require reflective practices that are both embedded within their curricula and assessed, but I found no evidence of this. I would like to see the status of these practices raised and explicitly stated in online course/module descriptions.

I also note that what evidence I did find of reflective practices within conservatoire curricula referred solely to written work, akin to Nelson’s complementary writings, but none reference the reflexive practices that take place instrument-in hand that I detail in this thesis as part of my ELPaR. In my thesis acts of critical reflexion and reflection imbricate; they iteratively inform each other and create a nest in which the other lenses of my theoretical framework can operate. The current view of reflective practices as writing-based seems to be missing important learning opportunities.

2.3 From Effortful to Effortless: A Learning Journey

Henceforth in this chapter I explore the issues involved in empowering the learner to move from the effortful practice of often challenging tasks towards a less effortful target state of easy spontaneity and intuitive expertise. I examine each of my theoretical lenses and relate the issues they raise to my own lived experiences of ELPaR to draw out ways in which my experiences and understanding of each lens might be of use to others in informing the development of new approaches to instrumental pedagogy. The remainder of this chapter is intended to deepen understanding of the rationale behind *The Entangled Web of Musical Learning*.

Music-making is a composite performative act that requires many cognitive processes, of both body and mind, to take place simultaneously. These simultaneous processes are akin to the already cited ‘synthesis of the multimodal dimensions of experience’ (van der Schyff et al., 2022, p.66) and they involve the skills of PAPAPI.

With the intention of not over-complicating pedagogy from the instrumental learner/teacher perspective I reduce these core processes into five headings, noting that with ‘interaction’ we already begin to see an overlap within these skills and processes:

1. Doing;
2. Reacting/Adapting/Interacting;
3. Imagining;
4. Planning; and
5. Listening.

Informed by my ELPaR I provide here an overview of how I conceive these five core cognitive processes, highlighting where they imbricate with PAPAPI.

Five Core Cognitive Musical Processes

Doing

Doing is perhaps the most important element of musical performance and musical learning. In performance, it is the act of producing that connects the performers, composer, and audience together, and all performance-related musical cognition informs the *doing* part of making music. Learners engage with *The Entangled Web of Musical Learning* to generate know-what that empowers their abilities to *do*, and elite musicians engage in heightened forms of enacting know-how. The act of *doing* is informed and affected by the other processes (Reacting/Adapting/ Interacting, Imagining, Planning; Listening) and it combines PAPAPI with the multimodal dimensions of experience proposed by van der Schyff et al. (2022). Developing knowing-doing in the form of know-what to know-how requires perceptual skills that inform planning and imagining and train automated, easy motor control to empower ‘Reacting/Adapting/Interacting’.

Listening

Listening is primarily a skill of perception and awareness. It requires precise monitoring of sonic outputs on both an individual and collective level, which will often prompt and inform Reacting/Adapting/Interacting and Imagining, thereby affecting *doing*. Upon hearing, in-the-

moment, the performer uses the auditory feedback to know/inform/intuit/feel what to do next. For the learner, listening is crucial to understanding the impact of the other cognitive processes and can inform the entangled web of all my theoretical lenses as they generate know-what that informs the development of know-how.

Reacting/Adapting/Interacting

For the musician to react/adapt/interact they must first *perceive*, and multimodal dimensions of perception are required in both learning and performing, which include the player:

1. Perceiving their own physical actions through kinaesthetic and proprioceptive feedback, and relating this feedback to its impact on the sounds they make. This might inform in-the-moment reacting/adapting/interacting in performance, and/or reflection for/in/on action in the practice room.
2. Perceiving sensory/auditory feedback from the instrument.
3. Perceiving their own sound as they create it and relating it to the imagined sounds that they intended to make. If the two do not match, reacting/adapting might be prompted in the moment or inform the planning of future practice objectives.
4. Perceiving the sound of others and reacting/adapting/interacting accordingly.
5. Perceiving the audience and reacting/adapting/interacting accordingly.
6. Perceiving the effect of the acoustic and reacting/adapting according.

Imagining

Imagining music encompasses many possible cognitive activities. Many writers talk of the importance of ‘inner hearing’ in creating an internal, mental representation of music. The inner ear is particularly valued as a means of knowing how notation sounds, via mental representation, without having to play or hear it out loud, and is often conceived as an activity that takes place away from the instrument. Covington states that the mental hearing of music allows performers to work out phrasing, tempos, shading, and ‘to rehearse nuances of style, unimpeded by the instrument’ (2005, p.25). She further states that Glenn Gould, Vladimir Horowitz and Anton Rubenstein all depended on mental practice and that ‘mental rehearsal is advocated by teachers and researchers’ (2005, p.26).

Imagining can also encompass physical cognition, where imagining the musical intention is melded with imagining how to physically realise it. This might involve a feedback loop, with inner hearing, heuristic know-how-in-action, sensorimotor and auditory feedback, all entangling to feed the imagining of sounds yet to be created. Vernon Howard ‘distinguishes

between forming an image and doing something with imagination. The latter he terms heuristic imagination⁴², which he describes as forming an image by partial means of which the task is carried out' (Barten, 1992, p.55).

Planning

Planning involves actively addressing intentions. Coulson and Harvey's concept of *Learning to Reflect* (2013) can support planning, especially the reflection-for-action stage of their process. Planning can be used to address issues, problems, and deficiencies, but also creative and artistic intentions. Planning is particularly important in the learning stages of instrumental playing, but in some circumstances may be gradually superseded by intuitive, automated, spontaneous expert know-how-in-action as expertise grows.

I posit advanced instrumental learning as a process that involves developing the ability to simultaneously deploy the skills of PAPAPI, whilst engaging in the five core cognitive processes, in a creative and spontaneous manner that aims to become, over time, automated, effortless, in-the-moment and often intuitive; until these skills become easy, through hours of Deliberate Practice⁴³ and experiential application, they remain effortful and therefore difficult to do all at once. The noted psychologist Kahneman states that 'it is the mark of effortful activities that they interfere with each other, which is why it is difficult or impossible to conduct several at once'; he adds, 'you can do several things at once, but only if they are easy and undemanding' (2011, p.23). Implicit here is that the learner needs to work towards making all the core cognitive processes involved in playing an instrument and performing music easy and undemanding, which then releases capacity for exercising and synthesising multimodal, higher order cognitive skills, as illustrated in my *Synthesis of Multimodal Musical Cognitive Processes and PAPAPI Skills*⁴⁴.

2.4 Achieving a State of 'Flow'

During the course of this investigation, working with a group of expert performer-teachers, I was required to learn new ways of doing things and to master new skills. I then wanted to integrate my new skills into the existing whole of my practice and to deploy them simultaneously and in synchronicity with other, already existing skills. I found that working towards being able to simultaneously deploy a variety of (often new) skills in a controlled,

⁴² See Chapter 2.7 for information relating to heuristics and imagery.

⁴³ See Chapter 2.9.

⁴⁴ See Chapter 2.5.

effortless, spontaneous, in-the-moment, intuitive way requires a mode of working where I am immersed in deep concentration, with a total focus and awareness of: what I am trying to produce (i.e., imagining how I want to sound); what I am doing physically moment-to-moment (which often entails kinaesthetic and proprioceptive awareness of and feedback from micro adjustments that are barely perceptible); feedback from the instrument; and what I actually hear (aural feedback), or expect to hear. This deep state of focus and awareness was first described by the psychologist Mihalyi Csikszentmihalyi in the 1970s as the ‘flow experience’ (Csikszentmihalyi, 2014, p.132)

Csikszentmihalyi describes ‘flow’ as an ‘optimal experience’, which is ‘characterized by complete absorption in what one does’ (Nakamura & Csikszentmihalyi, 2014, p.89), and his work investigated how a state of flow can have a positive effect on both learning and motivation. If pedagogy can enable students to achieve/work towards achieving a state of flow in their practice, the positive effects on both motivation and achievement will be evident. According to Csikszentmihalyi, the ‘conditions of the flow experience are’:

1. Goals Are Clear – One knows at every moment what one wants to do.
2. Feedback Is Immediate: One knows at every moment how well one is doing.
3. Skills Match Challenges – The opportunities in the environment are in balance with the person’s ability to act.
4. Concentration Is Deep – Attention is focused on the task at hand.
5. Problems Are Forgotten – Irrelevant stimuli are excluded from consciousness.
6. Control Is Possible – In principle, success is in one’s hands.
7. Self-Consciousness Disappears – One has a sense of transcending the limits of one’s ego.
8. The Sense of Time Is Altered – Usually it seems to pass much faster.
9. The Experience Becomes Autotelic – It is worth having for its own sake. (2014, p.133)

When in a state of flow there is a merging of action and awareness, a merging of mind and body. When flow is achieved, learners are said to be happy, enjoy learning, be intrinsically motivated to explore, and be autonomous, and learning is said to be fun, and rewarding (Csikszentmihalyi, 2014). Kahneman states that those who experience ‘flow’ describe it as ‘a state of effortless concentration so deep that they lose their sense of time, of themselves, of their problems’ (2011, p.40).

Flow theory is not without its critics, and in sports science in particular, questions have been raised. Swann, Piggott, Schweickle and Vella (2018) note a series of criticisms and anomalies

that they claim have been ‘overlooked, ignored, or disregarded to date’ (2018, p.8). They claim that some of Csikszentmihalyi’s terminology and definitions of flow dimensions are imprecise and open to interpretation, citing Kowal and Fortier (1999) critiquing the ambiguity of the individual flow characteristics, and Hoffman and Novak highlighting ‘a lack of consistency in operational definitions of flow used by different researchers’ (Hoffman & Novak, 2009, p.26). Furthermore, they differentiate between factors which may facilitate flow and factors which might be causal mechanisms.

Swann et al. (2018) state that whilst Csikszentmihalyi lists the conditions of flow, it is not clear how these conditions are achieved or met, nor how many of them are required to achieve a state of flow, or whether flow may still occur in their absence. They also question Csikszentmihalyi’s claim that flow is experienced universally, in the same way, across all domains.

Even Csikszentmihalyi himself acknowledges some of these issues, stating:

[N]o magic formula exists for creating flow. You cannot conjure it up by following a recipe or rigidly adhering to a series of steps. Although certain conditions must be present for flow to occur, their presence does not guarantee that flow will occur. (Csikszentmihalyi, Latter & Weinkauff Duranso, 2017, p.vi)

Notwithstanding the criticisms of flow theory, my experience as a teacher and performer has demonstrated to me that total immersion in a state of flow, whether in the process of learning and embedding new skills on an individual level, or whilst experiencing in-the-moment spontaneity when performing with others, can empower the (emerging) ability to do several things at once with (increasing) ease, as described by Kahneman above. The differences between solitary states of flow experienced on an individual level and collective states of group flow as experienced by teams, where tasks require interdependence and cooperation (Walker, 2010, Sawyer, 2015), are well documented. Walker states that ‘In highly interdependent situations, people may serve as agents of flow for each other. This form of social flow is mutual and reciprocal, a form that is likely to be qualitatively different than solitary flow’ (2010, p.4). I posit that individual flow is more likely to be experienced by learners in their practice space whilst developing know-what and embedding their own personalised know-how heuristics, which they can then deploy in collective flow situations rehearsing and performing with others. For the learner, flow represents a state of heightened awareness where a variety of perceptual feedbacks can be recognised and utilised to inform decisions that fuel improvement. For the performer, flow represents the ability to be totally immersed in making music, attending to

both what we are hearing and what we are doing, moment-to-moment, in an effortless, spontaneous, and intuitive manner. Kahneman refers to this as a ‘state of effortless attending’ (2011, p.40). For me, flow is a characteristic state of self-directed learning that empowers autonomy and motivation, and when learners manage to ‘lose their sense of time, of themselves, of their problems’ (Kahneman, 2011, p.40) in their practice space, this is a force for good. I further posit that flow is a likely necessary ingredient for musicians who might be designated as ‘expert’⁴⁵ or ‘elite’⁴⁶ (Ericsson, 1993), and as such, flow represents a high aspirational goal for pedagogy.

2.5 ‘PAPAPI’ and the ‘multimodal dimensions of experience’: A Synthesis of Multimodal Musical Cognitive Processes and Skills

In order to develop new approaches to instrumental pedagogy it is necessary to understand the forces at work that empower ‘flow’. This starts with understanding the multiple cognitive processes at work when developing high level musical skills. I have researched current academic thinking that might inform the development of musical ‘know-how’, and I have been drawn to work that seeks to unify ideas relating to ‘embodied and enactive cognition’⁴⁷ with ideas relating to the ‘predictive brain’ (Clark 2013, Kirchoff 2018). According to both Clark and Kirchoff these are ideas that are often presented as being in opposition, but both have sought to reconcile these ideas and demonstrate that they can occupy common ground and represent cognitive processes that might coexist and be complementary. Based on my own lived experience, I believe that musicians employ embodied, enactive, and predictive cognition simultaneously and that instrumental learners likewise employ these same cognitive processes when engaging with *The Entangled Web of Musical Learning*⁴⁸.

In common with van der Schyff et al. (2022), Malinin (2019), and Clark (2013), I argue that musical learning encompasses a melded cognition of both the mind and the body, rejecting any suggestion of duality, as well as cognition informed by the physical, social, and cultural environments in which learning and performing take place. Some musical and aesthetic decisions might originate in the brain, informed by propositional knowledge of issues relating to genre, composer, tradition, etc., whilst others might originate or be led by bodily cognition,

⁴⁵ See Chapter 2.3 for a detailed consideration of what constitutes expertise.

⁴⁶ See Chapter 2.8 for Ericsson’s definition of ‘elite performers’.

⁴⁷ See Chapter 2.6 to for information on embodied and enactive cognition.

⁴⁸ See page 39, Fig. 1 for schema).

informed by embodied (proprioceptive, kinaesthetic, trained muscle memory, etc.), extended (the instrument as artifact or tool), or situated (the performance space, acoustics, the other musicians, the audience, etc.) cognition, all of which become familiar through years of deliberate practice and practical experience. This feeds predictive cognitive processes based on imagining, training (e.g., muscle memory), experience, expectation, and in-the-moment feedback.

In arguing for a ‘unified science of mind and action’ or a ‘unifying model of perception and action’ Clark states that ‘brains...are essentially prediction machines...that support perception and action by constantly attempting to match incoming sensory inputs with top-down expectations or predictions’ (2013, abstract). Clark explores a hierarchical model that brings ‘perception, action, and attention into a single unifying framework’ (2013, p.201), which he believes constitutes ‘the perfect explanatory partner...for recent approaches that stress the embodied, environmentally embedded dimensions of mind and reason’ (2013, p.201), thereby ‘confirming and extending the perspective known as “enactivist” cognitive science’ (2013, p.204), as posited by Di Paolo, 2009; Thompson, 2007; Varela et al., 1991. Clark recognises here how his thesis links with and supports various aspects of 4E cognitive science, explored in the next sub-chapter.

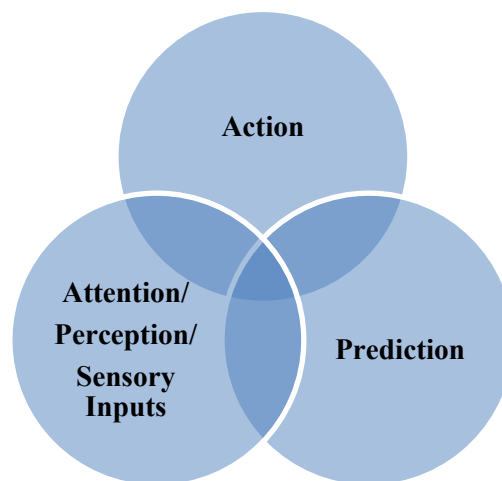
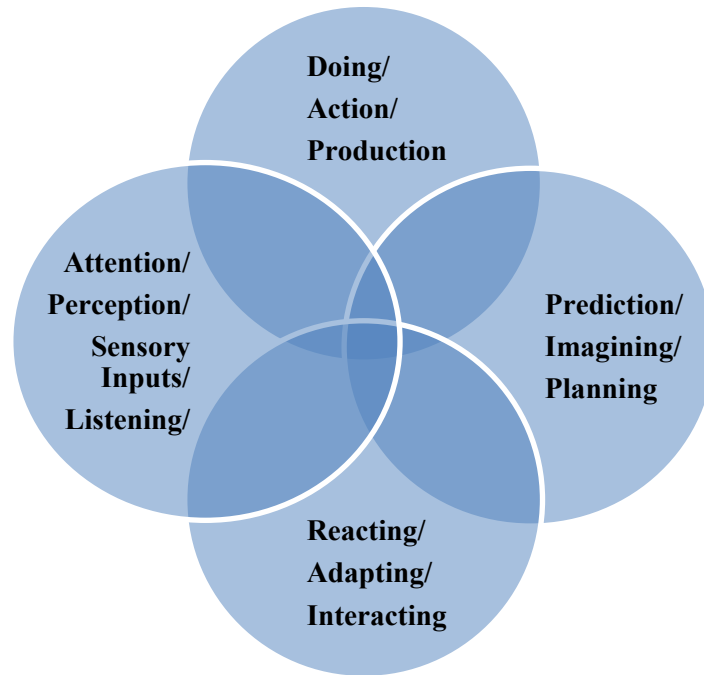


Figure 6: Author’s summation of Clarks’s ideas relating to ‘unifying model of perception and action’

Clark’s ideas, which I sum up in the Venn diagram above, represent what the musician is experiencing, in-the-moment, when practising and performing, through combined mind, body, and situated cognition. I have developed Clark’s ideas by synthesising it with Pearce and

Rohrmeier's (2012) similarly described skills of 'perception, production, and interaction' to propose a multimodal entangled skillset which I call PAPAPI (**P**erception, **A**ction, **P**roduction, **A**ttention, **P**rediction, **I**nteraction)⁴⁹. PAPAPI combines with my simplified learner/teacher facing version of the multimodal core processes⁵⁰, as informed by Schyff et al. (2022), and I show this newly synthesised rendering in the Venn diagram below.



Synthesis of Multimodal Musical Cognitive Processes and PAPAPI Skills

This newly synthesised schema aims to illustrate the simultaneously imbricating multimodal cognitive acts taking place, in-the-moment, when practising and performing, through combined mind, body, and situated cognition. As a musician and teacher, I instinctively ascribe primacy to 'doing, action and production', which in my mind is the realisation and enactment of musical cognition, but I acknowledge that there is a 'chicken and egg' element to this issue, and others might ascribe heightened importance elsewhere. For example, for the philosopher Alva Noë, 'perceiving is a way of acting. Perception...is something we do' (2006, p.1). He posits perceiving as 'a kind of skillful bodily activity' (2006, p.2), constituted by our possession of sensorimotor knowledge, and he therefore places perception as the driver of action. Noë's ideas clearly foreshadow Clark's (2013) thesis of 'perception, action and attention'. Acknowledging the 'chicken and egg' element here, where any of the cognitive processes or skills might take

⁴⁹ See Chapter 2.5.

⁵⁰ *Doing; Reacting/Adapting/Interacting, Imagining; Planning; Listening*, as described in Chapter 2.3.

the lead in any specific given moment, it is important to note that this Venn diagram schema is non-hierarchical, and any of the processes or skills may act as a catalyst for enaction.

Discussion of Noë's concept of 'skillful bodily activity' leads me now to explore embodied cognition. Malinin references Thompson and Varela (2001) and Chemero (2009) when she states that 'the notion that cognition may be "radically" embodied has been at the forefront of cognitive science debate since the early 21st century' (Malinin, 2019, p.1). The idea of embodied cognition resonates with my lived experience; the notion of embodiment has long been a part of my own instrumental practice as a musician and teacher, and Malinin's assertion that 'the body plays a role in shaping perception and cognition' (2019, p.2) is something that I recognise in my own practice.

2.6 More Than Embodied: 4E Cognitive Science (4ECS) and Musical Learning

In considering the evolution of cognition from a 4ECS perspective, Louise Barrett starts by stating:

How and why cognition evolved depends on what one thinks cognition is. The classic definition by Neisser (1967) identified cognition as the processes by which sensory inputs are transformed, manipulated, augmented and used to give rise to motor outputs, with the implicit assuming that these processes took place solely in the brain. (Barrett, 2018, p.1)

Up until the final assumption that 'these processes took place solely in the brain' Neisser seems to foresee the advent of 4ECS, whilst also describing the processes of musical cognition that I have outlined under Clark's vision of a 'unified science of mind and action' or a 'unifying model of perception and action'. Clark was clearly building on Neisser's ideas regarding sensory inputs leading to motor outputs, but the big shift in thinking was the move away from the idea that cognition happens solely in the brain.

For musicians, Neisser's sensory inputs leading to motor outputs is not the whole story, as motor outputs are ultimately transformed, via the synthesis of the multimodal cognitive processes already discussed, into sonic outputs. Sensory inputs and motor outputs, as posited by Neisser, are two of the cognitive processes that facilitate musical learning and performance, but understanding of cognition has come a long way since 1967, and Neisser's ideas now need to be viewed within a much more complex and nuanced multimodal whole.

4ECS has developed during the last thirty years as a rejection of traditional, brain-based, computational views of cognition, asserting that ‘brains cannot be divorced from their bodily and environmental contexts’ (Barrett, 2018, p.2). Ideas of embodied cognition bring ‘mind, body and world together by reconfiguring representations as controllers of action (“action-oriented representations”), rather than the abstract, action-neutral ‘mirrors’ of the world favoured by the classical cognitivist position’ (Barrett, 2018, p.9).

4ECS focusses on cognition captured under four headings: ‘embodied, embedded, extended and enactive’, in contrast to the computational model of cognition which is ‘rational, cerebral, isolated and self-sufficient’ (Claxton, 2021, p.112). I here offer an overview of the 4Es, and extend them to add a fifth (as suggested by Claxton, 2021):

Embodied cognition: Embodied cognition asserts that the physical body is ‘integral to our intelligence’ and that cognition is not merely the realm of the mind and the brain. According to Malinin, ‘Embodiment refers to how the body contributes to cognitive process and is based on the premise that the brain and body evolved together and are therefore intrinsically coupled’ (2019, p.2). It suggests a cognitive system that includes the brain, the nervous system, and sensorimotor capabilities (Gallagher, 2015), rejecting the Cartesian separation of mind and body as artificial; muscles and sinews enable us to coordinate our actions, whilst seeing and hearing enable us to interact with the world around us (Claxton, 2021). Claxton states that there is evidence ‘that even our loftiest thoughts and most abstract concepts...are grounded in the physical, sensory, mobile, motivated realities of our lives’ and that ‘traditional, disembodied education looks sterile and out of touch’ (2021, p.113).

4E instrumental pedagogy, as envisioned by Schiavio, Nijs, van der Schyff & Juntunen (2020), supports ‘flexible ways of learning that take advantage of various resources a bodily approach can offer’ (Schiavio et al., 2020, p.2), and learning to control what they describe as the ‘moment-to-moment dynamics of bodily activity’ (2020, p.2) is an integral element of my approach to heuristic learning⁵¹. Schiavio et al. state that ‘many scholars argue that aspects pertaining to body and action, which emerge and develop in the concrete, moment-to-moment dynamics of a music lesson, play a fundamental role in driving meaningful teaching and learning’ (2020, p.1). This type of experiential pedagogy is heuristic in nature, and ‘can inspire important insights concerning how meaning is generated and transformed during musical practice’ (2020, p.1).

⁵¹ See Chapter 2.7.

Enactive cognition: Claxton (2021) states that thinking, reasoning, and recalling facts are secondary acts of cognition, and that the primary purpose of enactive cognition is to do things; to act, to achieve complex movements, to be competent, and to get things done. I have already outlined how Clark believes that his ideas regarding perception, action, and attention confirm and extend previous ideas of enactivism. Malinin likewise writes of the ‘intertwined processes of acting and perceiving’ (Malinin, 2019, p.3) and how this interaction can reveal new opportunities for subsequent actions, stating that ‘creative professionals develop a repertoire of actions as part of their practice, using them to initiate and sustain improvisational and adaptive interactions toward finding meaning in a creative situation’ (2019, p.3).

According to Claxton, explicit knowledge, including ‘reasoning, thinking and discussing...are what we need to fall back on when our accumulated expertise is found wanting’ (2021, p.113). Enactive cognition forms part of a ‘brain-body-world system’⁵² (Beer, 2000) that acknowledges the ‘interrelation between physical and conceptual approaches’ (Nelson, 2013, p.57) in the development of skills, or what Nelson terms ‘know-what’. This rendering of enactive cognition correlates with the idea of ‘know-what’ to ‘know-how’, which is a central feature of the PaR methodology⁵³ used in this investigation, and a central objective for learners engaging with *The Entangled Web of Musical Learning*.

Extended cognition: Extended cognition posits a link between agent and artifact, suggesting that artifacts (including media and technologies) couple with embodied brains (Sutton, 2010) and can play a significant role in creative cognition. Extended cognition recognises that humans have invented, and continue to invent, an array of tools that form an ‘integral part of our cognition’ (Claxton, 2021, p.115). For example, ‘our mobile phones and tablets become such an immediate, integral part of our cognition that to break or lose a smart device can feel like having a mini-stroke’ (Claxton, 2021, p.115). Extended cognition recognises the importance and necessity of integrating these ‘cognitive tools’ and ‘clever technologies’ into the learning process. Claxton further writes that ‘our intelligent actions are accomplished not just by our brain-minds but also by the array of instruments with which we surround ourselves’, adding that ‘we shape our tools and rooms and thereafter they shape us’ (2021, p.117). The link between musician as agent and musical instrument as artifact within this idea of extended cognition is, I believe, self-evident, and as a musician I am constantly aware of my instrument

⁵² See ‘embedded cognition’.

⁵³ See Chapter 4.

as a cognitive tool providing perceptual feedback that prompts, informs and modifies in-the-moment ‘cognition that leads to competent action in the world’ (Sterelny 2010, p.465).

Embedded cognition: Embedded cognition supposes that as individuals we are embedded within the constraints of an inhabited social-cultural-material world, and that this world forms part of a ‘brain-body-world system’ (Beer, 2000) which situates our practice, and within which we perceive ‘opportunities for action’ which ‘depend upon the unique bodily capabilities of the actor’ (Malinin, 2019). Schiavio and van der Schyff assert that ‘if the body plays a key role in determining musical learning, so does the socio-material and cultural environment in which it is embedded’ (2018, p.14). Claxton references the writing of John Donne to state that ‘No person is an island, entire of her - or himself. Everyone is “a piece of the continent, a part of the main’ (Claxton, 2021, p.114) and traditional education has not taken into account how we connect to ‘our physical and social surroundings’ (Claxton, 2021, p.114). Thus, embedded cognition argues that nobody exists in an isolated vacuum, and how we interconnect and interact with each other and with our environment, within social and cultural norms and boundaries, constantly alters how we process and acquire knowledge and understanding by altering how we think, experience, and feel.

Claxton has taken the 4Es and added more, of which I believe ‘Entangled’ forms a crucial fifth ingredient in musical cognition, and needs to be understood when developing thinking about music pedagogy.

Entangled cognition: According to Claxton, ‘Entangled means that perception, action, motivation, memory and thinking are all tightly woven together’ (2021, p.113), which reflects Clark’s ‘unifying model of perception and action’ and Csikszentmihalyi’s thesis of flow. Instead of conceiving that the mind processes information in a linear and sequenced order, such as ‘Input → Perception → Interpretation → Memory + Thinking → Decision → Action → Output’ (Claxton, 2021, p.113), entangled suggests that many of these activities happen simultaneously or overlap. In Chapter 2.3, I offered Kahneman’s explanation of how these simultaneous activities need to be effortless to be achievable, and how effortless ease can lead to a state of flow, where there is a merging of action and awareness. I also outlined in the introduction to this chapter the existence of a similar non-linear process within my own practice, explaining that my PaR methodology of exploring, experimenting, discovering, testing, and refining expert ideas was also an entangled, iterative process.

Claxton states that where once ‘Perception and Action were seen as separate ‘departments’ at opposite ends of the conveyor belt, with ‘the intelligent bit’ - memory and thinking -

somewhere in between’, entangled suggests that ‘all the different departments are talking to each other (simultaneously), so that, in an instant, what we see is infused with a sense of what we want or need to do and what affordances for action are available’ (2021, pp. 113-114). In this scenario Claxton states that ‘a short-list of possible courses of action is being drawn up way before we have finished interpreting the scene before us’ (2021, p.114) as the brain weaves together and reconciles, often at lightning speed, all these contributory factors. This view of entangled, simultaneous cognitive processes occurring at lightning speed resonates with Leech-Wilkinson and Prior’s description of heuristics as ‘short-cuts based on experience that solve problems too complex to resolve quickly enough using analytical thought’ (2014, p.6)⁵⁴. My ELPaR has shown me that heuristics offer the possibility to empower adaptive and dynamic ways of acting/enacting within an entangled whole by developing an instinctive knowing-doing that can be learned, honed, and refined through deliberate practice and be intuitively deployed in-the-moment, at lightning speed.

Connections between 4ECS and musical learning have been explored in the recent music education research of Schiavio and van der Schyff. In beginning to consider how 4ECS might inform musical development and music pedagogy Schiavio and van der Schyff employ 4ECS as a lens through which to ask ‘how the cognitive processes involved in the acquisition of musical skills might be understood’ (2018, abstract). These authors’ view of 4ECS, within the domain of instrumental pedagogy, rejects, like Gallagher, the Cartesian separation of mind and body in favour of a more holistic, combined mind-body-environment cognition, that enables performance decisions that they describe as a form of ‘skilled coping’, that are non-reflective, situated and enable an in-the-moment ability to adapt (Schiavio & van der Schyff, 2018, p.6).

Here we further perceive the multimodal dimensions of cognition relevant to musical learning and performing, and the entangled web in which they operate; a web that is: ‘brain-body-world’ based (Beer, 2000); encompasses the 4Es (now 5Es in my thesis); acknowledges and works toward the need for each act within the entangled whole to become ‘effortless’ (Kahneman, 2011) in order to be easily achievable simultaneously; involves PAPAPI, and ultimately empowers a state of ‘flow’ (Csikszentmihalyi, 2014). Thompson and Varela confirm that ‘understanding the complex interplay of brain, body and world requires the tools and methods of nonlinear dynamical systems⁵⁵...that cut across the brain–body–world divisions’ (Thompson & Varela, 2001, p.418).

⁵⁴ Leech-Wilkinson & Prior’s ideas relating to heuristics are discussed in Chapter 2.7.

⁵⁵ I have not used Dynamical Systems Theory as a lens in this inquiry, but I acknowledge it as a way of viewing many of the multimodal issues about which this investigation is concerned.

With such an entangled web of cognition-in-action, I asked myself how we might empower learners so that all of this might become easy, spontaneous, intuitive, and automated, in a way that is responsive moment-to-moment and empowers flow and communication. This led me to ask whether heuristics might offer a practical solution for enabling the entangled web of multimodal cognition required for the development and deployment of musical skills, and equip students to enter a state of flow. Achieving the effortless, spontaneous, intuitive ‘flow experience’, in both the practice room and in performance, as theorised by Csikszentmihalyi (2014), seems to me to be the ultimate aim of any pedagogy that aims to facilitate high level musical skill development and acquisition.

2.7 Heuristics and Imagery

I am conscious that words can be subjective and can mean different things to different people. They are only partially capable of conveying concepts of sound, mapping actions, and communicating the kinaesthetic, proprioceptive, and aural experience. Tone colour expressed as metaphor, and the lack of clarity caused by an opaque and subjective use of language, is a theme that recurs at various points throughout this investigation. It informs a search for alternative ways to communicate ideas that are less open to misunderstanding, as well as a desire to empower learners to discover and author their own personally meaningful metaphors and imagery. My thesis posits that heuristics represent one way of moving away from subjective language and towards personally meaningful exploration and discovery.

There are differing views on heuristics and their efficacy. Kahneman is an originator of the Heuristics and Biases (HB) approach, which ‘favors a sceptical attitude toward expertise and expert judgment’ (Kahneman & Klein, 2009, p.517). On a basic level Kahneman gives a technical definition of heuristic as ‘a simple procedure that helps find adequate, though often imperfect, answers to difficult questions (2011, p.98). He describes heuristics as intuitive, imprecise, and error prone and highlights their potential for inappropriate application. Others describe heuristics as a method of problem solving whose results are plausible, provisional, useful, but often fallible (Polya, 1945), or like a ‘rule of thumb’ (Goldstein and Gigerenzer, 1999).

I want to stress that these are not the type of heuristics that I am advocating. The type of intuition that musicians need is not imprecise, error prone or fallible, but something skilled and reliable, built and honed through deliberate practice and experience. This type of heuristic fits an approach called Naturalistic Decision Making (NDM), which focusses on skilled intuitions, and of which Gary Klein is a key proponent. Klein states that skilled ‘intuition depends on the

use of experience to recognize key patterns that indicate the dynamics of the situation' (1998, p.33). For Klein, a key part of expert intuition is recognition, which for me encompasses much of what Clark calls 'perception'. Klein further states that 'because patterns can be subtle, people often cannot describe what they noticed, or how they judged a situation as typical or atypical' (1998, p.33), thereby highlighting the tacit nature of intuition, but adds that 'skilled decision makers know that they can depend on their intuition, but at the same time they may feel uncomfortable trusting a source of power that seems so accidental' (1998, p.33). This tacit knowledge might be considered akin to Polanyi's concept of connoisseurship, which Ebitz describes as 'a skill that works its results in practice...within a context' (1988, p.209); a skill that involves 'tacit knowledge of how to do something, a cognitive skill that can only be acquired by guided practice and a process of trial and error' (Klein, 1998, p.209).

Musicians need to reach a operational state where they can be totally trusting of their intuitive powers in order to occupy an unencumbered state of flow, and this trust is embedded over years of deliberate practice, described by Kahneman as 'skill and expertise acquired by repeated experience' (2011, p.185) and by Ebitz as skill that is 'acquired by guided practice and a process of trial and error' (1988, p.209), and that manifests once mastered as heuristic. Kahneman states that 'the acquisition of expertise in complex tasks...is intricate and slow because...it is not a single skill but rather a large collection of miniskills' (2011, p.238). Nothing about this process is accidental; it is the result of insightful teaching and feedback combined with hours of deliberate practice and situated experience over a prolonged time period. Kahneman states that developing 'intuitive expertise depends...on the quality and speed of feedback, as well as on sufficient opportunity to practice' (2011, p.241).

Csikszentmihalyi's concept of flow and Kahneman's 'skill and expertise acquired by repeated experience' both resonate with Leech-Wilkinson and Prior's previously cited observations about the performer using heuristics that represent 'short-cuts based on experience that solve problems too complex to resolve quickly enough using analytical thought' (2014, p.6). They state that performers imagine how the next sound should feel, tacitly using their experiential knowledge to generate a sound that feels that way. These decisions and processes, spontaneous and in the moment, are too fast to be made via analytical thought processes and Leech-Wilkinson and Prior say that 'managing this through feelings is much faster than through thought, and...enables expressive, as opposed to mechanical, musical performance' (2014, p.7).

From a pedagogical standpoint, it seems reasonable to suggest that instrumental teaching should aim to empower students to develop the heuristics required to make spontaneous, non-mechanical, in-the-moment musical decisions in performance. There are commonalities here between my rendering of heuristics and Susan Hallam's concept of 'automation' in musical learning and performance. Hallam makes the connection between automation of skills and increased levels of musical expertise (Hallam & Himonides, 2022), which is similar to how I see heuristics functioning. In my thesis, the heuristic first serves to train the automation; for example, a heuristic might begin as an image conceived to develop the ability to consistently recreate a particular physical action or tonal quality. Once trained and embedded, heuristics can be employed to instigate and empower automated abilities, acting as a shortcut (Leech-Wilkinson & Prior, 2014) to prompt multimodal cognitive processes. Heuristics act as a key or a catalyst to quickly unlock and empower physical or creative intentions that have become embedded through deliberate practice. One key difference between heuristics and automation as I see them is that automation implies repeating a process in a mechanical manner to achieve the same consistent results. Where I advocate automation, it is with the understanding that automated processes must be fluid, creative, and adaptive rather than a mechanism designed to reproduce similar outcomes. In contrast, heuristics can be applied spontaneously and creatively to achieve something different, in-the-moment, in every performance, even where other parameters (repertoire, venue, musical colleagues, etc.) might be the same; heuristics empower a live, expressive adaptability to changing circumstances and remove some of the difficulties involved in taking decisions and actions that are creative and fluid. Notwithstanding, little is written about the use of heuristics in instrumental pedagogy or how the music student might develop heuristics that empower them to perform and adapt spontaneously or in-the-moment.

My concept of heuristics shares many characteristics with 4ECS and PAPAPI, and aims to empower my *Synthesis of Multimodal Musical Cognitive Processes and Skills*⁵⁶. My heuristics are action-orientated, in-the-moment cognitive acts; they are often embodied, embedded, enactive, and entangled, and act as tools that facilitate access to and the deployment of the tacit knowledge that empowers enactive spontaneity via the ability to intuitively predict and act instinctively and in-the-moment within an entangled web of situated perception and action. It must be acknowledged, however, that musical heuristics are concerned with the fulfilment of an objective and, unlike 4ECS, do not need to be based in verifiable truth; if something works, if it is effective, then it is useful and valid (Mandolini, 2020). This is not the same as a heuristic that is imprecise, error prone or fallible. Whilst a heuristic might not be verifiable as true, or

⁵⁶ As discussed in Chapter 2.5.

represent a universal truth for everyone, its value is in its efficacy for the individual, which is one reason why discovering and developing personalised heuristics through exploration is so important.

Personalised heuristics are a concept developed by Lee Bach, who describes the ‘heuristic research model as a vehicle for acquisition of knowledge through the prism of the individual’ (2002, p.91), stating that ‘heuristic inquiry acknowledges a methodology that investigates experiences. Heuristic processes integrate disciplined self-study and in-depth experiential accounts of the phenomenon under investigation’ (2002, p.91). Furthermore, he states that ‘one enters heuristic research without hypotheses or suppositions. The purpose is discovery rather than proof’ (2002, p.93). A major objective of my research is to empower students to engage in personalised heuristic inquiry, engaging with the multimodal dimensions of *The Entangled Web of Musical Learning* to generate know-what that they convert into know-how. In this way learners can become heuristic researchers of their own technical and expressive practices, developing a deep and embedded understanding of what works for them that leads over time to an adaptive, spontaneous, intuitive ‘knowing-doing’. According to Huber et al:

Via learning by doing, knowledge can be acquired which is implicit in the action itself. Mastering new challenges is thus accompanied by a knowledge which does not already exist, and which only arises in doing, in other words by trying things out and experimenting. (2021, p.17)

Huber et al. sum up what I believe heuristics have to offer the learner musician en route to mastery of their craft. Learning-through-doing trains students to become heuristic researchers of their own practice, developing students’ awareness and their ability to provide their own feedback, through aural, kinaesthetic, and proprioceptive perception and awareness. This empowers problem solving and the mastering of new skills, and can equip students for lifelong, autonomous learning that will benefit them throughout their working life, in line with recent research that suggests that ‘musicians who identify themselves as learners may be better able to create and sustain a career in music’ (López-Íñiguez & Bennett, 2020, abstract, p.1).

Entering heuristic research ‘without hypotheses or suppositions’ with the intention of ‘discovery rather than proof’, as suggested by Bach (2002), can be seen in Harnum’s citing of professional trumpeter Colin Oldberg, who recommends learners to ‘cultivate a non-judgmental exploration of sound with your instrument and body in relation to it. It’s fun! It’s supposed to be fun. And the fun might even be necessary’ (Harnum, 2014, p.182). This approach encourages students to engage in heuristic exploration, whilst also harnessing the fun

element of ‘flow’ posited by Csikszentmihalyi. Later in his book Harnum states ‘no matter how good you get, the exploration of sound is endless’ (2014, p.224), emphasising the lifelong commitment to learning and constant refining of skills that many professional musicians possess and that heuristic exploration can facilitate.

Imagery

One of the ways in which heuristics can engage the learner on a personal level is through the use of metaphor and imagery. Leech-Wilkinson and Prior cite Barten (1992, 1998) and Woody (1992) to state that ‘it is clear from empirical studies that metaphors play a key role for performers’, teachers’ and students’ musical understanding, especially in relation to musical expression’ (2014, p.2). Barten states that ‘figurative language referring to motor-affective states, actions, and tendencies seems to be distinctly suited to communicating musical aesthetic experience’ (1998, p.89), and Howard writes of ‘heuristic imagery...intended to guide or help control bits and pieces of a technical or interpretive effort’ (1982, p.60).

In working with expert performer-teachers I unveiled numerous examples of heuristic imagery (although they never labelled it so) that they employ within the one-to-one teaching studio, and in my ELPaR I experienced developing heuristic imagery, sometimes as suggested by the experts, sometimes discovering my own, and sometimes synthesising imagery from multiple sources and exploratory lived experiences. Much of this heuristic imagery has now become an integral and engrained part of my practice, facilitating my ability to initiate, guide, control, and positively influence motor-affective states and actions relating to both technical and interpretive efforts. This type of imagery is distinctly suited to facilitating musical learning. Barten states that ‘heuristic imagery is...a way of informing the student of the desired target experience or mode of performance’ (1998, p.94). She gives as an example, ‘if a flute instructor wants a beginning student to keep an open throat, it is probably more communicative to suggest that this should be done by imagining a hot potato in the mouth’ (1998, pp.94-95). Barten states that this type of heuristic imagery can help the teacher to capture the learner’s attention and imagination and make learning more memorable. Woody adds that instructional information is often more easily expressed and understood metaphorically than if anatomical suggestions are employed (2002, p.216). These are observations that I was mindful of when constructing The Tone and Timbre Toolkit⁵⁷

⁵⁷ See Chapter 7.

Whilst the use of heuristics is often linked with use of metaphor, in my use of heuristics for pedagogical purposes I have avoided offering linguistic metaphors for learners to use, believing them to be more powerful when user-generated, as well as too open to misunderstanding and misinterpretation⁵⁸. Howard notes that ‘Heuristic imagery, like any other metaphor, may fail in a variety of ways: through being misconceived, misdirected, mistimed, or simply misunderstood’ (1982, p.144). This warning adds weight to my thesis that heuristics are most effective when they are facilitated by expert teaching and pedagogy, but developed by the learner and learned through doing, so that the knowing-doing acquired is implicit in the action and is therefore personal to the individual. Where words can mislead, images and pictures invite a personalised response and leave space for the learner’s imagination, and in my primary research I discovered many examples of imagery used by expert performer-teachers which aid heuristic discovery and which I utilise in The Tone and Timbre Toolkit.

My intention in encouraging the use of heuristics in learner-exploration is to empower the learner, and if they choose to also develop their own metaphorical language that is meaningful to them, this is something that I would encourage, but I do not wish to suggest or prescribe. This heuristic voyage of discovering for oneself is described by Douglass and Moustakas⁵⁹ as ‘a passionate and discerning personal involvement in problem solving, an effort to know the essence of some aspect of life through the internal pathways of the self’ (1985, abstract). They describe the ‘private and imaginative nature of heuristic inquiry’ as ‘a process that affirms imagination, intuition, self-reflection, and the tacit dimension as valid ways in the search for knowledge and understanding’, concluding that skills and competence can only be learned through practice (1985, abstract); here they foreshadow the observations already cited by Ebitz (1988) and Kahneman (2011) relating to building skills through (deliberate) practice⁶⁰.

Douglass and Moustakas’s (1985) assertions about the imaginative nature of heuristics as a means of developing skills and competence through practice identify the importance of heuristic discovery as the means to gain what Kanno, writing about timbral control on the violin whilst performing contemporary music, describes as mastery of the instrument (skills and competence) and imaginative application (manipulation) of timbre (Kanno, 2001). Leech-Wilkinson and Prior state that heuristic devices employed in musical practice ‘make playing

⁵⁸ Misinterpretation of subjective language is discussed in Chapter 3.

⁵⁹ Moustakas is said by Lee Bach to have ‘developed the heuristic model during his passionate studies of loneliness in the late 1950’s’ (Bach, 2002, p.91).

⁶⁰ See Chapter 2.9.

much easier to control, producing sounds that feel right to hear by learning to make those sounds feel right to play' (2014, p.48). They describe this process as a 'chain of translations from (imaginative) idea to affect' that involves:

matching intended sound to an image, as an aid to producing the precise action required to make a sound able to generate in a listener a feeling response which, if not exactly what the player intended, will nevertheless play its part in the creation of an expressively persuasive performance of the score. (2014, p.48)

They state that the image, developed through years of (deliberate) practice and experience, is key to the performer, as it 'encode(s) the essential dynamic, emotional and motional information for the making of particular effects in sound, to the extent that the process now seems 'natural' (2014, p.48). Whilst I deliberately avoided offering linguistic metaphors as part of my user-facing pedagogical resources I embraced the use of visual imagery, examples of which can be found in The Tone and Timbre Toolkit.

By 'natural', Leech-Wilkinson and Prior observe that some musicians make links to singing and breathing, believing that 'this most deeply embodied musical experience acts easily as a reference point for instrumental playing' (2014, p.25). In both my Literature Review and my primary research with expert performer-teachers, singing as a tool for developing aspects of both artistry and physical awareness emerged as a recurrent theme, as has the need for deliberate, structured, extended, purposeful practice designed to enable sonic qualities to be controllable and reproducible at will. Whilst none of the expert performer-teachers in my study used the word heuristic, many alluded to the ability to adapt, mould and sculpt sound instinctively and spontaneously, based on acute listening and aural feedback combined with the ability to control physical movements at a micro level; singing is one example of an activity that experts believe develops acute listening skills and physical awareness. Harnum states 'if you can sing a melody line or an interval you've heard, that means you own it. It's a form of embodied cognition' (2014, p.258). Breathing is also seen as a part of a 'natural performance expression' that is sometimes 'linked to ideas concerning gesture and movement' in musical expression (Leech-Wilkinson & Prior, 2014, p.45), and many of the expert performer-teacher participants in my inquiry use singing and breathing exercises as pedagogical tools for developing flute tone and musical expression.

Leech-Wilkinson and Prior also note that heuristics can lead to acts becoming 'ingrained through experience to the extent that they feel completely natural' (2014, p.28) and that (deliberate) practice 'reinforces automatic behaviour, increasing the number of musical

features or techniques that ‘feel natural’ to exploit’ (2014, p.29). It is worth pointing out here that extended periods of practice also have the potential to ingrain, reinforce and automate non-optimal practices. Harnum states that ‘the brain only processes what comes in, regardless of it's [*sic*] quality, so if you’re not doing it right, you’re creating neural pathways that may cause trouble’ (2014, p.42). He additionally states, ‘if you play something incorrectly during practice, that’s what your brain remembers. Take your time. Do it right.’ (2014, p.325).

As both a performer and teacher I have a lot of experience of working to unlearn practices that feel right due to having been ingrained over time, but do not work, are sub-optimal, or limit future development, and these practices are often resistant to change and the formation of new habits. The pedagogical need to unlearn dysfunctional habits through physiological changes and refinement is identified by Ayra Bastani Nezhad⁶¹, and highlights that learner discovery and development of heuristics needs to be carefully planned, monitored, and informed by well-conceived teaching and pedagogy.

To develop technical and artistic skills that become natural, e.g., tacit, intuitive, instinctive, and automatic, over time is to develop heuristics. Some might believe that it is problematic to call processes that result from so many hours of exploration and practice ‘natural’ but this is an objective of deliberate practice; it is the arriving at this tacit, intuitive, instinctive, automated point that allows for spontaneity in performance, often under stressful conditions, which pedagogy needs to empower and which students and teachers should strive for. This type of heuristic might be described as akin to what Schön calls ‘reflection-in-action’, which he describes as the spontaneous, intuitive performance of actions in which we show ourselves to be knowledgeable in a special way, and where our knowing is in our actions (1983, p.49). This ‘knowing-in-action’ is developed through practical experience and deliberate practice, and as we learn to get better at engaging with and managing the fully entangled web of simultaneous and complex cognitive processes and actions that performing music requires, this leads to the development of heuristics that affect all dimensions of practice; not just the physical control of the body and instrumental technique, but also the creative, imaginative and expressive skills involved in making music.

The hitherto lack of documented heuristic practice as a feature of instrumental pedagogy might result from the very same tacit, intuitive, instinctive, automatic, individual, and highly personal nature of their deployment, developed over years of practice and experience, which is enacted rather than articulated, and therefore rarely documented and difficult to pass from teacher to

⁶¹ See Chapter 3.

learner. It might be that heuristic learning does indeed take place behind closed doors, in the ‘secret garden’, but lack of access means that we do not know.

One notable expert performer-teacher whose use of heuristic imagery in teaching is well documented is the eminent cellist and pedagogue Amit Peled⁶² (Peled, 2018), who has developed a system of emojis for teaching the cello that Abrahamson describes as:

iconic mnemonics capturing multimodal imagistic heuristics for fundamental corporeal and cognitive facets of playing the instrument. The emojis are intended to encapsulate holistically how a player should orient toward accomplishing a range of essential technical feats, beginning from posture and breathing and through to minute technicalities of left-hand, right-hand, and left–right coordination and musical engagement with the instrument. (2020, p.223)

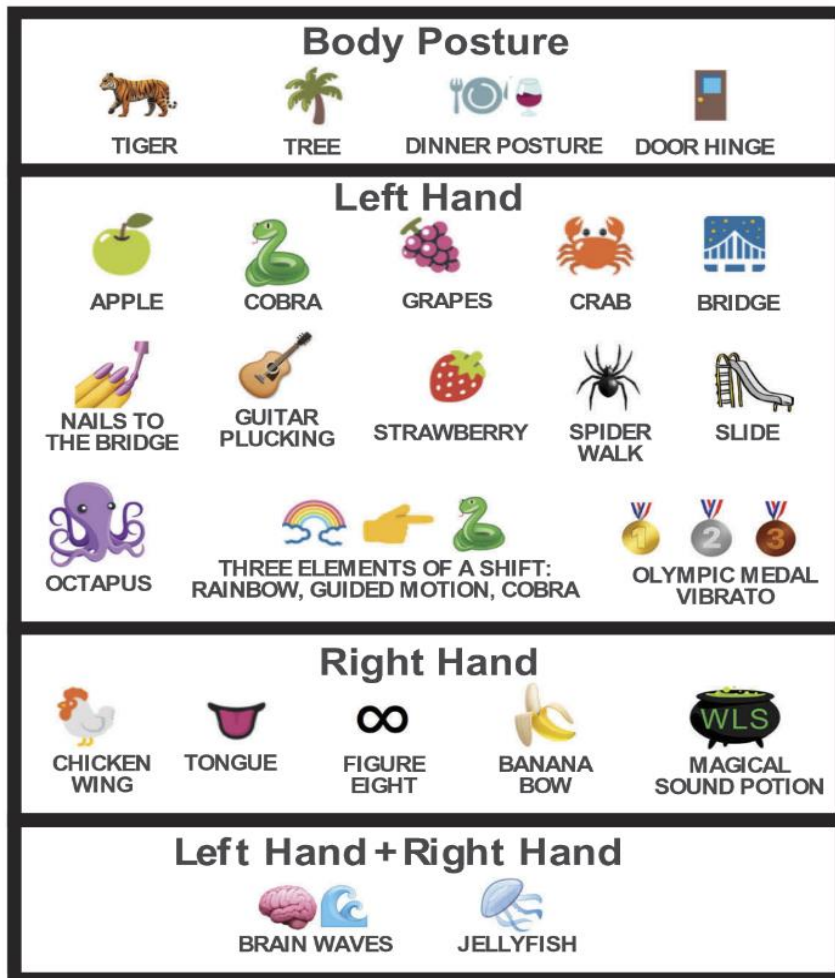
Peled’s approach resonated with me instantly and in reading Abrahamson’s description I recognised shared objectives with the new pedagogy I sought to create; my tools are also ‘intended to encapsulate holistically how a player ~~should~~ *might*⁶³ orient toward accomplishing a range of essential technical feats...and musical engagement with the instrument’ (Abrahamson, 2020, p.223), and I also employ images as a type of emoji to represent my tools and prompt actions. My editing ‘should’ for ‘might’ in Abrahamson’s description reflects my intention to avoid telling learners what they should do or will discover, embracing the idea of ‘fuzzy generalisations’⁶⁴ as a way of presenting my findings that invites learners to try for themselves without hypotheses or suppositions; it reflects my intention to empower personalised learner discovery and to avoid teacher-centred dogma or doctrine. Peled’s emojis for cello instruction are reproduced below⁶⁵.

⁶² International soloist and chamber musician, and professor of cello at the Peabody Institute of the Johns Hopkins University in Baltimore, Maryland, USA.

⁶³ Author edit.

⁶⁴ See Chapter 4.4.

⁶⁵ An online tutorial demonstrating his approach can be found at <https://www.youtube.com/watch?v=-4JR4jCIQdA>



(Abrahamson, 2020, p.238)

Figure 7: Amit Peled's Cello Emojis

Heuristic imagery, as I envision it, acts differently, and serves a different purpose within the domains of learning and performing. As part of the learning process, it acts as a prompt to train perception and action, inviting reflection on bodily activity, sensorimotor feedback, and the resulting sonic output; it helps to develop and embed shortcuts that empower the development of a skill. Once the skill is mastered, heuristic imagery empowers the spontaneous, in-the-moment deployment of that skill; the heuristic empowers an action, and/or an intention to easily (following hours of deliberate practice embedding the heuristic) deliver a desired outcome, in a fleeting moment of time, within a state of flow.

In Chapter 1.4.2, I cited Holmes stating that ‘the physical production of tone is guided by imagery’, and that ‘expert performers appear to perceive timbre through the creation of mental images (conscious internal representations) that inform and guide technical decision-making as an interpretation develops’ (2012, p.304). Holmes also notes that before playing, performers

‘image, either physically or mentally, the character of the sound they wish to produce’ (2012, p. 304). I see what Holmes describes as the predictive part of Clark’s thesis. My intention, via The Tone and Timbre Toolkit, is to provide images that act as tools, that through deliberate practice, will guide and train the physical production of tone and colour and lead to spontaneous in-the-moment adaptive expression, whilst simultaneously opening a window to the discovery of a wider range of tonal possibilities that can satisfy what is asked of flute players by composers, conductors, teachers, colleagues, and their own musical imagination.

If teachers aim to encourage and nurture students’ imaginations and individual artistic voices I argue that the most effective way to achieve this is via a joint, learner-centred heuristic exploration, with teachers acting as guide and facilitator, bringing knowledge and experience of what is possible, of the professional domain, and the practical application of performance skills, including in different repertoire, genres, acoustic settings, etc., as well as potential pitfalls for students to avoid or be aware of. I have earlier argued that master-apprentice knowledge transfer⁶⁶ is successful for some students and/or in some circumstances, but I reiterate here Gaunt’s call for a combination of both ‘the transmission of expertise and collaborative enquiry’ (2017, p.37) to form part of instrumental pedagogy. This thesis argues that the holistic development of the individual artist requires collaborative, heuristic exploration to be a central part of the learning process.

These active processes for acquiring knowledge, understanding and skills, through experience, the senses, thought, and reflexion/reflection, are at the heart of my ELPaR methodology⁶⁷ and also at the heart of my *toolkit*⁶⁸, which invites students and teachers to try ideas out, experience them, focus on how things feel and might be refined, on how they sound, and to reflect on what might or might not be useful to them in achieving their learning objectives. This approach to developing practical research outcomes that students can explore, with the intention of ‘disclosing potential real-life applications that inform theory and practice’ (Schiavio et al., 2020, p.2), acknowledges that a ‘close focus on...experiential and behavioral features can inspire important insights concerning how meaning is generated and transformed during musical practice’ (Schiavio et al., 2020, p.2). This is what my work in ‘The Tone and Timbre Toolkit’ sets out to achieve. It is an attempt to address what Schiavo et al. suggest could be a possible aim of current music education research, namely that ‘researchers could develop a range of self-reflection tools that help describe in more detail the moment-to-moment dynamics

⁶⁶ See Chapter 1.3.3.

⁶⁷ See Chapter 4.2.

⁶⁸ See Chapter 7.

of bodily activity, in turn supporting flexible ways of learning that take advantage of various resources a bodily approach can offer' (2020, p.2).

My approach to developing tools that are practical and based in the physicality of learning-and-knowing-through-doing, and that also empower self-reflection, is what The Tone and Timbre Toolkit sets out to offer; moving away from a 'unidirectional stream of knowledge...passed from a teacher to a student'⁶⁹, to more relational approaches that highlight improvisation, creativity, collaboration, and discovery, as well as the role of movement and the situated body for learning' (Schiavio & van der Schyff, 2018, p.2). The heuristic element of my approach goes beyond a focus on bodily activity to also incorporate the creative, imaginative, and expressive elements of artistry.

2.8 Collaborative Learning

In music education the concept of collaborative learning is becoming increasingly accepted and validated. According to Gaunt and Westerlund, 'collaborative learning is becoming one of the most powerful ways to deal with the challenges of development in music and higher music education...particularly with processes of developing new knowledge in contemporary contexts'. They discuss 'learning as a social endeavour, and of teachers being facilitators and co-learners rather than doorkeepers of learning', and of 'widening and democratizing knowledge production' (2013, p.1). In investigating conservatoire leaders' observations and perceptions on curriculum reform, Rumiantsev, Admiraal and Rijst add that 'musicians nowadays need to be able to work both creatively and collaboratively, often in a wider range of artistic, social and cultural contexts (2020, abstract). They further add that 'nearly all situations in the professional practice of musicians require collaboration, which makes it necessary to include this type of learning in conservatoire programmes' (2020, p.30).

Collaborative learning can take place between student and teacher in the one-to-one teaching studio, but also peer to peer in more informal learning contexts. Furthermore, Gaunt also acknowledges that students must learn to collaborate internally with themselves, citing an unpublished interview with pianist Ronan O'Hora from her own research to state that 'a particular aspect of this internal collaboration relates to inner perception and dialogue about the nature of making music and the place of expecting and embracing "mistakes" as a natural part of the creative process' (Gaunt, 2017, p.34). O'Hora states that 'as a solo pianist you play chamber music with yourself' (Gaunt, 2017, p.35) and notes that this requires a different type

⁶⁹ The aforementioned 'master-apprentice' model of knowledge transfer.

of psychological preparation. In a similar vein, Blackwell quotes the violin pedagogue Brenda Brenner talking of ‘the importance of mistakes as learning opportunities’, with Brenner stating, ‘I want them (my students) to make mistakes, and I try to use them as a launching pad for our conversations about what they should be thinking about when they are making these decisions musically. Mistakes are just information that will help them get better’ (Blackwell, 2022, p.83).

I see strong parallels between O’Hora and Brenner’s views, and what is required of a reflexive/reflective learner if they are to develop the ability to reflect for/in/on action, before/during/after an event that has the potential to inform future growth. Expecting and embracing mistakes is a crucial part of learning-through-doing, offering opportunities to experiment without preconceptions to discover ‘what-works’; to find things out for yourself, in the privacy of your practice space without worrying that you do not want others to hear you sounding ‘bad’.

Gaunt notes that ‘many conservatories and specialist training institutions are currently exploring ways to locate one-to-one lessons more explicitly within a rich environment of ensemble work, interactions with a wide range of professionals and a supported community of peer learning’ (Gaunt, 2017, p.36). This requires the skills and competencies of instrumental teachers to be broader than has historically been the case and requires instrumental/vocal teachers ‘to take on new roles as they engage in various types of collaborative work as mentors, co-ordinators, facilitators, advisers, directors and music leaders as well as ‘teachers’ in the traditional sense of the term’ (Lennon & Reed 2012, p.292).

One of the barriers to changing teaching practices in a conservatoire context is the fact that many instrumental teachers work part-time hours, often only a few hours a week, making them relatively isolated and difficult to involve in change at an institutional level. Some conservatoires have ‘described the difficulty in changing teachers’ attitudes in terms of making collaboration a top priority, because many of them hold relatively small part-time positions and therefore do not have a lot of contact with each other and with the institution’ (Rumiantsev et al., 2020).

If research-based teaching materials can be developed, through researcher/expert practitioner collaboration, that encourage collaborative working methods, their merits will, over time, lead to their adoption within the one-to-one teaching studio and beyond; offering the possibility that teachers might organically begin to change or develop their practice as pedagogues, without needing to be persuaded or coerced. The key here is the quality and integrity of the teaching materials, and research must work to create materials that transcend the idiosyncrasies of

performer-authored method texts that currently dominate the field. The collaborative elements of this type of pedagogy may be new to some teachers, but if the materials are well conceived and likely to achieve positive learner outcomes this might help to tap into the collaborative part of performer-practice within each expert performer-teacher and direct the same collaborative skills used in performance towards teaching; after all, experienced musicians are well versed in acts requiring collaboration, and most should have easily transferable skills. Gaunt and Westerlund note that music making is largely collaborative in nature and that:

Collaboration takes place on multiple levels: between performers, between composers and performers, performers and audiences, teachers and students, and creative artists and their participants. Yet the nature and potential of these collaborative elements have largely remained on the fringes, under-utilised by educational practitioners, and similarly little explored by researchers in music education. (2013, p.2)

In examining some of the benefits of collaborative learning and developing a collaborative culture of music learning, Rumiantsev et al., identify that collaborative learning can empower the ‘problem-solving skills and reflective, cooperative and communicative competences (that) are necessary assets in preparing conservatoire students for professional practice’ (2020, p.31). In pursuit of this they further state that ‘Teachers should focus on the learning process rather than on achievement and competition and need to focus on facilitating the learning process instead of transmitting knowledge and skills’ (2020, p.31). This focus on the learning process is a major feature of my work in *The Tone and Timbre Toolkit*, which provides materials and tools for learners and teachers that invite exploration and experimentation and encourage an openness to discover what works for the individual student and discard what does not. *The Tone and Timbre Toolkit* situates the teacher as facilitator, advisor, and agent of feedback rather than font of all knowledge, giving the learner more agency in the learning process and beginning to address the under-utilisation of the collaborative skills possessed by performers in their work as educational practitioners noted by Gaunt and Westerlund above.

2.9 Deliberate and Enjoyable Practice and Elite Performance

Krampe and Ericsson (1995) posit elite performance as the extreme of a continuum in acquired ability and achievement gained through ‘deliberate practice’. They define deliberate practice as an effortful and ‘highly structured activity with the explicit goal of improving some aspect of performance’ and state that ‘elite performers try to maximise the amount and outcome of their practice activities at every developmental stage’ (1995, p.86). Evans and Bonneville-Roussy describe deliberate practice as ‘effortful’, adding ‘strategic’ and ‘conscious’, and state

that 'the most successful musicians know that deliberate practice... is necessary to produce reliable and consistent improvements in performance' (2016, p.2). Harnum agrees, noting that Western classical musicians have 'learned to be supremely efficient with their practice' (2014, p.158).

During a musician's student years deliberate practice requires of pedagogy that 'performance is carefully monitored for weaknesses and specific tasks are devised to combat them' (Krampe & Ericsson, 1995, p.86). Deliberate practice is suggested here as a pre-requisite for developing enhanced musical skills, over and above what is often perceived as the importance of innate musical ability, and this provides the motivation to engage in ongoing deliberate practice.

According to Ericsson, Krampe and Tesch-Römer (1993), expert performance is 'the end result of individuals' prolonged efforts to improve performance while negotiating motivational and external constraints', stating that 'individual differences, even among elite performers, are closely related to assessed amounts of deliberate practice' (1993, p.363). Moreover, they assert that 'many characteristics once believed to reflect innate talent are actually the result of intense practice extended for a minimum of 10 years' (1993, p.363).

There have been several investigations and meta-studies relating to deliberate practice since Ericsson et al. that argue about the degree of importance it holds in building expert performance skills, but they all conclude that it is a significant contributory factor. In one large meta-study examining 'correlations between deliberate practice and music performance' Hambrick et al. state that 'deliberate practice explained 28.9% of the variance in performance...leaving 71.1% of the variance unexplained and potentially explainable by other factors' (2014, p.15). Clearly deliberate practice is only one of a number of factors affecting expertise or elite performance, but at nearly 30% it appears an important one, and any investigation aiming to further practice in instrumental pedagogy should acknowledge the role that deliberate practice plays in the development of high-level skills and aim to fuse deliberate practice with heuristic inquiry.

Ericsson et al. identify three major constraints on the process of deliberate practice: the 'resource constraint', the 'effort constraint' and the 'motivational constraint' (Ericsson et al., 1993). My research, in furthering pedagogical knowledge in instrumental practice, aims to acknowledge and overcome some aspects of each of these constraints. The resource constraint concerns, amongst other things, the availability of expert teachers and detailed training materials. My investigation is designed to create training materials that are born out of the knowledge and practice of expert performer-teachers; to democratise their knowledge by giving it a reach beyond their private teaching studios. The effort constraint involves

acknowledging that ‘the duration of effective daily practice that can be sustained for long periods is limited’, in part because ‘it is necessary to maintain full attention during the entire period of deliberate practice’ (Ericsson et al., 1993, p.370). Ericsson et al. argue in favour of large amounts of deliberate practice, stating that practice hours can increase over time with age and experience, but they caution against excessive amounts, stating that rest time, including sleep, napping, and leisure activities, is also important. The motivational constraint ‘acknowledges that deliberate practice is not intrinsically motivating or enjoyable, but is undertaken to achieve specific goals, principally improved performance’ (Krampe & Ericsson, 1995, p.86). Not everyone agrees with this assertion however, and in Harnum’s research on practice he states that ‘every professional musician I’ve spoken with said that practice is quite enjoyable’ (2014, p.27) and that practice aimed at achieving specific goals is not incompatible with enjoyment in the practice space.

Others offer a solution to this dilemma, identifying enjoyment and autonomy as crucial motivators in practice activities. Pitts and Davidson state that ‘practise [*sic*] which is satisfying and enjoyable will in itself be a source of motivation’ (2000, p. 54), whilst Evans and Bonneville-Roussy identify self-determination and autonomy as motivating factors, stating that when ‘activities are perceived to be aligned with the self and experienced as personally important, interesting, and enjoyable’ (2016, abstract) the result is autonomous motivation. These facets of motivation, as described by Pitts and Davidson and Evans and Bonneville-Roussy, are both explicit and implicit within my model of heuristic discovery utilising The Tone and Timbre Toolkit; the tools I offer allow opportunities for prolonged, deep periods of deliberate but enjoyable practice. The intention of my work is to motivate learners by making tone and timbre related deliberate practice enjoyable and the results of prolonged periods of deliberate practice tangible.

2.10 Chapter Summary

As a conceptual framework, *The Entangled Web of Musical Learning* seeks to create a model, built around the four skill-building, generative know-what lenses and the two automation-embedding, intuition-empowering, know-how lenses, for learner-centred development of multimodal skills and processes, within an iterative cycle of personalised knowledge creation that focusses on sensory perception, imagination, and action. *The Entangled Web of Musical Learning* is a theoretical framework that is designed to be applied; is not offered as a means to indirectly study the impact of the six lenses working together, but rather as a practical tool with which learners and teachers might engage to inform the development of musical skills and

abilities, and that institutions might use and adapt as a way of embedding critical reflexion/reflection into curricula. *The Entangled Web of Musical Learning* offers a framework around which to design practice and teaching strategies that might harness the potential offered by developing personalised awareness and imagination.

In my own ELPaR I found that the know-what generated by an awareness of engaging with the multimodal entangled theoretical frames of *The Entangled Web of Musical Learning* has the power to inform the development of know-how-in-action, that might embed, over time, to become instinctive, intuitive, and spontaneous. At that stage, *The Entangled Web of Musical Learning* begins to empower an in-the-moment automation of expressive and technical know-how, leading to an effortless state of ‘flow’ (Csikszentmihalyi, 2014). In engaging in *The Entangled Web of Musical Learning* it is helpful to understand how the cognitive skills and processes of my *Synthesis of Multimodal Musical Cognitive Processes and PAPAPI Skills* imbricate and operate.

Wöllner and Williamon state that ‘musicians experience various forms of sensory feedback when practising and performing’ (2007, abstract), and that ‘skilled performers and eminent pedagogues have long since acknowledged the importance of being able to imagine music in the mind: aurally, visually and kinaesthetically’ (2007, p.39). In exploring the role of auditory, visual, and kinaesthetic skills within the context of sensory feedback as experienced by musicians, Wöllner and Williamon also acknowledge that there is still much to learn, from both applied and theoretical perspectives. From a pedagogical perspective, they ask, ‘how might these skills be trained and used to enhance learning and performance?’ (2007, p.40).

These are the questions for which *The Entangled Web of Musical Learning* seeks to offer a solution. In establishing and understanding the *Synthesis of Multimodal Musical Cognitive Processes and PAPAPI Skills* that takes place in musical instrument/vocal learning and performance, the theoretical framework presented in this chapter was now ready to be applied and explored in my primary research activities.

Chapter 3: Literature Review

This literature review presents a unique and substantial survey of flute pedagogy-related materials, inquiring into both the history and historiography of practices past and present to collect information from a variety of sources in a way not found in one place elsewhere. As such it represents a contribution to knowledge in its own right, as well as informing further stages of my primary research and ELPaR pedagogy-generating activities.

This review investigates what is currently understood about the various factors that influence and impact the production and use of tone and timbre in flute playing. It aims to establish a knowledge base, looking at how tone production in flute playing is understood, developed, and implemented, and to identify areas where a research orientation may be beneficial in unveiling key new insights that might be employed to inform the development of new ideas and approaches to tone and timbre-related pedagogy in flute playing. Furthermore, it sets the topic in a historical context, with the intention of informing current and future thinking through an awareness of what has gone before.

The review establishes where current practice lies, examining areas of agreement, disagreement, and doubt, and identifying gaps in documented knowledge. The information gathered provides a starting point from which the researcher begins to engage in primary research; working with expert performer-teachers, firstly through a phase of semi-structured interviews⁷⁰, followed by an in-depth exploration of the issues from within the ‘secret garden’, to create new, research-based, flute-related pedagogy that aims to empower learners in developing, mastering, and employing tone and colour in their practice. The review surveys information from a variety of sources, including academic literature, performer-teacher authored method texts and books, and internet-based materials.

Throughout the review I look for ideas and approaches that, knowingly or otherwise, share commonalities with, or reflect ideals represented by, the six lenses of my theoretical framework. Of particular interest is information relating to PAPAPI within a ‘brain-body-world’ (Beer, 2000) that might develop to empower an effortless state of ‘flow’ (Csikszentmihalyi, 2014); identifying how pedagogy currently facilitates learners to develop aural and physical awareness that builds know-what in the learning stages, to embed, over time, know-how-in-action that empowers an individual’s easy, spontaneous, intuitive control of the entangled whole of tone

⁷⁰ See Chapter 5.

and timbre, both in the practice room and when immersed in the entangled whole of a performance.

Whilst the review also set out to investigate flute tone and timbre related pedagogy within a more holistic woodwind setting, it was found that the absence of physical resistance encountered by the air when playing the flute, in comparison to playing other woodwind instruments where reeds and mouth pieces create significant blowing resistance, makes the study of flute tone-related technique incompatible with the wider woodwind family. There are some studies comparing the bodily activity of the larynx, pharynx, and vocal tracts across woodwind instruments, and also of singers, but observations such as ‘every woodwind instrument requires a different laryngeal position’ (Sataloff & Trollinger, 2019) are indicative of the problems of comparing across woodwind instruments. Nevertheless, this review does explore some aspects of vocal and string pedagogy that inform the production and application of tone and timbre in flute playing, in both the pedagogical and the professional performance domains.

3.1 Tone, Timbre, and Vibrato: A Historical Perspective

I believe that students in the 21st century can gain a great deal by considering the different playing styles and ideals of tonal quality from the past. Awareness of past ideals, including the language used to describe different playing styles and tonal qualities, and the differences in materials from which instruments were, and still are, made, all contribute to build a picture of tonal contrasts and different aesthetic ideals. By understanding what has gone before, students can inform and extend their understanding of tonal possibilities beyond what is simply current. In an ever-changing world we must assume that fashions will continue to change and that players can benefit from being enlightened by past practices.

During the 19th century the music profession had entered a period where elite players more frequently moved country to work, performing and touring in countries beyond their own national borders, starting a process of cross pollination of playing styles and aesthetic tastes. The advent of the gramophone and the radio further fuelled this cross pollination of styles, tastes, and attitudes. The 20th century was a time of great change, and fashions in music performance were no exception. Much has been written about the French and British Schools of flute playing (Powell, 2002, Raposo, 2007, Valette, 2010, Gearheart, 2011, Lewis, 2015) by both academics and flute players/enthusiasts, and both schools had general characteristics ascribed to them regarding their differing concepts of how the flute should sound.

The main differences between British and French flute playing are summarised by Jessica Raposo as being:

French School:

- Use of silver flutes;
- Use of consistent vibrato in the tone;
- Play with a relaxed embouchure;
- Even, homogeneous, tone throughout the different registers.

British School:

- Use of wooden flutes;
- Use of a straight tone;
- Play with a firm embouchure, with the lips stretched into a smile;
- Large, reedy tone in the lower registers, and a thin high register. (2007, p7)

In the UK, most British flute players played on wooden flutes until well into the 20th century. From the point of view of tone, the British wooden flute style of playing stemmed from the playing and teaching of Charles Nicholson (1795-1837), who during his career played with all the London orchestras and taught at the Royal Academy of Music. Nicholson's ideal tone was described by Richard S. Rockstro in his treatise 'The Flute', as 'ought to be as reedy as possible; as much like the hautboy [oboe] as you can get it, but embodying the round mellowness of the clarinet' (1928, p.608). Macaulay Fitzgibbon (1855 – 1942) described Nicholson's playing thus:

He had a very peculiar, strong reedy tone – something between the oboe and the clarinet – grand, but so hard as to be almost metallic. His lower notes were specially powerful and thick, and resembled those of a cornet or an organ. (1914, p.208)

It is said that hearing the power of Nicholson's tone in live performance was a factor that led Boehm to develop his own flute design.

These tonal characteristics seem to represent what was considered desirable in flute sound by both British players and British audiences, and these tastes lasted well into the 20th century. Many written accounts of British-style flute playing from the late 19th to early 20th centuries can be found, and the following example, written of John Amadio's playing, is representative of what was written about the style at the time: 'extremely thick and dense in the low register

while small in the top register, and he used a completely straight sound with no hint of vibrato’ (Raposo, 2007, p.51).

In contrast, Fitzgibbon goes on to make comparisons between the British and continental styles, noting that the British style displayed a ‘vigour and robustness of tone, especially on the lower notes’, whilst the French and Belgians aimed ‘chiefly at producing silvery purity and sweetness of tone rather than volume – quality rather than quantity’ (1914, p.217). He also noted that the ‘foreign style’ was ‘marked by refinement and delicacy of taste...the phrasing often exquisite’ (1914, p.217).

Raposo highlights the differing ideals of sound between the British and French schools, contrasting the British objective to imitate the sound of other wind instruments with the French aim to imitate the singing voice (2007, p.12). She further elucidates early 20th century ideals of tone, citing Rockstro (1928), writing about flute tone in general rather than specifically alluding to differences between different national styles of playing. Rockstro wrote that ‘the chief constituents of quality of tone may be antithetically grouped:

- Power – Softness
- Volume – Thinness
- Brilliancy – Dullness
- Sweetness – Harshness
- Clearness – Impureness
- Acuteness – Gravity (1928, p.78)

He also noted that it was the combination of these qualities that contributed to what he called ‘penetrativeness’ [*sic*], what we might nowadays call projection.

When exploring the timbral qualities typical of French flute playing in the 19th to 20th century, the playing and teaching of Paul Taffanel is the obvious starting point. Taffanel is universally accepted as the father of the French school, with many of his students from the Paris Conservatoire, such as Philippe Gaubert, Georges Barrère, Louis Fleury and Marcel Moyse also noted exponents of the French style. Taffanel and Gaubert wrote ‘Méthode Complète de Flûte’ (1923), which is still widely used as a pedagogical method today, and Moyse’s publications relating to tone, still the most widely utilised of the French method texts today, are looked at in more detail later in this review. Taffanel based his concept of the ideal flute sound on imitating the human voice, describing the voice of the young soprano Adelina Patti as ‘an invaluable model of sound production and limpid tone’ (Blakeman, 2005, p.23). Inspired

by his time as both principal flute and later as conductor at the Grand Opera, Paris, Taffanel and his students worked a great deal with the best sopranos of the time, such as Dame Nellie Melba and Luisa Tetrazzini. Taffanel's tone was described by Fitzgibbon as 'extremely soft and velvety, and his playing full of soul, expression and refinement' (1914, p.206). Toff describes the French tone as 'silvery, pure, sweet, and, above all, refined' (1996, p. 103).

In the early part of the 20th century many of Taffanel's students from Paris emigrated to America, where they obtained principal flute positions in many of the major orchestras (Boston, Philadelphia, New York, Chicago, etc.). They took with them the French ideal of tone and the style of playing as well as their silver flutes, which quickly became popular in the USA. From these French roots an American style started to develop, including making flutes from platinum, said to 'enhance the fullness and mellowness of the sound' (Toff, 1996, p.105), and the addition of the B foot joint became common. This led to a first generation of American flute players born out of the French style, led by William Kincaid (1895–1967), whose tone was described as 'rich and robust, with great projection...heavier and darker than the traditional French sound' (Toff, 1996, p.105).

In the UK, by the mid-20th century, two figures stand out as being preeminent, both as performers and teachers. Gareth Morris, principal flute of the Philharmonia Orchestra and teacher at the Royal Academy of Music, is considered to have his roots in the British School of wooden flute playing, whilst Geoffrey Gilbert, principal flute at various times of the London Philharmonic Orchestra, BBC Symphony Orchestra and others, and teacher at the Guildhall School of Music and Drama, Trinity College of Music, Royal Manchester College of Music and later at institutions in the USA, started in the British style but was one of the first British players to change mid-career to the French style and a silver flute.

From Nicholson to Morris, technique relating to tonal aesthetics was mainly embouchure focussed. Raposo describes the traditional British embouchure as 'firm...with the lips stretched into a smile' (2007, p.7), and Morris himself writes of an embouchure that consists of the lips drawn back in a slight smile and held firmly against the teeth (Morris, 1992). In contrast, Floyd (1990) states that Gilbert's approach to the embouchure was the exact opposite of this, and Toff describes the embouchure suited to the silver flute as looser, allowing the player to 'make the nuances of timbre and pitch that are the hallmarks of the French style' (1996, p.104).

The traditions embodied in the style of each were passed down through their students, but as the 20th century progressed the British wooden flute style of Morris became less popular, and the legacy of the French, silver flute style adopted by Gilbert remains dominant, as displayed

by some of Gilbert's most successful students, including James Galway, William Bennett, and Trevor Wye. Whilst silver (and sometimes gold and platinum) flutes are now the norm for most 21st century players, it is not uncommon for professional players to also play on wooden flutes. In the UK, the co-principal flute of the BBC Symphony Orchestra, Daniel Pailthorpe, is an example of an elite flautist who usually plays on a wooden flute.

Vibrato, discussed in detail later in this review, is often contentious, both in terms of its production and application. Historically, British flute players were said not to use vibrato, preferring a 'straight tone', whilst with French players the use of vibrato evolved to be a very important feature of their style. For students nowadays, Pope⁷¹ recently told me that she believes we reached 'peak vibrato' about 20 years ago, and that current fashions are to use a bit less⁷².

3.2 Academic Writing

There is scant academic writing that focusses specifically on tone and timbre/tone colour within flute playing and pedagogy, or indeed within woodwind pedagogy in general. The Australian academic and flautist Bastani Nezhad states that in the course of his research into flute tone he 'became aware of the obvious negligence towards tone pedagogical skills in academia with little investment in its investigation' (2012, p.34). He also notes, as do I, 'that there are innumerable details involved in the teaching of tone that are often only conveyed from master to pupil and rarely documented' (Bastani Nezhad, 2012, p.36). In accepting Bastani Nezhad's findings, it is clear that an opportunity exists for research in this domain to widen access to the knowledge of the 'master' as part of a process of unveiling new insights and creating new approaches to pedagogy for the benefit of the wider flute playing community.

Bastani Nezhad's research focusses on flute tone, specifically investigating what he terms 'primal sound' and 'root tone'⁷³ in flute playing and pedagogy. His concept of primal sound as a factor in flute tone production involves harnessing the ways that we, as human beings, naturally produce both voluntary and involuntary sounds, in particular sounds that originate in

⁷¹ One of the expert-performer-teachers who participated in the primary research phases of this inquiry.

⁷² As an aside, another separate area that this investigation does not cover but which is worth briefly mentioning here is the use of timbre, vibrato, and dynamics in baroque music. There is a wealth of literature on this subject, including historical treatises of the time, and any player wishing to consider authenticity in baroque music performance will need to study this area in detail, but it falls beyond the scope of this investigation.

⁷³ Bastani Nezhad's concept of root tone is akin to a good basic tone, what Wye describes as a player's 'everyday' tone, that occupies a space between hollow and focussed.

the larynx or that are created by the use of vowel shapes inside the mouth. According to Bastani Nezhad:

Primal sounds are caused by various emotional triggers such as joy, fear, sadness and pleasure, that can lead individuals into different mental-emotional states. These are always accompanied with both a vocal phonation or primal sound and a muscular reaction...Both vocal and physical reactions stem from a body automatic reflexive response that leads the brain to create a motor command due to an internal stimulus to which the body responds automatically. This process occurs automatically as there is no conscious thinking required for its formation. (2013, p.13)

As an example, Bastani Nezhad describes that when one hurts oneself, for instance burning a finger, there is usually a vocal response such as 'ow' coupled with a simultaneous physical response of retracting the finger from the source of the pain. It is this connection between primal sound and automated physical reaction that Bastani Nezhad believes can be harnessed in flute pedagogy to train players to connect naturally occurring sound production to automated, reflexive physiological responses.

By developing this connection the root tone will emerge and evolve, manifesting itself as a personalised, individualised tone, unique to each player due to their unique physical characteristics, and representing a 'means of expressing personality in music performance and distinguishing performers' levels of sophistication' (2012, p.33). In presenting the idea of the root tone as being unique to each player, Bastani Nezhad states a strong link between root tone and the personal voice in singing. He states that:

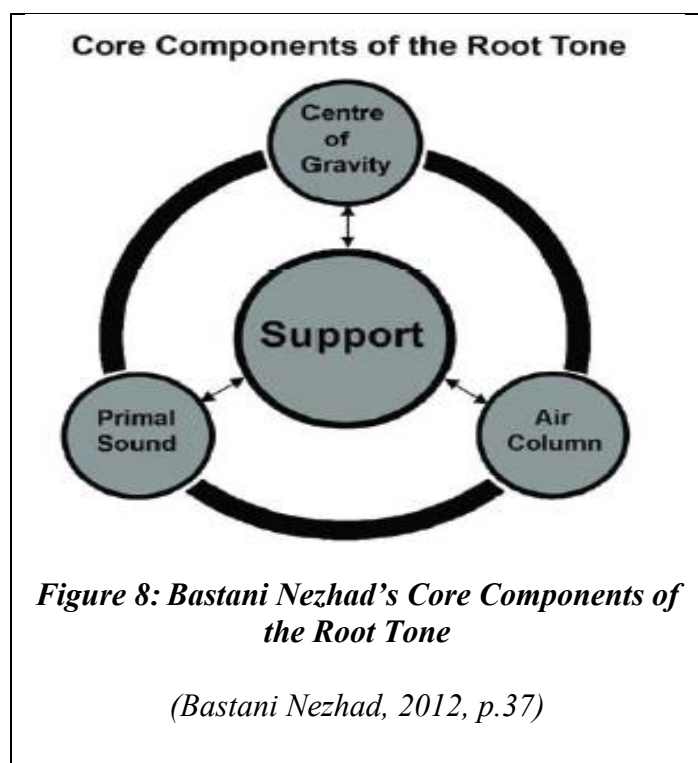
The root tone corresponds with the personal voice in singing that manifests the natural and genuine identity of the singer through his/her voice. Discovering personal voice has been a fundamental subject among singers. Commonly, imitating the voice of another singer, beyond that which happens of necessity in the learning process, is considered to be vulgar, non-artistic, and boring. (2012, p.33)

In pursuit of the individual, unique voice in singing, he adds that 'primal sounds can be explored through various exercises that target human primal sounds as the basis for personal vocal tone' (2013, p.27, Endnotes No.3). The ideal of developing the personal voice, either vocally or in flute playing, echoes Holmes (2012) stating that elite performers often have a distinctive tonal quality which forms part of their musical personality and identity (as already cited in Chapter 1.4). Relating flute tone and the voice, both in terms of aural similarities and

in terms of technical production, is a theme shared by many performer-teachers in their method texts⁷⁴.

Along with primal sound, Bastani Nezhad identifies the core components of root tone in flute playing as (air) support, which he considers to be the most important, combined with centre of gravity, and the air column, which he defines as ‘the vibrating tube that stretches from the lungs up towards the mouth shaped as embouchure and continues along the whole length of the flute’ (2012, p.38).

He prioritises the need to master root tone, saying that developing a personalised root tone is a first step towards high levels of expression, and that developing a variety of tonal colours is a more advanced step and comes later, once the individual player’s ‘root sound has been very well explored and established’ (2012, p33). In this sense, my research could represent a continuation or extension of the research and knowledge creation undertaken by Bastani Nezhad. I aim to empower learners to ‘explore and establish’ a personalised ‘root tone’ (not a term I use), and to explore timbre/tone colour by providing them with a set of tools that invite experimentation and personalised discovery, designed to empower the development of the personalised, individual musical voice through harnessing the potential of each player’s unique physical characteristics in the training of automated, spontaneous, intuitive, personalised heuristics.



Bastani Nezhad references Alexander (technique) writing about feeling being more important than the mind, echoing ideas of embodied cognition as discussed in Chapter 2, to affirm that the core components of root tone are ‘best taught through a physiological language and are better perceived through hearing and feeling rather than rationalization’ (2012, p.38). I acknowledge this stance but believe that tone is not only best taught through hearing and feeling, but also best taught through

⁷⁴ See Chapter 3.7.3.

collaborative, teacher-facilitated, learner-centred, personalised exploration. I advocate for an approach that combines a 5ECS approach to PAPAPI within a ‘brain-body-world’ (Beer, 2000) in order to invite learners to explore for themselves, via deliberate practice, to develop spontaneously deployable heuristics that empower an in-the-moment state of flow, both in the practice room and on the concert platform.

Finally, Bastani Nezhad (2012) makes some additional pedagogical observations that informed my pedagogical materials, stating that students should be encouraged to appreciate tonal changes in their playing through the repertoire that they play, and advising against being too technical, which he says leads to boredom. He states that each component of tone is connected and overlapping, resonating with the 5ECS concept of an entangled whole, but that the components should be addressed separately whilst not losing sight of the whole. He advocates working on each of the components in isolation, gradually fusing them together into a more integrated whole, through a step by step ‘accretional’ approach, which can then be followed by a more holistic musical approach, mixing physical control and mastery with mental, emotional, spiritual, and cultural aspects of performance, which I might describe as embracing the entangled whole.

The American expert performer-teacher Nyfenger⁷⁵ likewise advocates for working on developing timbral contrasts by isolating and experimenting with different aspects of technique, such as blowing angles and the size of the lip aperture, which he states will affect volume, colour, and pitch. Like Bastani Nezhad, he advocates learning to maintain and control each aspect of technique before embarking on combining the different elements within an entangled whole. I adopted this approach in *The Tone and Timbre Toolkit*, where I invite students to firstly explore each tool individually, before experimenting with blending them in different combinations, searching out the combinations that work for them; in the words of Bruce Lee, I invite learners to ‘Absorb what is useful, Discard what is not, (and) Add what is uniquely your own’ (Twitter, (now ‘X’) 2020).

Like many performer-teachers, Bastani Nezhad (2012) also highlights some of the problems that poor technique can create for the flautist, including performance anxiety and problems with confidence, and the pedagogical need to often unlearn dysfunctional habits through physiological changes and refinement. He gives as examples how small changes in posture, centre of gravity etc. can have a big impact on tone quality, whilst emphasising that achieving

⁷⁵ Nyfenger’s approaches to various factors that affect the production and teaching of tone and timbre are examined throughout this chapter.

change often requires high levels of kinaesthetic and proprioceptive awareness. This focus on kinaesthetic and proprioceptive awareness is reflected in various aspects of my theoretical framework, as detailed in Chapter 2.


The invisible nature of many aspects of flute playing technique and the problems that this causes in flute pedagogy is also raised by Bastani Nezhad (2012). For example, he notes that whilst string players can see much of their technique in relation to areas such as bowing and vibrato, flute players cannot see the speed or volume of the air column and require a more kinaesthetic awareness. Toff also notes this problem, stating that:

Wind instruments are shrouded in mystery when it comes to analysing tone production because it is difficult, if not impossible, to document most of the technique visually...You can observe external embouchure shape, but you can't see the airstream either in the mouth or as it crosses the embouchure hole of the flute. For this reason, flute pedagogy is inconsistent. (1996. p.94)

These issues are also raised by several expert performer-teachers (Moyses, Bernold, Nyfenger) and their observations are discussed in Chapter 3.8.4. I observe that similar issues are also notable in vocal pedagogy, which is perhaps why so many writers cite singing technique as a valuable source of instruction for flute players⁷⁶.

In addition to the work of Bastani Nezhad, two master's theses that have investigated some relevant issues relating to tone and tone colour in flute playing are those of Wilcocks (2006) and Hakala (2023).

Wilcocks conducts a literature review of issues relating to the embouchure, vibrato, and tone colour, and she creates practice charts that she suggests learners use when trying out and experimenting with various tone-related parameters. She provides a basic overview of embouchure-related issues, and includes a useful table, labelled 'Aspects of embouchure that influence tone production' (Wilcocks, 2006, pp. 12-13), reproduced below.

<i>Factor</i>	<i>Description</i>	<i>Diagram</i>
Vertical positioning	Relation of the lips to the lip plate: positioning the flute a bit higher or	

⁷⁶ See Chapter 3.7.3.


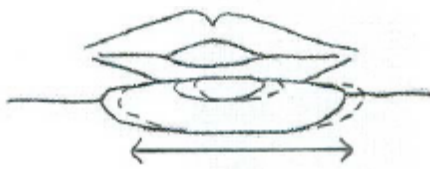

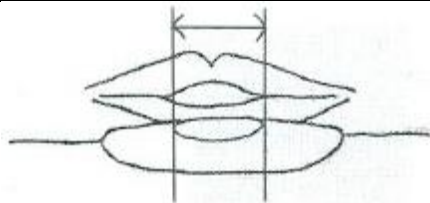
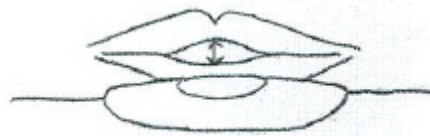
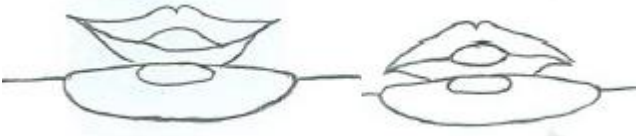
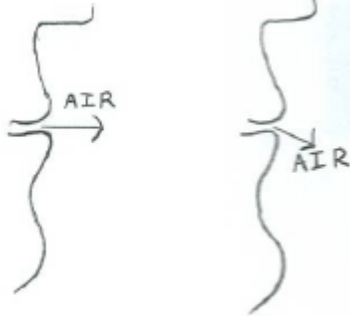
	lower on the lower lip.	
Coverage	The amount the embouchure hole is covered by the lower lip.	
Horizontal positioning	Relation of the lips to the lip plate: positioning the lip plate a little to the left or right of the centre of the lips.	
Positioning of arms	Lifting or lowering the arms effects the horizontal angle of the lip plate to the lips.	
Width of aperture	Horizontal distance (width) of the opening between the lips in relation to the width of the embouchure hole.	
Depth of aperture	Vertical distance (height) of the opening between the lips.	
Embouchure shape	Smiling, straight or sad embouchure.	
Angle of air jet	Lifting or lowering the air stream by moving the lower lip (jaw) forwards or backwards.	

Table 1: Wilcock's table 'Aspects of embouchure that influence tone production'

Additionally, Wilcocks gives an overview of opinions by some authors relating to: the positioning of the lip plate on the lower lip; the amount of the embouchure hole covered; the size (depth and width) of the aperture; smiling/sad/straight embouchure shapes; the

physiognomy of the face; issues relating to playing in different registers and playing intervals; issues relating to intonation and dynamics, and lip mobility (flexibility). She provides a more in-depth analysis of vibrato, including various author definitions, discussion of its purpose, its production, activities for learning vibrato, and vibrato ‘variables’, which she identifies as amplitude and speed.

Hakala (2023) focusses specifically on embouchure-related issues. She explores some limited literature, sometimes highlighting conflicting author opinions, before identifying problematic features of her own embouchure and documenting the process of changing/improving it, including examples of the exercises/resources used, and the results she achieved. Both authors acknowledge the importance of recognising the impact of differences in facial physiognomy on an individual level, and the importance of experimenting to find ‘what works’. Whilst Hakala presents a personalised description of her own journey melded with learning from the literature, Wilcocks presents a broader overview of existing knowledge, with the intention of informing specific improvements in ‘tone production with regards to embouchure, lip flexibility, vibrato and tone colour’ (Wilcocks, 2006, p.2). Some of the issues raised by Wilcocks are examined in greater depth in this chapter.

Other academic literature, most of which is not specifically relevant to tone and timbre in flute playing or does not explicitly make links to it, but is worthy of mention and adds to a sense of context, includes: *The Flute Inside-Out: Tracking Internal Movements in Flute Playing* (Junior, 2017); *Approaches and teaching methods in breathing and vibrato technique* (Kara & Bulut, 2015)⁷⁷; *A historical examination of the role of orchestral repertoire in flute pedagogy* (Malpass, 2013); *Articulation and the effect of language-specific consonant pronunciation on a flutist’s articulation within the French and English languages* (Torres, 2012); *Flute pedagogy within the Suzuki tradition* (Watson, 2011); *Chest wall dynamics during professional flute playing* (Cossette et al., 2008); *Integrating extended techniques into flute pedagogy* (Marrs, 2003); *Respiratory parameters during professional flute playing* (Cossette et al., 2000); and *Applying the principles of body mapping to flute pedagogy* (Pearson, 2000). In addition, there have been various investigations exploring flute tone from the point of view of spectral analysis of timbral qualities, including: instrument and headjoint manufacture (Benade & French, 1965); measuring in hertz the amplitude and frequency of mouth resonance (Coltman, 1973); blowing pressure (Fletcher, 1975, Han & Lee, 2016); the differing tonal qualities of different metals (Widholm, Linortner, Kausel, & Bertsch, 2001); the differences between woodwind

⁷⁷ Explored in Chapter 3.

instruments (Ely & Van Deuren, 2009); the presence and distribution of harmonics within the sound (Yorita & Clements, 2015)⁷⁸.

3.3 Books and Method Texts Written by Expert Performer-Teachers

The most widely utilised pedagogical materials relating to the development, production and application of tone and timbre in flute playing are found in method texts authored by expert performer-teachers. Performer-teacher books and method texts are written by recognised professional experts in the field based on professional embodied/enactive/embedded knowledge and know-how gained through years of experience. These methods are mostly ‘master-apprentice’ in nature, designed to share and promote the authors’ own personal practices, based on years of successful professional experience, with the intention of illuminating various aspects of flute-related technique and musicianship. They describe their own expert practice, offering advice, practical exercises, and specific repertoire or musical extracts to players looking to develop tone and colour in their practice. These texts also sometimes offer cautionary tales about possible adverse effects caused by poor or less-than-optimal technique.

Method texts often identify relevant issues and provide suitable materials for use on working to develop skills and overcome problems, but upon closer analysis they often reveal a lack of depth and rigour and can seem anecdotal rather than factual; they are not academic in origin, reflecting instead what Persson describes as ‘commonsense teaching (derived from tradition and lore)’ as opposed to ‘trained or expert teaching (derived from empirical models and knowledge)’ (Carey et al., 2013, p.2).

In defence of the authors, they are not endeavouring to write an academic text nor to justify or validate their assertions; rather, they offer their wealth of professional experience and practical know-how, combined with their professional standing and success, as confirmation and validation of their knowledge and practices. It must be pointed out, however, that many of the concepts from method texts are taken by the flute playing community to be undisputed fact; these concepts have been shared so many times that they now represent a socially constructed common conception of truth and have a legacy which purports to be knowledge.

⁷⁸ Explored in Chapter 3.9.3.

The works of Moyse and Wye are the clearest examples of this. Having been used by successive generations of learners and having sold millions of copies worldwide, translated into several different languages - according to Wye's website his books have been 'translated into eleven other languages and have sold over one million copies' (www.trevorwye.com/biography) - they continue to be core texts in pedagogical settings, and they continue to influence new pedagogical materials and publications; their content has a reach far beyond anything so far produced by academia. While many of the ideas contained in these texts work perfectly well, there are also frequent contradictions and differences of opinion between authors. For example, where one author centres on use of the embouchure as the primary means of manipulating tone and colour (e.g., Moyse), another will focus on use of air stream, placing the embouchure as a side issue (e.g., Debost).

The value of these method texts and their corresponding approaches and exercises has the potential to be greatly enhanced by a research-informed understanding of how to use them effectively. Where author instruction is lacking or unclear, or where multiple authors contradict one another, researchers have the opportunity to illuminate how expert performer-teachers use these texts in their one-to-one teaching studios in ways not specified or instructed by the author and not documented elsewhere. Understanding about how these method texts are utilised to best effect within the expert performer-teacher one-to-one teaching studio has the potential to elevate their usefulness, making them of greater pedagogical value to those who lack access to the privileged, competitive, and expensive world of the 'secret garden'.

The authors and method texts explored in this review were chosen to identify and highlight current common thinking and practice, but they are by no means exhaustive; there are so many that this would be an impossible task. Similar ideas are also expressed by other authors, but the intention here is to address each major theme in a complete and full manner using a selection of the most commonly utilised texts. It should be acknowledged that as a UK-based investigation the texts explored are those most commonly utilised in UK educational settings, as identified by the expert performer-teachers who took part in this investigation, and by the literature itself.

Some of the themes to emerge are conceptual, whilst others are more practical in nature, thereby lending themselves more readily to explanations that can be viewed through the six lenses of my theoretical framework. The following is an exploration of current knowledge and understanding, gained from the writings of expert performer-teachers and from academia, of a

range of issues that affect and influence the production and musical application of tone and colour/timbre.

3.4 Timbre / Tone Colour

In Chapter 1.4 I examined ideas relating to how timbre or tone colour might be understood (McAdams et al., 2004, Dolan, 2013, Wallmark & Kendall, 2018), and how it can form part of the distinctive sound and musical personality that distinguishes many elite musicians, highlighting how this understanding contributes to a variety of elements related to musical performance and communication (Holmes, 2012). I also cited Baxtresser (1996) advising that in orchestral auditions flautists should take advantage of ‘a tremendous opportunity to explore the full range of colours and dynamics’, with an implicit understanding from her statement that not all auditionees do take this opportunity. In this sub-chapter I investigate why flute pedagogues believe timbre or tone colour to be of such importance, and what can be learned from non-research-based flautist-authored literature.

Performer-teachers are much more likely to discuss colour, with all its subjective, aesthetic, and artistic connotations, than to analyse timbre in a more detached, scientific way. This is perhaps because, first and foremost, they are artists themselves; they identify as artists and they see high levels of artistry as the pinnacle of achievement in this area, with issues relating to pedagogy given a lesser status, as discussed in Chapter 1.

Whilst colour is often talked about within the discussion of tone, there is often little depth to the discussion, which is usually limited to the desirability of playing with a variety of colours, linguistic descriptions of different tonal qualities whose subjective nature create confusion and communicate ideas poorly (Nyfenger, 1986, Toff, 1996, Bastani Nezhad, 2012), and some limited advice about ways to explore creating and manipulating tonal colours. For example, in ‘On Sonority – Art and Technique for Flute’, which is a core text in many expert performer-teacher studios, Moyses writes ‘The tone should be broad and generous for the first three pieces, fluid and bright (different timbre) for this last one’ (1934, p.27). There is no explanation of what he means with these descriptions of tone or what a player might do physically to explore how to achieve either of these timbres. I acknowledge that being too prescriptive or dogmatic with instructions might risk limiting learners’ imaginations, or making suggestions that work for some but not all. However, offering ideas and tools that facilitate personalised learner exploration and might empower learners to develop their own tone and timbre-related know-how intuitive heuristics seems to me to be a missed opportunity in these texts.

The noted French flautist Phillippe Bernold⁷⁹ notes, like Baxtresser, that the potential of the flute to create a wide range of timbre and colour is often not prioritised or taken advantage of by flautists. He says:

The flute's ability to play with tone colour is an almost singular advantage yet it is one I have often observed neglected by many flutists, who rather maintain an aggressive tone colour. This deprives the performer of the pleasure and beauty of the more mysterious, 'fluted' sound'. (2016, p. 71)

Baxtresser and Bernold highlight how tone colour contributes to both employability and expressive possibilities, which are surely high on the list of many learners' objectives, and raise the question of why tone colour is often neglected. I ask, is the pedagogical literature in use lacking or deficient in some way? Do teachers lack the tools to teach tone colour effectively, or is it simply not prioritised? From a pedagogical standpoint, this neglect needs to be addressed.

In describing the absence of colour, Wye writes:

The artist may be perfectly happy to draw in black using white paper. If you wish to make only one kind of sound, then the choice of colour will be yours. These exercises will help you to experiment with a whole palette of colours out of which you will be free to choose one, or more, of the colours, in order to paint your musical picture. (1988, p.17)

Wye seems to imply that a lack of colour equates with a lack of musical interest and that a full palette of colours gives greater expressive possibilities. Like Wye, his student Clare Southworth writes of a palette of colours, stating that 'artists have at their disposal an unlimited palette of colours. Through (deliberate) practice flutists can also achieve the flexibility required to develop their own palettes' (2008, p.3). Wye and Southworth's analogy between music and painting is also seen in academic research. Karel Lill writes that 'relationships among the visual and aural arts - especially between color and sound - have been postulated by artists and composers for a variety of purposes' (2012, p.35). These colour/sound analogies seem to me to simultaneously offer possibilities whilst also being problematic; they can serve to spark imagination and creativity, but they also represent another example of subjective, opaque

⁷⁹ Professor of flute and chamber music at the Conservatoire National Supérieur de Musique de Paris and writer of several exercise books on aspects on flute pedagogy.

language that in pedagogical settings might lead to miscommunication, misinterpretation, and misunderstanding.

The use of metaphors to attribute aesthetic and artistic qualities to sound is problematic because of their personal and subjective nature; they often lack common understanding and agreement, or a measurable, scientific definition. This problem is a common feature of the most widely used current pedagogical flute literature. For example, Wye writes about a spectrum of colour with ‘dark and rich’ at one extreme and ‘light and hollow’ at the other (2015, p.10), but what exactly do these words mean? How do they sound and how do flute players create them physically? Toff highlights this issue, citing Vernon Powell saying: ‘Everyone...speaks of dark and bright tone, and I’m never quite sure what they mean. Tell me, when you speak of a dark tone, what is it you are looking for – pea green, cerulean blue or black magic?’ (1996, p.99). Nyfenger similarly writes that ‘affixing names such as dark, light, bright, heavy, German, French, or tubby only adds to the confusion, as each person has a highly personal definition of what each of these terms conveys’ (Nyfenger, 1986, p.9). The issue is echoed by Bastani Nezhad, who writes ‘the problem with this verbal approach to labelling tonal qualities is that these attributes are more a matter of personal preference and may sometimes serve as pragmatic considerations rather than being a precise definition of good tone’ (2012, p.36).

Expert performer-teacher Nyfenger (1986) recommends learner exploration, and provides the student with some ideas and exercises designed to discover new timbres in their playing; once new timbres are discovered he recommends practising long notes with gradual metamorphoses between timbres in order to isolate and control each one, initially maintaining the same dynamic level and later adding crescendos and diminuendos. He also draws the reader’s attention to issues around projection and the long process of learning from aural feedback, first from teachers, friends, and colleagues, and later, developing the skill to judge for oneself. He notes that some timbres ‘may be fascinating on the stage, but do not project to the audience and thus imply selfishness and/or lack of experience’⁸⁰ (1986, p.114), although he does not give any clues as to identify the timbres to which he refers.

In the high register of the flute, Nyfenger recommends trying to capture in the sound some of the fundamental note from the lower octave, addressing the need to be aware of the distribution of the harmonics within the note, which reflects the research findings of Yorita and Clements,

⁸⁰ It is worth noting here that whilst some of these timbres might not work on stage they may have other expressive uses, for example in the recording studio, and might therefore be worthy of student exploration.

2015⁸¹. Wye also asserts that the more the fundamental (lower octave) note is present in the sound of the middle and top octave the better the sound will project.

In learning to control timbre, both Nyfenger and Wye recommend starting from the hollow end of the spectrum. Wye states that ‘ the hollow *yellow* fundamental tone is the basis on which to add harmonics to produce a purple (more focussed) sound’ (1988, p.19), whilst Nyfenger writes that:

it is best to begin with a round, recorder-like sound and gradually modify the color than to bite down immediately and be trapped in a reedy, harsh sonority which falls dead in the first row of the audience, the so-called false center. (1986, p.63)

The idea of starting from the hollow end of the timbral spectrum also emerged in my primary research⁸², and I took this approach when structuring The Tone and Timbre Toolkit. The tools in my toolkit are designed to be explored both in isolation and blended in multiple combinations; they are grouped into tools that might facilitate timbres at the hollow end of the spectrum as well as tools that might aid in adding more focus and a greater harmonic content to the sound. Over time, through deliberate practice, I envisage them to become like a set of ingredients that can be effortlessly blended in varying combinations and quantities to control and manipulate all the various parameters of tone and timbre. Mastery of timbre/tone colour at an expert or elite level necessitates that the player can simultaneously blend (i.e., imagine, control, and deploy) a range of tools and skills in a manner that has become effortless, spontaneous, in-the-moment and instinctive.

3.5 Posture

Many students might not prioritise the development of good posture in their practice and may not understand the fundamental role good posture plays in achieving a good tone. Moreover, without expert-teacher support they might not be aware that their posture is deficient and inhibiting their tone and may lack the self-awareness to fix problems. Poor posture can also risk health implications for young players, particularly those who play asymmetric instruments like the flute. Schlumpf states that:

Recent cross-sectional studies in children of most music schools show that there is a continuously increasing development of musculoskeletal symptoms and disorders due

⁸¹ See Chapter 3.10.2.

⁸² See Chapter 5 onwards.

to an asymmetry of posture which is given by the kind of the musical instrument played by the pupils....muscular training, a consequent warm up before playing and rigorous time management can help to avoid these overuse or repetitive strain syndromes that often interfere with the ability to play the instrument as usual. (2013, abstract)

Similar issues were identified by Barczyk, Sipko, Demczuk-Włodarczyk and Boczar (2012). In a study involving 67 students split into violinists and non-violinists designed to assess the impact that playing an asymmetric instrument has on spinal curvatures, Barczyk et al. note that ‘it has been proposed that ideal skeletal alignment involves a minimal amount of stress and strain and is conducive to maximal efficiency of the body’ (2012, p.319), but that ‘playing an instrument often requires a certain posture and asymmetric position that may affect the anteroposterior spinal curvatures and may lead to postural asymmetry’ (2012, abstract). The asymmetric nature of flute playing posture, like the violin, is clear to see, but additional complications arise in flute playing as posture also affects the correct functioning of the breathing apparatus, the employment of which is necessary for playing the flute. Whilst there is existing research regarding flute posture-related injury (Dib & Sturmeay, 2007, Ackermann Kenny & Fortune, 2011), and that references practices such as Alexander Technique (Holm, 1997, Önal, 2022), and yoga (Lee, Carey, Dubey & Matz, 2012), there is currently no literature regarding how these issues are viewed by expert performer-teachers.

3.6 Embouchure

When discussing tone, the biggest single, recurring factor on which performer-teacher authored writings focus is the embouchure. Words like relaxed, stable, and flexible are commonly used to describe the features or attributes of a good embouchure, whilst words like tight and rigid are designated undesirable features. These are descriptions that I have already discussed in connection with the historical differences between the British and the French embouchure styles as they related to the playing of wooden and silver flutes, and they are clearly still relevant today.

The primary functions of the lips are described by Nyfenger as ‘...shaping and directing the airstream, changing the speed of the air to help change registers (but not without the help of proper support from below), and helping to color the tone’ (1986, p.46). Nyfenger cautions against using the lips as a ‘valve to hold back excessive air pressure’ (1986, p.46) as this leads to loss of control and fatigue. Other performer-teachers such as Debost, Gilbert and Bernold agree with this point. Debost adds:

...the lips should not produce any effort. Their mission is to lead the air brush (column) to the breaking edge (lip plate), but the energy of the air (speed and pressure) comes from many factors, but not from the lips. (2002, p.154)

From the currently most used pedagogical literature about the embouchure, I divided thinking into the following subheadings:

- i. Formation of the embouchure
- ii. The importance of a relaxed embouchure
- iii. Lip pressure and the lower jaw
- iv. The importance of flexibility
- v. Position of the flute on the bottom lip
- vi. Size and shape of the aperture

The overriding question here is how students and their teachers can work towards optimising the formation and use of the embouchure to enhance tone and timbre, whilst acknowledging that we all have a different facial physiognomy and that a variety of approaches is likely to be required to accommodate each player's individual physical characteristics.

Wye and Galway both caution against generalising about the embouchure, emphasising these individual physical attributes. Galway highlights that differences in 'the size of the mouth itself, the shape and thickness of the lips, how they come together when the mouth is closed, the space between them when it is open' (1998, pp.82-83), make rule making problematic. Wye states that 'every teacher has his favourite theory about mouth shapes and the correct *faces*' to pull' (1988, p.15) but cautions against learners copying or modelling their embouchure on either their idols or their teachers, and that this route offers limited success. He further states 'you are *you*; no one else...you must use what you have to obtain the best result' (1988, p.15), advocating that judgements about success or otherwise of embouchure formation be made on whether it sounds good.

Academics who have researched the flute embouchure include Garner, who identifies the 'Four Steps to a Good Embouchure' as follows:

- a) Put the lip plate under the pink part of the bottom lip.
- b) Form the embouchure as in saying the word pooh.
- c) Think of the air stream being split 60/40.
- d) Keep the corners of the embouchure down, don't smile. (2003, p2)

Garner asserts that ‘to produce a variety of sounds or tone colors, infinite adjustments of the basic embouchure are necessary’ (2003, p.1). This puts his research in agreement with Moyses, whose many publications, such as ‘On Sonority – Art and Technique’ (1934), put the development of embouchure control as the highest priority in developing tone and timbre, and contain daily exercises for lip flexibility and control.

Here we begin to see the pedagogical problems involved in teaching embouchure-related technique, and the need for approaches and materials that are adaptive to each individual student’s requirements. Pedagogy must acknowledge the uniqueness of each player’s apparatus and embrace personalised exploration and discovery rather than master-apprentice knowledge transfer as the best method for developing know-how.

3.6.1 Formation of the Embouchure

Various writers provide some basic guidelines, similar to Garner, for the formation of the embouchure. According to Floyd, Gilbert said that a ‘critical factor in producing a beautiful tone on the flute is the formation of the embouchure’ (1990, p.53), and he recommended consideration of the following factors:

- a) The position of the lips
- b) The placement of the jaw and chin
- c) The mouth and throat cavity
- d) The size and shape of the aperture (Floyd, 1990, p.53).

Here we start to identify the component parts of the flute player’s embouchure; lips; jaw; chin; mouth cavity; throat cavity; and size and shape of the aperture’, which are discussed later in this chapter.

Most writers warn against pulling or stretching the corners of the mouth, like in the old British school of playing, and Gilbert and Garner both advocate forming the lips as if to say ‘pooh’.

According to Floyd, Gilbert said:

For greater flexibility and refinement of the sound, turn the lips, especially the top lip, outward, as if saying ‘pooh.’ By bringing the lips forward and opening them outward, the player uses more of the inside of the lip. This allows the air stream to be guided by the smooth, inner surface of the upper lip. (1990, p.55)

From a pedagogical standpoint, Debost advises:

There is no ideal lip position. Teachers who constantly try to change their students' lip formation are actually doing them a disservice. Who says that your embouchure has to be dead center, at right angles with the flute? Pythagoras? Archimedes? If your position works (be it as crooked as mine), keep it there. Don't confuse logic and symmetry with ease and comfort: they are not necessarily roommates. (2002, p.69)

Debost highlights ease and comfort as the important factors here, along with the idea that players should be guided more by their ear than by a set of physical rules. The overriding objective with embouchure formation is to have ease and control over the quality of sound, and to avoid fatiguing the lips, so as to simply let the tone happen (Bastani Nezhad, 2013).

It is clear that what works for one may not work for all, and that many great players employ different embouchure styles; indeed, some elite players have crooked or offset embouchures that in theory should not produce good results, but do. I believe that these observations reinforce my thesis that empowering a learner-centred approach, in this case to embouchure-related teaching, working with the learner's individual physical set up to discover personalised modes of operational knowledge, of know-what to know how, is paramount.

3.6.2 The Importance of a Relaxed Embouchure

Many writers agree that 'relaxed' is a desirable feature in embouchure formation and that tension and/or tightness inhibits flexibility, which can have a negative impact on many aspects of playing, including intonation, dynamics, and colour. In my own practice I have found this assertion to be true. However, the degree to which 'relaxed' is desirable appears to be somewhat controversial; an embouchure which is too relaxed leads to a loss of control, which then necessitates the player to compensate by using too much air. Wye writes:

Relaxed is a fraught word: relax this, relax that. What is meant is that the muscles must be controlled but not rigid. They must be capable of movement in order to deal with tone colour, nuance, octaves, etc. There cannot be a totally relaxed embouchure, or there would be no tone. To relax is to collapse. Moyse sums it up in the word 'supple'. (1988, p.15)

Debost and Floyd agree with Wye. They all concur in stating that a certain degree of relaxedness enables lip and jaw flexibility, but a state of control needs to coexist if the player is to be able to manipulate the tone and maximise expressivity. Perhaps it is the jaw and chin that need to be relaxed more than the lips? 'Keep relaxed, especially your jaw', writes Southworth (2008), but 'Avoid tension or rigidity in your lips' (Wye, 1988), and 'When you

play with a tight embouchure you don't have any flexibility in your lips because they are too rigid' (Floyd, 1990, p.77).

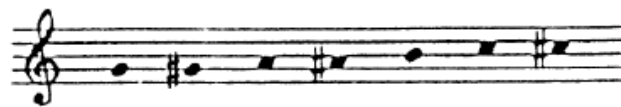
Moyse highlights of paramount importance the need to keep the lips free at all times. Of the lower jaw Moyse suggests that its job is to 'adjust the angle between the flute and the lips' (1934, p.4), listing the advantages of working this way as:

allowing plenty of freedom for the lips to vibrate in the manner of an oboe reed, to produce different tone colours, to link notes together in a supple way, to use slight changes in pressure in order to correct faults arising from the use of *f* and *p*, and to work for lengthy periods without tiring. (1934, p.4)

There is clearly much uncertainty in this area caused by differences in approaches and teacher-performer anecdotal evidence that my research can address.

3.6.3 Lip Pressure and the Lower Jaw

Moyse discusses lip pressure in relation to register and homogeneity of tone. Writing of the bottom octave he states that short tube notes, heading up to C sharp in the treble clef stave, become increasingly easier to play because fewer keys are pressed down so less of the tube of the flute is in use. This ease means that as the pitch rises, heading to the C sharp, the notes 'emerge with increasing vigour, colour, and height, indeed sometimes too much' (1934, p.3).



Conversely, as more fingers are added as we play from G down to low C the notes get more difficult to play because 'the column of air has to pass through an increasingly long passage (tube), and they will therefore emerge increasingly weakened and lacking in warmth' (1934, p.3).



To combat this natural tendency, Moyse recommends that as we move upwards towards C sharp the lower jaw should be retracted and lip pressure should be decreased; conversely, as we play down towards low C, 'the jaws should be increasingly tight with the lower jaw advanced, and lip pressure should be increased' (1934, p.4).

In the middle octave the same is true, only less so, as ‘some lip pressure and a slight displacement of the jaws are already required to take (play) the higher octave’ (1934, p.4).



3.6.4 The importance of flexibility

A flexible embouchure enables the player to adjust timbre, pitch, and dynamics, and it also enables smooth, legato playing over large intervals. There seems to be much agreement that once an optimal embouchure is established, movements need to be as small as possible, as large movements cause problems by overworking and fatiguing the lips. Flexibility enables the air to be shaped and directed and is achieved by very small movements of lips and jaw. According to Galway the movement of the mouth should not be visible, and flexibility in this context does not mean looseness. He adds that the embouchure remains tensed and the adjustments to it are so tiny as to be hardly perceptible (1998).

Debost asserts that ‘lip gymnastics are harmful’ but acknowledges that ‘...slight lip movements are almost inevitable when changing registers, especially in conditions of stress during public performance and auditions’ (2002, p. 155). By contrast, Gilbert advocated for flexibility of the lip muscles and asserted that both the top and bottom lip need to be free to move in order to guide the air effectively, but cautioned that ‘being so loose that the air cannot be guided is too extreme...’ (Floyd, 1990, p.55).

It appears that when discussing a relaxed and flexible embouchure, breaking down the individual components of the embouchure and the functions that they perform is key. The literature tells us that: a relaxed jaw and chin is desirable as it creates more resonating space inside the mouth; the lips should be flexible and supple enough to guide the air in different directions but if they are too loose control is lost; and an aperture that can easily change in size whilst avoiding tension and rigidity enables greater flexibility and control. Most writers recommend the minimum of movement necessary throughout the compass of the instrument, whilst acknowledging that some, limited movement is necessary for octaves and large intervals, dynamics, intonation and colour. Perhaps a comparison can be drawn by comparing the flute player’s embouchure, and the way it directs the airstream, to the bow of a string instrument. If the hair of the bow does not have enough tension, contact with the string will be compromised,

in the same way that an embouchure that is too relaxed will not be able to control and direct the air stream in different directions, will necessitate too much air to be exhaled, or will find it difficult to change aperture size to make changes to expressive parameters such as colour, dynamics and intonation. Further comparisons between string and wind playing can be found in Chapter 3.8.4.

3.6.5 Position of the Flute on the Bottom Lip

A slightly different factor that can contribute to a lack of flexibility is the incorrect placement of the lip plate on the chin or lower lip. Placing the flute too high on the lip (as might be encouraged for playing the piccolo) can have adverse effects. Wye, like Garner, states that for most people ‘the embouchure hole is best placed at the edge of the red part of the lip’ and that ‘if the lip-plate is too high on the lip, it will be difficult to focus the tone’ (Wye, 1988, p.17). Placing the lip plate too high can also cause problems with dynamics and create a tight quality to the sound. Floyd agrees with this, stating ‘remember not to position the flute too high on the lip. Lowering the flute on the lip allows the air stream to be directed downward, adding to the harmonic content of the sound and a greater dynamic range’ (1990, p.56). Nyfenger similarly writes that ‘placing the flute under rather than on the lip’ frees the lower lip, allowing it ‘maximum mobility and flexibility’ (1986, p.49), adding that it enables a deeper angle of the airstream resulting in greater depth of tone and easier manipulation of the angle to make changes to dynamics and colour (1986, p.49).

The question of how much of the embouchure hole should be covered by the bottom lip receives a variety of answers, appearing to be a constant variant depending on the colour and dynamic level required, and also differing according to the physiognomy of each individual player, and the construction of the flute headjoint. Likewise, there are varying opinions about the amount of pressure with which the lip plate should be placed on/under the lower lip, with some writers (e.g., Debost, Galway) encouraging some pressure as an aid to stability, and others (e.g., Gilbert) arguing for minimal pressure as it limits flexibility and causes tension.

3.6.6 Size and Shape of the Aperture

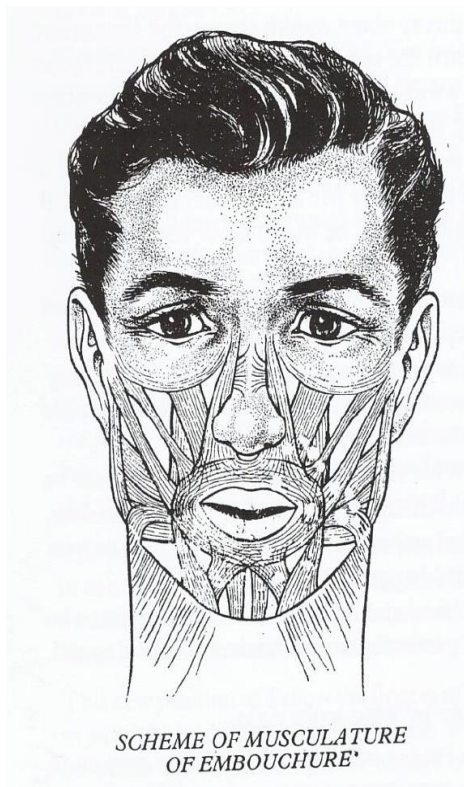


Figure 9: Scheme of Musculature of the Embouchure

(Wye, 1988, p.16)

The centre of the embouchure, the hole through which the airstream is directed toward the flute, is called the aperture. The size and shape of the aperture are clearly important and there are many muscles involved in making changes to them, as illustrated in the ‘Scheme of Musculature of Embouchure’ diagram opposite. We have established that a relaxed or supple state needs to coexist with the correct amount of tension in order to exercise control over various expressive parameters (timbre, dynamics, intonation, etc.) whilst avoiding the embouchure collapsing. It is widely agreed that changes to the aperture should take place in the centre of the lips and that controlling the aperture from the lateral part of the lips causes problems relating to tension and rigidity. If the aperture is too big then it requires too much air to be used and often results in an airy, unfocussed tone quality; if it is too small the tone is squashed, sounding thin, pinched, and small. The size of the aperture affects the harmonic content of the tone⁸³. An oval shape to the aperture is generally considered more favourable than a round opening, but individual physical characteristics of the mouth and lips also play a part here, reminding us of Galway’s assertion that it is difficult to generalise.

⁸³ See Chapter 3.9.4.

3.6.7 Overview of the literature relating to the embouchure

The following overview of the embouchure related literature is offered to aid the reader in identifying: the various parameters that might affect embouchure formation and use; where authors are in agreement/disagreement; where authors do not prioritise specific parameters; and which parameters are most commonly identified across all authors, which might be taken as an indication of importance.

The writer states the importance of...	Floyd/ Gilbert	Debost	Wye	Bernold	Southworth	Galway	Garner	Moyses	Nyfenger
understanding that individual physiognomy makes everyone's optimal embouchure different		✓	✓			✓		✓	✓
maintaining a natural position of the lips	✓	✓						✓	
understanding that too relaxed is undesirable	✓	✓	✓			✓	✓		
the position/ability to move the jaw and chin	✓	✓		✓			✓	✓	
The function of the mouth cavity and throat	✓	✓	✓		✓	✓			✓
the size and shape of the aperture or mouth hole	✓		✓	✓	✓	✓		✓	✓
the angle/direction of the air directed against the back wall of the embouchure plate.	✓	✓	✓			✓			✓
not stretching/pinching the lips laterally (into a smile)	✓	✓	✓	✓					✓
maintaining a lip position that is more or less the same in the higher as in the lower register, stating that movements should be minimal/imperceptible	✓	✓		✓		✓			
covering/uncovering	✓		✓	✓				✓	✓
stability on the chin	<i>against</i>	✓				✓			<i>against</i>

The placement of the lip plate on the bottom lip/chin (not too high)	✓		✓				✓		✓
Having totally flexible/supple lips		✓				✓		✓	
using of vowel sounds to change colour	✓		✓		✓	✓			
a relaxed, pouting lip formation	✓						✓		
turning the top lip, outward, as if saying ‘pooh.’	✓						✓		

Table 2: Overview of the literature relating to the embouchure

3.7 Airstream/Air Column

I have already drawn attention to some of the issues relating to airstream, such as its invisible nature and how it is directed by the lips, and it is clear that use of airstream is a major factor in tone production (indeed for some writers, like Debost and Bernold, it is the principal factor, ahead of embouchure). Bastani Nezhad describes the air column as ‘the vibrating tube that stretches from the lungs up towards the mouth shaped as embouchure and continues along the whole length of the flute. The air column generates the energy of the tone’ (2012, p.38). Bernold states that ‘Control over both ends of the air column accounts for a rich, full, nuanced and sophisticated sound’ (2016, p.4). With these statements the importance of the air column to tone quality are clear, and we begin to have a mental image of the air’s journey from the lungs, through the mouth, exiting through the lips, and traversing along the length of the flute. Bernold draws our attention to the starting point of the air column, the support mechanism for exhalation, and to the point where the air leaves the body, via the lips, and makes contact with the instrument, specifically the cutting edge of the lip plate. Once the air has left the body and is inside the instrument it continues to have impetus but is henceforth out of the player’s control. Here we see how the lips and the airstream work together, with the lips enacting the players’ final opportunity to influence the air before it exits the body.

3.7.1 Embouchure vs Air Pressure/Speed/Volume

Once an optimal embouchure is established, the volume of air exhaled must be carefully regulated, and as already discussed, it is dangerous to try to push too much air through the lip aperture. Too much air has an adverse effect on lip flexibility (Moyses, 1934, Nyfenger, 1986,

Debost, 2002, Gilbert/Floyd 1990) by putting too much stress on the lip muscles, resulting in fatigue. It can also result in an airy tone quality that does not project well, a lack of colour and focus, running out of breath and problems with long phrases, and inhibit control over dynamics, intonation, and articulation.

In general terms, air pressure/speed is slower in the lower register and increases as the pitch rises. If you are going to use more air, the aperture will need to increase in size, and vice versa, but writers suggest that more air does not necessarily equate with a bigger sound, and they encourage an economy of air that focusses on resonance to create a big sound rather than relying on a bigger volume of air. William Bennett talks about a ‘harmonics-in-tune’⁸⁴ sound, saying that when the harmonics are in tune the sound is resonant and projects, and it is this that makes the sound big, not the use of a large volume of air (Seed, 2016).

There is clearly a need to balance the volume and pressure of the airstream with a flexible and supple embouchure, thereby enabling the two to work together and not to each other’s detriment. Different writers give different weight of importance to these two factors. As already identified, many writers, including Floyd, Debost, Galway and Bernold, recommend an embouchure that barely changes throughout the compass of the instrument. They recommend only minimal embouchure changes when changing register or playing large intervals, and advocate for changes of register instigated by increases and decreases in the air pressure. Any movement of the lips should simply occur naturally to accommodate the airstream, the result of a state of suppleness and lack of tension. In this way the lips accommodate and assist the changes of air pressure but do not lead the changes. Actively changing the embouchure can lead to unintentional changes of colour, intonation problems, and poor legato. Bernold writes that the:

...lip position should remain more or less the same in the higher as in the lower register. The point is to increase the volume of air when playing higher pitches - in other words, blow a little stronger. The resulting sound may be a little unrefined at first, but I strongly advise students to persevere and practice. The next step will be to refine their playing once they have eliminated every (possible) source of tension. (2016, p.6)

Bernold also notes an interesting contradiction between Moyse and Debost in relation to the function of the embouchure versus the air stream. He notes:

⁸⁴ This concept arose many times in my primary research activities, and is explored in Chapter 6.3.2.

Two great masters and two different and contrasting schools of thought on flute acoustics and aesthetics: while Moyse bases his trademark tone development technique on correct lip aperture and chin movement without paying particular attention to breath issues, Debost goes the opposite way and almost exclusively uses breath to shape sound in every register...I would gladly combine the two schools: breath control is essential in my own conception of flute playing, but the correct use of lips and jaw is very important for broadening the dynamic palette, varying tone colors, acquiring good intonation - and generally improving one's playing. (2016, p.72)

There is clearly uncertainty in this area caused by differences in approaches, and Bernold's pragmatic mix of the two is likely a sensible one. Through heuristic exploration learners should seek to find the balance that works for them.

3.7.2 The Angle of the Air (covering/uncovering)

The next factor that affects timbre is the angle or direction of the airstream. Aiming the air column higher or lower can affect pitch and dynamics, but it also affects the presence, number, and distribution of harmonics in the sound, and therefore the timbre. To resonate and project, low notes need to contain some higher harmonic partials within the sound, and conversely, high notes need to contain lower harmonics if they are not to sound harsh and shrill. This reflects the need, stated by Yorita and Clements (2015)⁸⁵, for the sound to contain a balanced distribution of harmonics. The harmonics contained within a note are adjusted by a combination of factors, but air direction and speed, aperture size, and the amount of the embouchure hole that is un/covered, assuming that the embouchure is not tense or rigid and has the correct balance of relax and tension, are key.

The term 'covering' is often used to talk about directing the air more downwards into the instrument (into the hole in the lip plate). According to Gilbert, covering requires the top lip to protrude further out over the bottom lip (or the bottom lip/jaw to recede) and/or the bottom lip to cover more of the hole in the lip plate. The opposite, 'uncovering', involves raising the direction of the airstream. Uncovering involves having the bottom lip/jaw more forwards and/or having the bottom lip cover less of the hole in the lip plate. The degree of un/covering affects the harmonic content of a note, and therefore the timbre, as well as intonation and the dynamic level. Gilbert advised to cover more whilst playing *forte*, pushing the upper lip forward and pulling it down over the teeth whilst simultaneously withdrawing the bottom lip

⁸⁵ See Chapter 3.10.

and chin, resulting in a lower angle of airstream and a flatter pitch, and conversely, to uncover more whilst playing *pianissimo*, lifting the upper lip away from the teeth and pushing the lower lip/chin forward, resulting in a higher direction of airstream and a sharper pitch (Floyd, 1990).

Wye further observes the effects that covering to a larger or smaller degree can produce, and highlights how this can affect the harmonics contained within the note. He also links these effects to projection and differences in perception regarding what the player hears in comparison to what the listener hears. Wye writes:

By turning the head joint in and covering the embouchure hole too much, a false tone is produced, which is a recipe containing strong upper partials and little fundamental. We say that the sound is buzzy. What is strange is that this tone quality sounds loud to the player but small and directional to the listener; a sort of 'keyhole' effect. When some exercises have been practised with the embouchure hole more uncovered, the directional buzziness becomes less marked and, if the airstream is also lowered, the tone appears to come from a general area, rather than from a fixed point. The player is often unaware of this. You need a good teacher or another player or, at least, another pair of sensitive ears to help check what's happening. (1988, p.18)

The implications of these observations are discussed in more detail later in Chapter 3.11, 'Acoustics: The Performer and the Listener'

3.8 Resonance

Before addressing issues of resonance in flute playing, I found it useful to first consider some dictionary definitions of the words 'resonate' and 'resonance', as they would be used in the context of discussing the sound of a musical instrument.

Definitions of 'resonate':

1. (Oxford Learners Dictionaries online, 2023) to make a deep, clear sound that continues for a long time
2. (Cambridge English Dictionary, online, 2023) to produce, increase, or fill with sound, by vibrating (= shaking) objects that are near
3. (Collins English Dictionary, online, 2023) If something resonates, it vibrates and produces a deep, strong sound

Definitions of 'resonance':

1. (Oxford Dictionary of English, online, 2023) the quality in a sound of being deep, full, and reverberating.
2. (Cambridge English Dictionary, online, 2023) the quality of being loud and clear
3. (Cambridge English Dictionary, online, 2023) the production of a sound as a result of vibration (= shaking) of another object
4. (Collins English Dictionary, online, 2023) If a sound has resonance, it is deep, clear, and strong

When considering these definitions in the context of flute tone and timbre, my attention is immediately drawn to the following words, questions, and observations.

1. Vibrat/e/ing/ion – ‘the production of a sound as a result of vibration (= shaking) of another object’. I ask: What ‘objects’ need to vibrate (instrument? body parts? the air?)? How can this vibration be best achieved? What does it look like /feel like/ sound like when achieved at various points along a continuum according to the desired timbre?
2. Reverberating – Is this a reference to the acoustics of the room or performing space, the instrument, or a desirable physical attribute within the body whilst playing? Or a combination of all? What does it look like /feel like/ sound like when achieved at various points along a continuum according to the desired timbre?

In addition, the adjectives *deep*, *full*, *clear*, *loud*, and *strong* are common features of these definitions, but using these adjectives might lead to confusion, as flute players need to resonate throughout the whole compass of the instrument, from low to high, and in all dynamic levels, from *ppp* to *fff*; for our purposes these definitions need to be explored and expanded.

The following are the common, recurring factors which the literature says affect resonance:

- The resonators, listed by various writers as: mouth cavity, diaphragm, throat, nose cavities, sinuses, chest, pharynx, larynx, the instrument etc.);
- Airstream (volume, speed, pressure, angle); and
- Levels of tension and rigidity.

It is worth pointing out here that the concept of resonance as understood by flute players is perhaps not how resonance is understood within the scientific domain. Resonance is an issue that has been discussed within the flute playing community over several decades, and is an example of the aforementioned knowledge that is socially constructed, rooted in tradition via lessons and masterclasses; knowledge constructed by listening and observing features of a ‘desirable’ sound as produced by elite performers or identified/modelled by the teacher, with

the objective of developing the ability to create, return to and reproduce said ‘desirable’ sound at will.

3.8.1 The Resonators

Most writers acknowledge the importance of the resonators within the body and the impact that they have on tone and timbre, and it is difficult to talk about the resonators without first acknowledging that they do not resonate in isolation. Debost asserts an indivisible link between the resonators and the airstream, identifying that it is the airstream that activates the resonators (2002). Resonance happens when the air exhaled by the flute player has the correct support, pressure and volume and then finds optimal conditions within the resonators.

Southworth identifies the ‘mouth, throat, sinuses and chest’ (2008, p.6) as the principal resonators’. Debost adds ‘nose cavities, forehead and inner ear’ (2002, p.14) to this list and also discusses the pharynx. Graf has an exercise combining playing and singing simultaneously, stating its purpose as ‘A relaxed optimum position of the larynx’ (1991, p. 18), although he does not explain why this is important or how it might sound and feel.

Accepting the idea that the resonators and the airstream work together symbiotically, learners must learn to allow all the resonators to resonate as much as possible, and to avoid inhibiting these vibrations. They can then start to isolate, maximise, switch off or combine specific resonators to achieve specific timbral effects. Developing the ability to control this effortlessly requires great skill at a sensory and auditory level, combining various elements of PAPAPI, but there is little advice in the existing literature on how to develop these skills.

3.8.2 The Mouth Cavity

Of all the resonators it is the mouth cavity which appears to have the biggest single impact on timbre. When considering the mouth cavity there are two main areas of discussion: (1) Creating a big ‘resonant’ space inside the mouth, and (2) changing the shape of the cavity inside the mouth to change the timbre. Writers discuss the effects of dropping or relaxing the jaw, creating more space between the upper and lower teeth, lifting the soft palette, using the feeling of a ‘semi-yawn’ to open the throat, and positioning the tongue in different places.

Southworth states that resonance refers to a fullness of tone which depends on the shape of the mouth cavities in which the sound can reverberate. She writes, ‘If the resonance is missing, then the tone will be thin. Your flute, mouth, throat, sinuses and chest all act as resonators’ (2008, p.6). To develop resonance when playing, Southworth says that it is necessary to ‘learn

how to raise and lower the soft palette' (2008, p.6) and links this to the feeling in the mouth and throat when yawning.

Floyd expands this idea further, noting:

The size and shape of the mouth cavity affects the resonating capacity of the air, and thus the tone quality. With more space in the mouth, an open throat, and proper breath pressure, the sound will vibrate freely on its own. Since the lower jaw and chin will be dropped down and back, more space will be created in the mouth cavity. By separating the back teeth, creating a half-inch or more space, an even greater sensation of dropping the jaw occurs along with more space in the mouth. Continue to enlarge the mouth cavity by opening the throat - sing ah or yawn. Sometimes, vibrating on a note will make you loosen the throat, and therefore the sound, because you have to open for the sound to come out. (1990, p.58)

Based on these observations we can assert that new tone and timbre related pedagogy for flute players needs to combine exercises designed to aid physical awareness and control of the resonators with high levels of aural perception, again reflecting PAPAPI. Learners need tools designed to explore how they can change, control and manipulate various parameters; they must notice what they do, how they do it, and the resulting changes in tone and timbre, developing the skill and control required to replicate desirable outcomes at will, and eventually to do this in an instinctive and intuitive manner so that thinking about technique and physical enactments does not impede or inhibit musical expression and communication.

3.8.2.1 Vowel Shapes

Employing different vowel shapes is a commonly recommended way of changing the shape of the resonating cavity inside the mouth that many writers say has an impact on timbre. One method for exploring this is to experiment with the shapes created by employing different vowel sounds. Southworth writes:

...vowels will add an open and warm quality...a-e-i-o-u...increasing your awareness of these vowel sounds, and integrating them into your own playing, will greatly improve your tone production. It is these vowel shapes, along with air speed and direction, which give your sound its colour. (2008, pp.3-4)

Southworth states that the order of vowel sounds, from most open to most closed, is 'o-u-a-i-e', and that we should lengthen these sounds, 'like singers', to sound 'oh-oo-ah-ay-ee'. She gives proprioceptive clues to how these sounds feel, asserting that 'Oo and ee are called forward

vowels, because the tongue is more forward and sound slightly closed; Oh-ah-ay are open vowels because the tongue is further back in the mouth' (2008, p.4). She also states that the order can be rearranged thus, 'Oo-Oh-Ah-Ay-Ee', to go from 'the lightest sound or colour to the darkest sound or colour' (2008, p.4) and that this represents a sound spectrum that moves from the least amount of harmonic content to the most. Southworth adds that 'As you work through the vowels, the sound or colour deepens or darkens and this is because there are more harmonics present' (2008, p.4).

Wye and Galway also write about using vowel shapes. Galway suggests experimenting with the idea of open and closed vowels. He suggests that vowel sounds produced at the front of the mouth are more closed and produce 'bright' colours and that open vowels created at the back of the mouth produce 'dark' colours. As an exercise, he suggests:

Say a series of words to yourself, moving from closed-up to open, thus: flit, fleet, fled, flat, flute, float, flask (with a long 'a', London's pronunciation, not Manchester's). Note the different feel of these vowels inside your mouth. From now on you can forget the words and just use the vowel sounds (and shapes inside the mouth). (1998, pp. 97-98)

Galway's use of the adjectives bright and dark might confuse some learners. According to Floyd, Gilbert used these words interchangeably to mean the same thing depending on whether he was teaching in the USA or Canada. Whilst labelling timbre in a consistent, mutually understandable way might be desirable, this example exemplifies why it is difficult. What I believe ultimately desirable for learners is to understand and be aware of the physical mechanisms for changing colour. Exploring what different vowel shapes can achieve is one way, and developing the ability to control and use them effortlessly is the ultimate objective. I would invite learners to try Galway's exercise for themselves and label the sonic results in any way that they find useful or meaningful.

3.8.3 Learning from Singers and Singing Technique

Several writers make strong claims about similarities between flute playing and singing, and advocate adopting the practices of elite singing technique and the approach taken by elite singers towards creating a resonant singing voice as a role model for tone production on the flute. This forms part of a tradition started by the flute pedagogue J. J. Quantz (1697-1773) who compared the ideal flute sound to that of the contralto voice and advocated the imitation of the 'chest tones' (Quantz, 2001) of the human voice. Authors write of singers' posture, and the way that singers warm up, breathe, sustain a legato line, use vowel sounds etc. as providing

a model which could be useful to flautists, and investigating vocal techniques and how they might be applied to flute playing should be embraced. Southworth emphasises the musical benefits of this approach, stating that:

We need to use our flutes like a singer uses their voice. Flutists are guilty of trying too hard to get it right instead of expressing the music. In songs, singers use words, music, actions and facial expressions to create a picture or story, with feelings and emotion. (2008, p.1)

Other advocates of modelling tone and tone production on the voice include Debost, Floyd, Galway and Bernold. Bernold, like Southworth, focusses on the musical benefits of this approach, whilst moving towards some considerations of technique, writing:

Legato singing - the basis of a singer's vocal and musical expression results from the way the singer connects notes through breathing and breath control, making the sound flow from one pitch to another. It is probably the physical gesture needed to "sustain" the sound that affects the listener. One can notice how much intense emotional expression is used in the singing of wider intervals! Maybe musical expressivity lies "hidden" in intervals - in other words: the wider the interval, the more intense the expression! (2016, p.54)

Debost focusses more on physical and technical aspects:

I think the voice is the best example of tone production for flutists. If no respiratory problem affects you, open your throat, breathe and blow as in a yawn. Your tone opens up too. Try to open your nostrils. The pharynx opens even more, and the head's hollow cavities enter into sympathetic resonance, amplifying your tone and giving it timbre. Singers, our models, are well aware of this phenomenon: they call resonators the internal volumes of the face (mask). (2002, p.204)

Moyse, who for many years held principal flute positions in opera orchestras (firstly at Paris's Opéra Comique and later at Paris Opera) uses lyrical melodies, mostly taken from opera, as a basis for developing good tone in his book 'Tone Development Through Interpretation' (1973), and many other performer-teachers have since produced books with a similar aim, focus, and source material.

Much could be gained from a more in-depth investigation into singing technique and the way that singers use the resonators and the airstream. Greater understanding of singers and how

their practice is transferable to flute playing could offer significant new insights and an opportunity for a significant piece of new research.

3.9 Vibrato

What is vibrato? Wye describes vibrato as ‘a fluctuation in the tone of the flute, about three quarters of which is a rise and fall in pitch, while the remainder is a rise and fall in volume or loudness’ (2015, p.137). Galway describes vibrato as ‘the pulse of sound brought about by the rapid alteration of more or less forceful pressure of breath’ (1998, p.106). Nyfenger similarly asserts that:

The wind player...by increasing and decreasing the amount of air being sent into the instrument without adjusting for the resulting rise and fall in pitch, produces a vibrato involving both pitch and dynamics. These variables combine in limitless combinations of speeds and amplitudes. (1986, p.21)

It is learning to develop an effortless control of these limitless combinations of speeds and amplitudes of pitch and dynamic level that pedagogy needs to facilitate. The literature highlights a range of vibrato-related pedagogical considerations, focussing on style and repertoire, pitch and dynamics, speed and amplitude, tempo and note duration, as well as the importance of being able to play without vibrato. This review highlights where the technical and expressive imbricate, as well as the need to fully explore the different possible physical origins and mechanisms involved in vibrato production.

3.9.1 Schools of Thought

Moyse, like many French players of his time, believed that vibrato should come naturally rather than be taught. Toff (1996) writes that the early 20th century French performer-teachers Taffanel, Gaubert, Barrère and Moyse were all of the ‘natural’ school, believing vibrato to result from musical feeling rather than something produced. Interestingly, Gilbert did not use the term vibrato, but instead referred to ‘expression’, believing that ‘the term expression more accurately describes the total content of the sound, including volume (dynamics), and tone colour, in which one’s vibrato becomes part of the sound, not something one does to the sound’ (Floyd, 1990, p. 91).

Toff identifies three different schools of thought on vibrato. She states that:

The production of flute vibrato is a subject of much discussion. There are three basic schools of thought. The first postulates that vibrato is a natural part of tone production, which cannot and should not be taught. The second school believes that because vibrato must be carefully controlled, it must be taught. The third school takes a safe middle position: some players have natural vibrato but others must be taught to improve and control it. (1996, p.109)

Whilst the French flautists were proponents of the ‘natural’ school, Kara and Bulut (2015) cite Galway as a major proponent of the second school. Galway states that ‘vibrato should be taught as soon as possible, partly because it sounds nice and so encourages beginners, partly because it helps them get the sound more in focus’ (1998, p.106)

In their article ‘Approaches and Teaching Methods in Breathing and Vibrato Technique in Flute Education’ Kara and Bulut first assert that ‘vibrato is one of the main techniques which gives depth, colour, and even vitality to the instrument...’ (2015, p.126). Through a survey of academicians in both the USA and Turkey they examined opinions relating to vibrato production and development, and beyond a general agreement that ‘vibrato should be isolated and practised’ (2015, p.128) they discovered much disagreement. This included debate as to whether vibrato should be taught or should be allowed to develop naturally, and whether vibrato should be produced from the diaphragm, the throat or by a combination of both. Like Toff, they identified the three different schools of thought, citing high level performer-teachers who agree with each school.

3.9.2 Vibrato Production and Physical Origins

Wye discusses various ways that vibrato can be produced, but recommends a combination of ‘using the larynx’ and ‘fluctuating the air speed and therefore the air pressure with the diaphragm’ (2015, p.137). According to Wye, these are the two preferred methods because: they require no involvement of the lips; they allow the ‘throat to remain open’; and they encourage ‘correct use of the diaphragm for tonal support’ (2015, p.137).

Wye writes that both singers and players of other instruments average between three to seven vibrato ‘wobbles’ per second, and he offers exercises designed to train the flautist to achieve this, stating that ‘it is desirable to vary the vibrato according to the mood and speed of the music, and the octave in which one is playing’ (2015, p.137). Before starting to learn to produce vibrato he recommends mastering the ability to produce a straight note, without any involuntary fluctuations in pitch or unwanted vibrato. He then offers a stage-by-stage process,

starting with two to three ‘wobbles’ per second, achieved through a series of abdominal pushes, which he describes as ‘similar to silently saying ha ha ha ha’ (2015, p.138), and designed to produce an increase and decrease in air speed. The exercises then gradually increase the number of pulses and the range of notes covered, utilising simple scale passages and slow melodies.

Gilbert’s exercise (see below) is similar, working on a single note to practise diaphragm pulses that gradually increase in speed.

Example 37. Vibrato exercise—pulsing

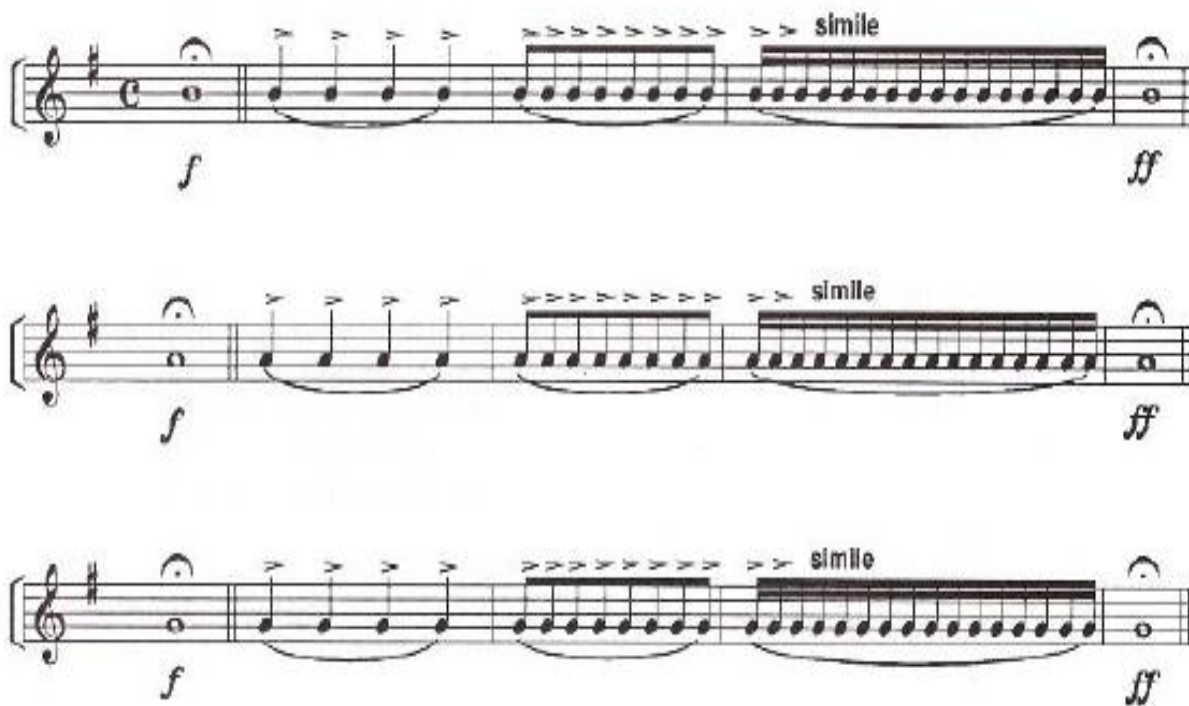


Figure 10: Gilbert’s Vibrato Exercise – Pulsing

(Floyd, 1990, p.98)

Gilbert said that ‘nobody knows precisely at what point vibrato goes from the diaphragm to the throat. It is impossible to explain so you give them (students) exercises to practise which take care of this problem’ (Floyd, 1990, p.98). He does, however, suggest that there is a point at which the vibrato speed becomes too fast for diaphragm pulses, and it has to move to the throat.

Galway also offers similar exercises for the early stages of learning to produce vibrato, as shown below. Galway recommends gradually increasing the speed of the ‘ha, ha, ha’ ‘until it

is really fast when you drop the ‘h’ and let the notes run together in a perfectly regular undulation of pressure’ (Galway, 1998, p.107)

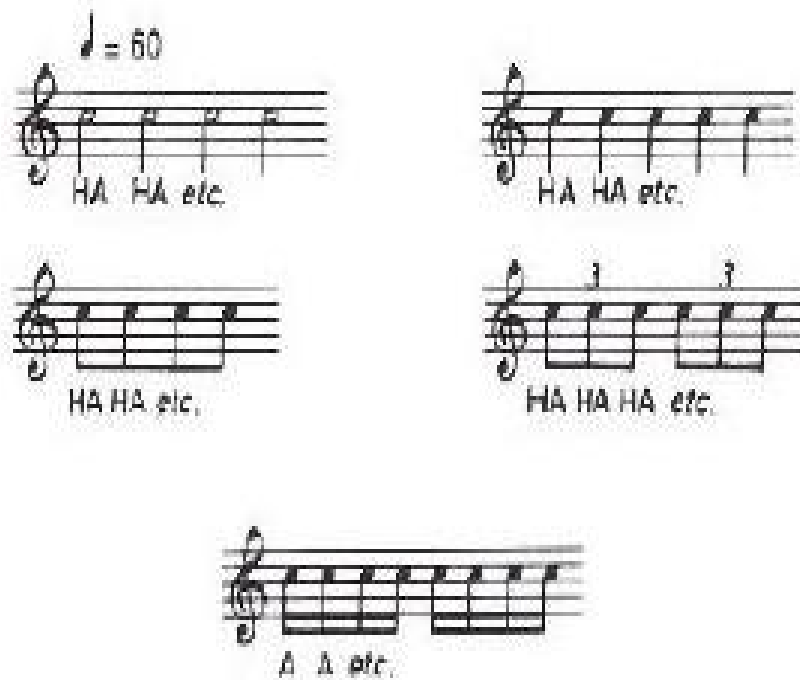


Figure 11: Galway's Vibrato Exercise 'ha, ha, ha, ha'
(Galway, 1998, p.107)

Gilbert additionally cautions that this approach to practising vibrato should only be used as an exercise and not employed in practising repertoire, stating it to be a purely mechanical exercise that risks inhibiting natural expression in performance if used to practise musical works. Wye also acknowledges that at this early stage the vibrato will be controlled and mechanical. His 'Stage 2' of the practice process involves trying to make vibrato 'a part of the tone and not something added to it' (2015, p.140), stating that 'vibrato should be within and inside the tone, not added on top' (2015, p.142).

For more advanced vibrato practice, Gilbert then recommends purposing Étude Progressive No.16 from Taffanel and Gaubert's *Méthode Complète de Flûte*, extract shown below, to combine vibrato notes with non-vibrato notes, exploring covering/uncovering and a back/forward position of the lips (or jaw), 'incorporating quick embouchure changes from forte to piano that coincide with quick changes in vibrato'.

Dynamics: $f > p$ $f > p$ $f > p$ $f > p$ $f > p$ $f > p$ $f > p$ $f > p$

Vibrato: ~~~~ ~~~~ ~~~~ ~~~~ ~~~~ ~~~~ ~~~~ ~~~~

Embouchure Position: C UC C UC C UC C UC C UC C UC C UC C UC

Lips: B F B F B F B F B F B F B F B F

C=cover, UC=uncover, B=back, F=forward

Used by permission

Figure 12: excerpt from *Étude Progressive No.16* from Taffanel and Gaubert's *Méthode Complète de Flûte* (Floyd, 1990, p.99)

Regarding the physical source(s) of vibrato, Toff (1996) also writes about production from the diaphragm and throat, and advises against jaw and lip vibrato, which she says are more appropriate in reed instruments. Galway and Nyfenger both assert that vibrato is produced in the throat, with Nyfenger stating that the throat is ‘the only place fast enough to emit a usable vibrato’ and that movement in the diaphragm or abdominals is ‘merely a reaction to the work of the throat’ (1986, p.79), whilst Galway adds that the diaphragm is ‘merely quivering in sympathy’ (1998, p.106) with the throat. Galway emphasises that vibrato must be taught, with the objective of mastering ‘a whole variety of speeds of vibrato, on every note and at every volume level’ (1998, p. 106).

Kara and Bulut (2015) cite a small scientific experiment (Gartner, 1981) conducted using twelve flute players as subjects, which concluded that vibrato originates in neither the diaphragm nor the throat, but rather more accurately described as originating in the ‘thoraco - abdominal’ region, also noting that the ‘larynx is actively participating with muscular activity’, making vibrato of ‘mixed origin’. They note that:

Thoraco-abdominal vibratos tend to be of lower frequencies, but the highest frequencies were produced by subjects with purely laryngeal mechanisms. Laryngeal vibrato has the widest range of all vibrato types and is preferred in *pp* dynamic levels in all registers. (2015, p.129)

From another experiment, Kara and Bulut cite Weait (as cited in Manning, 2012) conducting a similar experiment on himself using x-rays and video tape while playing. They conclude that ‘vibrato is not only produced with the diaphragm. The diaphragm muscle functions only as a supporter. The main muscles which help to produce vibrato are actually larynx, vocal cords and abdominals’ (2015, p.129).

3.9.3 Vibrato as Tone Enhancement

Moyse makes it clear that vibrato is an expressive tool and is at pains to recommend a tone that genuinely vibrates, with a ‘bell-like’ resonance. He states that the tone must already be ‘expressive because of its color, its fullness, its resonance’ (1973, p.15) before vibrato is employed. He writes that:

to make a tone vibrate is to emphasize and exteriorize its good qualities, to develop its resonance and heighten its sensibility. The more beautiful a tone is, the more its natural resonance can become expressively developed. One does not artificially make something vibrate that does not vibrate naturally. You only agitate it a little bit, that is all. (1973, p.16)

Moyse cautions against vibrato which is too rhythmically controlled, as in the early stages of Wye’s learning process, stating that it ‘will evoke much more of the fluctuation or undulation of a tone than it’s [*sic*] vibration’ (1973, p.16). He describes this as a ‘pseudo-vibrato rhythmically controlled by three, four or five pulsations per second that will blindly destroy the expression of a phrase because not all the notes of which it is composed have the same duration or the same expressive importance’ (1973, p.16).

Commenting on both the nature of vibrato on the flute and its use, Nyfenger reminds us that when choosing a vibrato style or when deciding to omit vibrato altogether, it is the musical style that informs these choices. He also cautions to be aware of the different vibrato requirements when playing long notes compared to playing fast passages of notes. He states that:

Long notes can be sustained with vibrato very easily without sounding distorted or artificial, whereas faster-moving notes may be adversely affected. Vibrato superimposed over a fast passage can cause disparities in the dynamic shapes of individual notes, as each note may unintentionally begin on strong or weak points of the vibrato loops. (1986, p.21)

Gilbert also confirms that ‘when playing fast, there is no need to use vibrato on rapid moving notes’ (Floyd, 1990, p.97).

Nyfenger also cautions that vibrato with too great a speed and amplitude can be described as sounding ‘bleating’ in the style of a ‘nanny goat’, with the resulting sound lacking in control rather than gaining in expressivity (1986, pp.21-22). This observation is echoed by Gilbert, who describes a vibrato that is too fast and too shallow as creating a nervous or restless quality in the sound (Floyd, 1990, p. 96), and he references Moyse stating that ‘if you play with nervous vibrato on every note, then you belong in the fields with the sheep and the goats – bleating [*sic*] with them’ (Floyd, 1990, p. 96).

3.9.4 Vibrato and Colour: Learning from String Players

Various expert performer-teachers draw attention to what flute players might learn from string players. Moyse and Nyfenger both write about the differences between how tone and vibrato are created on string and wind instruments. Moyse points out that tone and vibrato on string instruments can be separated and controlled completely independently by the left and right arm, stating that both a loud or quiet tone can be produced with either a light or an intense vibrato, whereas in wind playing, the tone and vibrato are dependent on the same air column and produced simultaneously, which means that the dynamic level dictates the intensity of vibrato. He states that ‘the vibrato will be light and discreet if the tone is soft. The vibrato will be prominent and intense if the tone is loud’ (1973, 16).

Moyse also writes that the flute’s ability to use vibrato as an expressive tool is inferior to that of string instruments, stating that in string playing ‘the vibrato is actually a direct complement of the tone. (It) intensifies its expression’ (1973, p.16), whereas on wind instruments he states that vibrato ‘intensifies nothing. It simply agitates the tone and remains a prisoner of the tone’s dynamic level’ (1973, p.16). As a result, Moyse asserts that ‘flutists in particular must impose upon themselves the duty of developing their tonal resources thinking of vibrato’ (1973, p.17). Although he does not write how to go about this, he does assert that awareness and observation are important in the process, stating that ‘For an artist the most precious of gifts certainly is the

gift of observation' (1973, p.16), foreshadowing a little, Clark's thesis of 'perception, action, and attention' (2013).

Like Moyses, Nyfenger asserts that string players can create a vibrato that employs a slight undulation of pitch without also affecting an undulation of dynamic level. He states that 'the string player moves his finger up and down on the fingerboard, shortening and lengthening the string to change pitch, while the bow maintains a steady pressure and speed' (1986, p.21), thereby maintaining a constant dynamic level. He contrasts this with wind players, where he describes vibrato as a rise and fall in both pitch and dynamics caused by increasing and decreasing the amount of air being sent into the instrument.

Nyfenger points out that all of the techniques relating to tone production on bowed string instruments 'stand out in the open, with the pitch-changing and vibrato-mechanism (literally) on one hand and the tone producing and articulation mechanism on the other' (1986, p.118). This ability to understand by seeing the tone production is in direct opposition to the invisible, hidden elements of tone production on the flute, as already highlighted by Toff (1996) and Bastani Nezhad (2012) in Chapter 3.2.

Turning from vibrato to colour, Bernold helps us to understand the potential of what tone colour can be by drawing comparisons with string instruments. By making a comparison between the degree of covering/uncovering in flute playing, which alters the length of what he calls the 'air reed' (or the distance between the lip aperture and the cutting edge of the embouchure hole), with the proximity to which the bow is placed near to the bridge, he creates a simile to help flute players better understand the degree to which string instruments can alter timbre, and to which flute players should aspire to emulate. He writes:

Like a bowed string instrument, the flute is able to vary its tone color. On string instruments, the quality of sound depends on the contact point of the bow on the string, between the lower end of the fingerboard and the bridge: the nearer the bridge, the more nasal and 'reedier' the sound is, as in *sul ponticello* playing, i.e. very near the bridge (the sound may even become grinding and grating); On the contrary, playing near the fingerboard will yield a muffled, diffuse sound, less defined but ethereal, softer and gentle. (Bernold, 2016, p.71)

Taking inspiration from the variety of timbres produced by other instruments is clearly one possible way of opening flute players to a bigger world of timbral possibilities. Just as the historic British school of flute playing aimed to emulate the sound of the oboe and clarinet, the

French school took singing as its ideal model of tone, and Moyse and Nyfenger take string playing as an exemplar, harnessing concepts of timbre away from the flute has the potential to inform working towards having the widest possible range of tonal contrasts. It would be my hope that working in this way might: facilitate an awareness that enables the ability to blend with or stand out from (in a soloistic manner) other instruments in ensemble situations⁸⁶; empower the realisation of players' musical imagination; empower the ability to be at the service of the composer or conductor and the requirements of the music; and empower the ability to communicate with the audience in an individual and authentic way, an ability that marks out truly elite performers (Holmes 2012).

3.10 Harmonics

This sub-chapter examines how harmonics and their relation to tone and timbre in flute playing are understood within the existing flute literature, where writing about harmonics falls into two main categories: (1) exercises based on the harmonic series designed to develop control of various aspects of technique that relate to tone production; (2) the harmonic content of the tone, where harmonics are sometimes referred to as partials or overtones within the sound.

3.10.1 Exercises Based on the Harmonic Series

Many writers have included exercises based on the harmonic series in their books, and Gilbert made several recommendations when practising harmonics exercises, as follows:

- (1) change from one harmonic to the next by increasing the breath pressure;
- (2) do not initiate the change from the lips – keep the embouchure still;
- (3) refrain from focusing the sound by turning in – the pitch will be flat;
- (4) find the focus by covering with the top lip. The more one covers, the more harmonics will be present;
- (5) keep the lips free from tension. Do not attempt to focus the sound by pulling from the corners of the mouth;

⁸⁶ See Chapter 3.12.

(6) when warming up on the harmonic series, do not force the upper notes. Start softly and get louder, making the tones vibrate very fast at the beginning (bell-like tones). (Floyd, 1990, p.67)

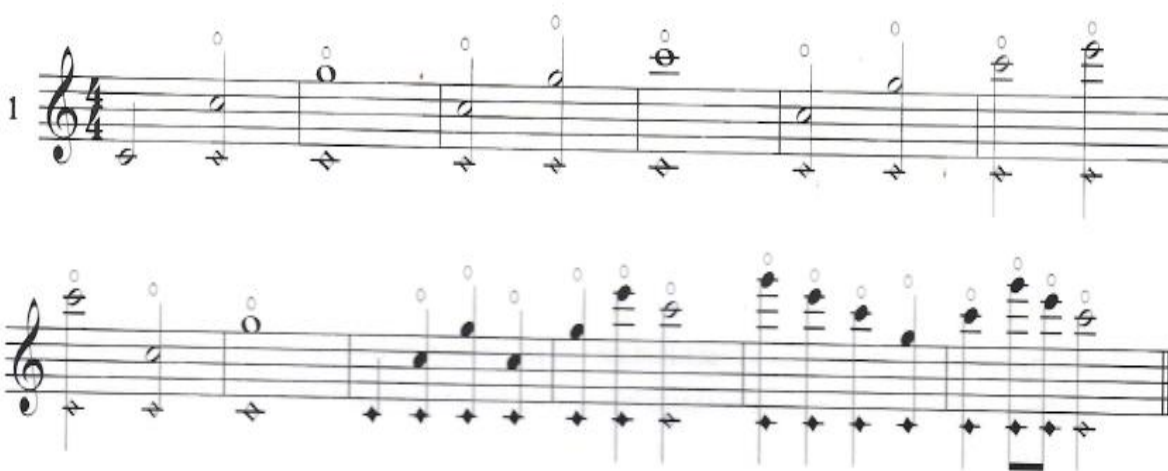
I offer here four examples of exercises using the harmonic series that form a representative sample of the existing knowledge and practice to be found in the flute pedagogy literature.

3.10.1.1 Wye (2015)

Wye provides exercises based on the harmonic series (see below). He describes harmonics as the ‘ingredients which make up the sound or tone’ and states that ‘when they are mixed together with the basic tone (the fundamental, or the first harmonic), they give tone its colour and character’ (2015, p.6). Wye states that when harmonics are already present in the low register, the middle and high register are easier to play, and he recommends young players to practise the harmonic series, starting on low C and blowing harder to achieve each successive partial, for a few minutes each day, to ‘help establish air speed and a richer tone’ (2015, p.6). In common with Nyfenger (see next sub-chapter), Wye then focusses on articulating each harmonic note, learning ‘where to place the note without cracking or splitting’ (2015, p.6). He then recommends repeating the exercises starting on the low fingerings for C#, D and Eb, emphasising the increase of air speed required for the higher harmonics. Wye’s exercises, as shown below, get progressively more challenging, building up to what he calls ‘bugle calls to learn how to pass from one harmonic to the other with confidence’ (2015, p.6).



Learn exactly where to place the notes without them ‘cracking’ or ‘splitting’.



Try some bugle calls to learn how to pass from one harmonic to the other with confidence.

The image shows three musical exercises for bugle harmonics, each on a single staff in treble clef. Exercise 2 is in 2/4 time and consists of a sequence of notes with fingering numbers above them. Exercise 3 is in 6/8 time and also consists of a sequence of notes with fingering numbers above them, ending with the word 'Fine'. Exercise D.C. is in 6/8 time and consists of a sequence of notes with fingering numbers above them, ending with the word 'D.C.'. The notes are arranged in a way that demonstrates transitions between different harmonics.

Repeat the three exercises using the fingering for low C[#], D and E^b.
Notice the increase of air speed required for the higher harmonics.

Figure 13: Trevor Wye's Harmonics Exercises

(2015, p.6)

No.1 of Wye's exercises above is also cited by Floyd as being recommended by Gilbert, and she reproduces it as an example, with permission, in her book (1990, p.67).

3.10.1.2 Nyfenger (1986)

Nyfenger recommends the practice of partials in order to develop 'supportive power, confidence, and the proper use and strength of the embouchure' (p.73), and he provides the following practical exercise using the harmonic series, also based on the low C fingering.



figure 29



figure 30



finger C, throughout

figure 31

Figure 14: Thomas Nyfenger's Harmonics Exercises

(1986, p.74)

In practising his exercises Nyfenger offers the following advice:

...begin by playing a large, free-sounding low-C and then, pushing the note to its limits without tightening the lips, allow C2 to emerge in a uniquely powerful and resonant form. The presence of the fundamental will give it additional richness. Keep this for

future use as a color. The next partial, G2, may be elusive, but only if you tighten up too much too soon and pass it by. (1986, p.73)

I note here some areas of agreement and contradiction with other authors. The idea of the fundamental adding richness is similarly expressed by Wye⁸⁷, but writing about tightening up ‘too much too soon’ implies that something has to tighten at some point, and tightening in any area, especially around the lips, is something that most writers caution against. Later, on the same page Nyfenger cautions to be aware of reducing tension and minimising lip movement, which implies to me that any tightening should be minimal.

Nyfenger continues with the following words of caution: Do not roll the flute inwards to achieve successive notes in the harmonic series (also cautioned against by Gilbert); and do not push the lips too far over the blowhole, as both of these acts ‘cause weakness and flatness’ (1986, p.73). This second point causes some confusion as it appears to contradict Gilbert when he says to ‘find the focus by covering with the top lip. The more one covers, the more harmonics will be present’ (Floyd, 1990, p.67). The act of covering involves bring the top lip more over the blowhole, and whilst Gilbert recommends it, Nyfenger recommends against it.

In figures 29 and 30, where the normal fingerings and harmonic fingerings are joined by a tie, the objective is to check for stability of pitch and tone. Nyfenger states that ‘one should, if blowing correctly, not have to make any adjustments between the “tied” notes to produce them in tune with it/themselves’ (p.75). This contradicts Seed’s writing⁸⁸, where he states that the octave harmonic should be in tune, but that the harmonic a 12th above the fundamental will be slightly sharp. Once Nyfenger’s exercises are mastered legato, he advises to practise them articulating each note, thereby discovering how to precisely place each note in a similar manner to horn players. This approach mirrors that of Wye.

3.10.1.3 Graf (1991)

Graf provides exercises starting on each note from C4 to D5. He states that the purpose of the exercises is ‘to discover and practice the embouchure positions appropriate for each register’ (1991, p.30). He indicates with a downward arrow that some harmonics should be played ‘noticeably too flat’ (1991, p.30), although he does not explain why or how, and he offers the following tips:

- Play with a firm mezzo forte and articulate each note with a clear attack.

⁸⁷ See Chapter 3.10.1.1.

⁸⁸ See Chapter 3.10.1.4.

- Observe the changes of embouchure, particularly in transition from the first to the second harmonic (octave/fifth) and vice versa. (1991, p.31).

The image displays a musical score for Peter Lukas Graf's Harmonics Exercises, consisting of seven staves of music. The score is written in treble clef with a tempo marking of $\text{♩} = 60$ and dynamic markings of *mf-f*. The exercises involve playing various harmonics, with some notes marked with downward-pointing arrows to indicate they should be played noticeably too flat. The score includes a copyright notice: © B. Schott's Sohne, Mainz, 1991. Below the score, there are two instructions: a downward arrow followed by "= Play these harmonics noticeably too flat." and another downward arrow followed by "= Spiele diese Obertöne merklich zu tief."

Figure 15: Peter Lukas Graf's Harmonics Exercises

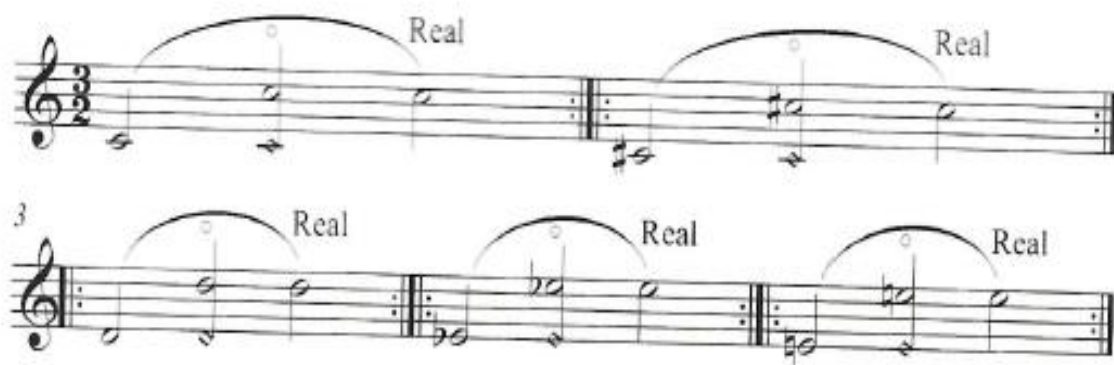
(1991, p.30)

3.10.1.4 Seed/Bennett (2016)

In writing about the teaching practices of William Bennett, Seed offers more than one use for harmonics practice.

Head joint position

Seed begins by focussing on using harmonics to develop a resonant and vibrant sound that projects well. He states that all the overtones within the harmonic series are hidden in any one note (the fundamental), and that they need to be in tune. The starting point to achieving this is to make sure that the headjoint is pulled out the correct amount. In the following exercise, the headjoint should be in the correct position if the harmonic note and the 'real' note are the same pitch. Seed advises 'If the real note is flatter than the harmonic, then push the headjoint in. If the real note is sharper than the harmonic, pull out the headjoint' (2016, p.7)

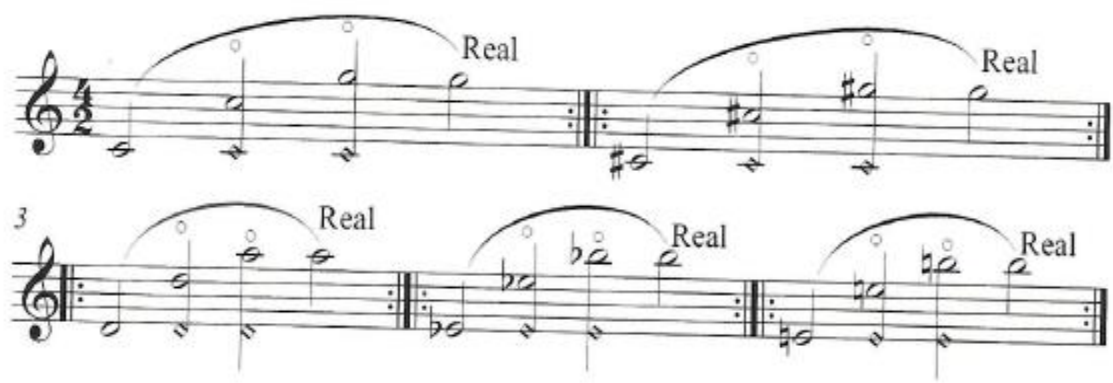


EXAMPLE 2.2. Exercise for tuning the octave to find an in-tune position.

Figure 16: Roderick Seed's Harmonics Exercises (i)

(2016, p.7)

When then adding the next harmonic from the series (a 12th above the fundamental) Seed advises that it will be very slightly sharper than the real note, and that the player should work to minimise the difference.



EXAMPLE 2.3. Exercise for tuning the next harmonic to find an in-tune position.

Figure 17: Roderick Seed's Harmonics Exercises (ii)
(2016, p.7)

The Three Components of Air

Once the headjoint is set up correctly Seed moves on to using harmonics to practise what he calls 'The Three Components of Air' – air speed, air direction, and volume (amount) of air' (2016, p.17).

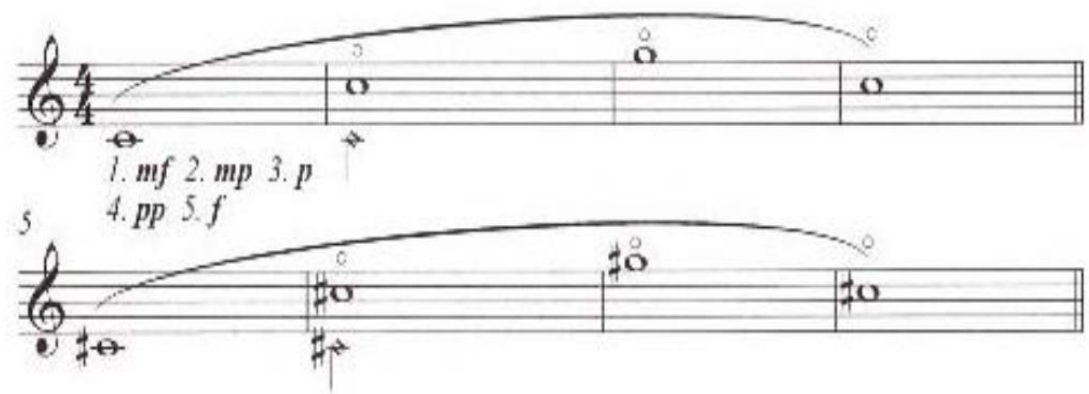


Figure 18: Roderick Seed's Harmonics Exercises (iii)
(Seed, 2016, p.18)

Seed gives the exercise above, starting from low C, then C#, and working up in semitones to a fundamental of G on the staff, asking the student to move smoothly from note to note without changing dynamic. To achieve this, he states that to ascend in pitch the 'air speed needs to

increase and the direction of the air needs to be raised' (2016, p.17), which is enacted by creating a smaller lip aperture and slightly increasing abdominal pressure; the dynamic will remain unchanged so long as the volume of air remains constant.

Phrasing – stress and release

Seed's final exercise using harmonics to develop tone focuses on developing control of stress and release for purposes of phrasing with the tone, matching words to notes (prosody) and focusing on the strong and weak syllables. Working in both 3/4 and 4/4 time signatures, using the words 'Dear-er' (stress on the first syllable), be-lieve' (stress on the second syllable), 'dar-ling' (stress on the first syllable), and the short phrase 'I love you' (stress on the middle syllable), Seed adds dynamics that require the lowering and raising of the air stream to avoid unwanted pitch changes whilst simultaneously achieving a crescendo or diminuendo. 'Dear-er' and 'dar-ling' place the emphasis on the first beat of the bar, whilst 'be-lieve' and 'I love you' start with an upbeat. See selected examples below (Seed, 2016, pp.37-43):

The image displays three musical examples in treble clef, each with dynamic markings and phrasing slurs. The first example, labeled "Dear - er", is in 4/4 time and consists of two staves. The first staff shows four measures with dynamics *f* and *p* alternating on the first and third beats. The second staff shows four measures with dynamics *f* and *p* alternating on the second and fourth beats. The second example, labeled "be - lieve", is in 4/4 time and consists of one staff. It starts with a rest on the first beat, followed by notes on the second, third, and fourth beats. Dynamics *p* and *f* are marked on the second and third beats, with slurs indicating phrasing. The third example, labeled "Dar - ling", is in 3/4 time and consists of one staff. It shows four measures with dynamics *f* and *p* alternating on the first and third beats.



Figure 19: Roderick Seed's Harmonics Exercises (iv)

(Seed, 2016, pp.37-43).

To achieve the desired stress and release, Seed writes about covering and uncovering (already examined in Chapter 3.6.2) and recommends using more vibrato on the stressed notes and less on the weaker notes.

3.10.2 Projection and Tone Colour

Harmonics (also called overtones or partials) are a feature of all sound, and it seems widely accepted in the flute literature that the harmonic content of flute tone is important because it affects both timbre (and therefore expression) and projection (and therefore whether your audience gets to hear your expressive ideas clearly). When discussing projection, Wye states:

The lowest sound frequencies travel the greatest distances. Their amplitude is directly related to the 'size of tone' and projection even though the higher frequencies sound louder to the player. Rolling the headjoint out - in other words, uncovering the embouchure hole - will diminish the volume of the few upper partials the flute possesses, and increase the strength of the fundamental, or lowest harmonic; what we call the lowest note. It follows that tone exercises have to be based on a recipe in which the fundamental is as large as possible, relative to the upper harmonics. (1988, p.17)

This appears to contradict the research of Yorita and Clements, 2015 (see next sub-chapter), who claim that an equal distribution of harmonics is key.

When discussing the effects of rolling out the head joint and thereby uncovering, Bernold says:

On the flute, tone color depends on the distance between the aperture of the lips and the blowing edge: the shorter the distance, the more intense, resonant and focused the sound

(cf sul ponticello) but it is often harsh and aggressive as well (the embouchure is covered). Uncovering the embouchure - i.e., increasing the distance between lip aperture and blowing edge - makes the sound softer but less defined and somewhat diffuse (sometimes with parasitic noises!). Yet it often has a very poetic quality not unlike that of a pan flute! (2016, p.71)

Bernold and Wye's assertions also seem to contradict each other, with Wye stating that by rolling out the headjoint (thereby uncovering) we increase the strength of the fundamental which contributes to greater projection, whilst Bernold states that the sound is more intense and resonant when we cover more (an idea that Wye says appears to be true to the player but is not in fact true for the listener). According to Gilbert:

Focussing or centring the sound means to develop the fullest harmonic content in the tone. The proper forte or fortissimo tone may be described as dark, focused, edgy, brittle, and somewhat bright. These qualities have one factor in common: the presence of many harmonics in the sound'. (1990, pp.66-67)

Gilbert's view seems to have more in common with Bernold than Wye.

For the student, current knowledge is clearly conflicted, and developing a personalised awareness, via heuristic exploration and discovery, is one way that they might learn what works best for them. Whether looking to produce a tone that contains more overtones, and is therefore more focussed and intense, or to achieve the 'poetic' quality created by a less covered sound to which Bernold alludes, following what works for someone else is a poor substitute for taking the time to discover what really works best for you. I acknowledge that some students might not like this approach, preferring to be told or shown how to do something. Being provided with a fix to a problem is both psychologically easier and expedient, but this route risks learning and skill development that is imitative (Lortie, 1975, Jørgensen, 2000) and safe (Buchmann, 1987), lacking in depth and the personalised nature of elite performers; it is just one example of why students should be encouraged to develop their own heuristic know-how.

3.10.3 Harmonics-in-Balance / Harmonics-In-Tune

In their paper 'Using spectral analysis to evaluate flute tone quality' (Yorita & Clements, 2015) the authors examine the harmonic spectrum contained within various notes played by flautists of varying levels and investigate how experienced flautists perceive, evaluate and describe the notes. They start by acknowledging the subjective descriptive language in common use, noting 'perplexing descriptions of tone color: bright, dark, dull, edgy, hollow, round, fuzzy, pure,

reedy, etc.’ and note that ‘readers must often rely on only written descriptions of timbre differences without the benefit of aural input’ (2015, p.2). They also note that flute literature often equates greater harmonic content with richness of tone but that the literature rarely specifies which harmonics contribute to good tone, nor provide information regarding the desirable balance or distribution of the harmonic content within a note.

In introducing their research, they state that:

This project explores (1) How tone quality is described by skilled flutists. (2) Whether the harmonic content or spectral signature has some correlation with tone quality. (3) Whether certain acoustic signatures are preferred, or considered ‘good’. The hope is that there are some measurable aspects of timbre that can be associated with desirable qualities. (Yorita & Clements, 2015, p.1)

Their research uses Harmonic Analysis Tools (HAT), tailored to the flute, to measure the presence and distribution of harmonics within a selection of notes, colour coding each harmonic from the fundamental upwards, as illustrated below.

Harmonic #	Note or pitch	Graph color
H1	Fundamental (perceived pitch)	White
H2	Octave above fundamental	Yellow
H3	Octave + fifth above fundamental	Green
H4	Two octaves above fundamental	Yellow
H5	Two octaves + third above fundamental	Red
H6	Two octaves + fifth	Green
H7	Two octaves + minor seventh above fundamental	Purple

Table 3: Harmonic Analysis Tools, Colour Coding

(Yorita & Clements, 2015, p.4)

They then ask flute specialists to describe and rate the varying timbral qualities and report these findings. They acknowledge some of the limitations of their investigation, such as the limited number of samples and target pitches analysed, and warn against making sweeping generalisations, but they conclude by identifying some trends observed within their data, summarised as follows:

- Samples that contain a balance of harmonics were viewed most positively, and frequently described as focused, rich, full, round, bright/dark, or clear (see spectral example below)

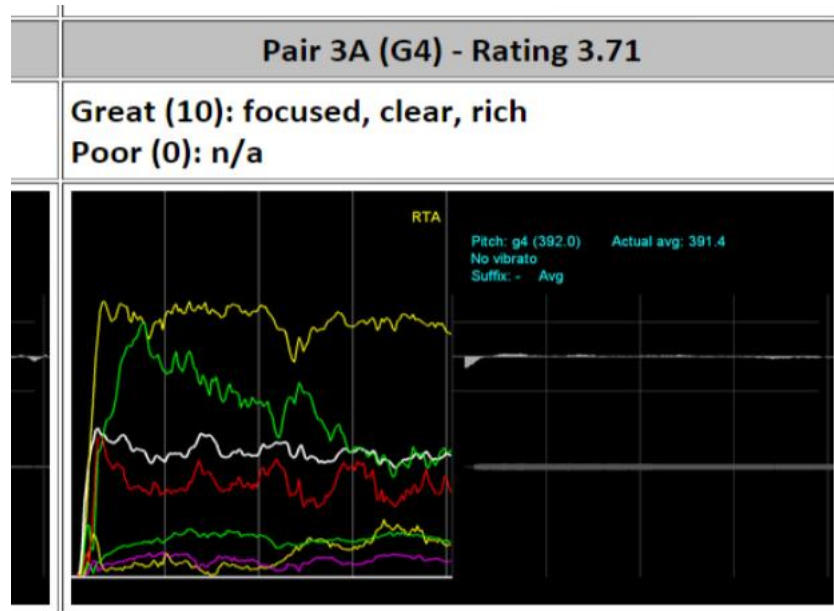


Figure 20: Balance of harmonics, positively rated

Yorita and Clements describe the favourably rated example in Figure 21 as having a harmonic signature that is very rich in harmonics, and where the H2 and H3 harmonics are stronger than the fundamental. Visually, the figure presents a full range of harmonics, both below and above the fundamental (illustrated in white).

Notes receiving negative ratings included:

- Samples with a strong fundamental note and/or strong octave above the fundamental note (H1 and H2) combined with relatively weak upper harmonics. Samples of this type were often described as weak, airy, or unfocused.

This seems to contradict Wye’s assertion that it is desirable to have ‘the fundamental is as large as possible, relative to the upper harmonics’ (1988, p.17).

- Samples lacking upper harmonics (H3-H7), which were described as airy, unfocused, weak, or thin.

- Samples with a strong H3, which were described as edgy, nasal, or trumpety/brassy. This was not always considered negative, but when H3 was disproportionate, the samples did receive negative ratings.

Disproportionate H3 might be the quality that Nyfenger describes when writing that ‘a tone with too much “edge” can destroy itself through imbalance and thereby fall out of the flute and drop onto the stage like a deflated balloon’ (1986, p.114). In general, tones perceived as weak, airy, or unfocused, or as excessive in some form (e.g., overblown, edgy, or brassy/trumpety) were viewed negatively.

Yorita and Clements compiled a table of all the adjectives used by participants to describe their samples, and identify where each is considered as favourable, neutral, or unfavourable. Additionally, they identify four adjectives that appear across ratings, acknowledging that perhaps personal taste sometimes has an influence on perception.

Circumstances	Descriptors
Favorable	rich(20), full(18), resonant(5), colorful(4)
Neutral or favorable	focused(52), clear(22), round(8), bright(8), dark(7), buzz(5)
Neutral or unfavorable	airy(37), forced(14), harsh(13), hollow(12), soft(12), dull(12), overblown(10), brassy/trumpety(6), lacking-core(6)
Unfavorable	unfocused(31), weak(20), thin(14), unsupported(11), sharp(9), breathy(8), muffled(6), nasal(6), uncontrolled(6), uncentered(5)
Across all ratings	edgy(29), diffuse(15), open(14), loud(11), warm(5)

Table 4: Linguistic Timbre Descriptors, rated favourable, neutral, unfavourable

(Yorita & Clements, 2015, p.8)

Yorita and Clements also note some of the limitations of their study caused by variables such as recording in different venues and an inability to control the sound reproduction setup used by survey participants. This highlights, in both live and recorded performances, the importance of the acoustical qualities of the performing venue or recording space, which have a definite impact on how the harmonic content of a note is perceived by both the player and the listener.

Tone that contains ‘excessive or out-of-balance harmonics’, as identified by Yorita and Clements, shares similarities with tonal qualities described by some performer-teachers as

being a ‘harmonics-out-of-tune’ sound. Some professional practitioners state the need for the harmonics or overtones contained within a note to be in tune and assert that this contributes to resonance and projection. In his book about the teaching approaches of William Bennet, Seed writes:

To get a large, full sound, we do not actually need to use a lot of air. This is a common misconception. When the harmonics are in tune, the sound will ring and project to the back of any concert hall, even in a soft dynamic. Many people blow too hard in order to get a big sound, but this is not an efficient way of producing a full enveloping sound. (2016, p.6)

Seed’s exercises based on the harmonic series have already been explored in Chapter 3.9.1.4.

3.10.4 Altering the Harmonic Content to Change Timbre

The literature identifies five main playing factors that affect the harmonic content of flute tone, which have already been discussed in this chapter. They are: the blowing angle of the air; how the air column cuts across the far edge of the lip plate; air speed and pressure (which depends on register and dynamic level); the size and shape of the lip aperture; and the resonating shape inside the mouth. These five factors all work as an entangled whole (SECS), and the ability to easily perceive and alter how each is working in combination is key to altering the harmonic makeup of the sound and thereby alter the timbre or tone colour.

This ability is an example of PAPAPI, as described in Chapter 2. The expert player might imagine the desired timbre, know what actions are likely to deliver it (know-how), predict the results of enacting the action, physically enact the action, perceive the changes to the timbre that take place, and make any necessary adjustments, all with a fleeting moment where none of the steps described are undertaken consciously; they happen spontaneously, intuitively, and with ease, within a state of flow. For the learner, who has not yet achieved this spontaneous state of flow and is engaged in training their abilities, aural and physical awareness is key. They will need to ask themselves a multitude of questions, such as: What timbre do I want to master? What needs to happen physically to instigate and control this timbre? What changes in the sound occur when I act? How does it feel to make these changes? How are these changes perceived aurally by both the player and the listener? How can I maximise control over these changes to maximise their expressive potential? How can I train myself to reproduce my desired effects at will and with ease? What are the potential pitfalls? Providing opportunities

for learners to answer these questions is the job of pedagogy, and there are partial answers to be found in the existing literature, but much to be learned from further investigation.

A final influencing factor regarding the harmonic content within the tone is to acknowledge that the physical characteristics of both the player (already discussed) and the instrument can have an effect. This factor makes me reflect back to Holmes (2012) and her observations about performers often having a distinctive tonal quality which forms part of their musical personality and identity (as already cited in Chapter 1.4).

Regarding the individual instrument, Floyd states that ‘research indicates that each instrument has a characteristic tone quality determined by the number and strength of the harmonics present. Therefore, the characteristic tone color of the flute depends on the lesser or greater prominence of specific harmonics’ (1990, p.53). It might be tempting for some students to see shopping for a better instrument or headjoint as a quick fix for some of their deficiencies; whilst this might help, getting the fundamentals of playing properly sorted before going shopping will help the student to find an instrument that is really suited to the way they play and that responds to their unique physiognomy and the personalised heuristics that they have developed.

3.11 Acoustics: The Performer and the Listener

Consideration of acoustics and projection is particularly important for learners looking for orchestral careers, or who expect to be performing regularly in large venues; performing in smaller, more intimate spaces presents different challenges. In conversation with Bruce Duffie, Galway talks about the importance of the acoustics of the venue and what you ‘get back’ when you play. Galway says that this is especially important when playing very soft and when using a large variety of timbres, and makes observations about the acoustics of various specific concert halls on orchestral sound as well as solo performance (Duffie, 1989).

When addressing acoustics, Nyfenger advises that all wind players should experience sitting in the middle of an orchestral wind section in order to experience the various ‘...extraneous noises such as air escaping around reeds...raspy strings, banging percussion...’ and asserts that orchestral players play ‘to the people in the hall’, where the sound will (hopefully) be lovely and balanced, but that the sound is not the same close up. He says, ‘A fine, realistic, sensitive conductor realizes what type of sound and dynamic is required to produce the desired effect in the hall’ (1986, p. 30). For the learner to be able to fulfil what is required by the composer, conductor, venue acoustic, etc. the instrumental teacher needs to share professional knowledge, and use this knowledge to assist the student in developing the necessary awareness and skills.

Developing an understanding of how different timbres work within the acoustic of the performing space results from a lot of listening and must be ‘judiciously applied to the real world of performance only after long practice and evaluation’ (1986, p.114), writes Nyfenger. He states that a tone with too much edge is imbalanced and does not project and that this lesson can be difficult to learn. At the opposite end of the spectrum, he says that a ‘tone which floats out of the flute like a feather but unfortunately also has the weight and projecting power of a feather employed as a projectile’ (1986, p.114) likewise does not project. Learning about timbre and projection requires lots of listening and feedback from others, starting with teachers and peers. Another possibility is to record performances and listen back, which is easily achieved currently by simply placing a mobile phone at the back of the performance space.

In his teaching, Nyfenger says that he attempts to give all his students the opportunity to experience these issues for themselves by each year holding:

...at least one flute seminar in a concert hall, where players who have been observing each other (all year) can alternate playing on stage and running out into the hall to listen (to each other). The only thing which is impossible to do is run out and listen to oneself. (1986, p.114)

He recommends finding a colleague who, close up, has tonal qualities similar to your own, and observing their strengths and deficiencies from a distance. Nyfenger also acknowledges that recording yourself in these spaces can give you valuable feedback.

Wye likewise cautions the player to be aware that the sound they hear when they are playing is not the same as what is heard by the listener at a greater distance, and indeed, such observations can be found in the literature for many instruments, as well as for the voice. On the flute, Wye says that the act of covering/uncovering⁸⁹ is key. He states that:

The 'best' tone is when the blow-hole is opened out one more notch than it seems best to you. That may appear to be odd. Your extra 'ears', your friend, will tell you that even when you think it sounds best, focused, alive, big, etc, your friend, who should be 20 feet or more away, will confirm that it sounds bigger and warmer when the embouchure hole is opened out a notch, or when you raise your head by a small amount. (1988, p.20)

This observation could serve to undermine inexperienced players’ sense of their own sound and serves to emphasise that without help (extra ears) it is impossible to either confirm or refute

⁸⁹ See Chapter 3.7.2.

this assertion. This adds pedagogical strength to the rationale behind Nyfenger's annual seminars for his students, and to regularly recording oneself in different performance spaces. It highlights the need for collaborative working and careful pedagogical consideration of how tone projects and how it is perceived, both up close and at a distance, in different spaces and venues.

3.12 Blending Flute Tone with Other Instruments

When timbre is used well it can fuse the sound of the flute with other instruments to create a new sound altogether. The importance of being able to blend flute tone effectively with other instruments is noted by Toff:

The very essence of ensemble playing is the ability to vary one's tone quality to blend with the other instruments (or to rise above them as needed). Oboist Robert Bloom tells a story of Toscanini rehearsing the third movement of Debussy's 'Iberia': "No, my dears, I am conscious of a flute and a bassoon. That's not what I want. I want to hear a third instrument, the result of a happy marriage between the two". (1996, p.100)

On his website (www.williambennettflute.com) Bennett wrote about two flautists, Fernand Dufrêne and Oliver Bannister, whom he considered to have the ability to blend their sounds with other instruments extremely well. He says:

Fernand Dufrêne ... had the same ability as Oliver Bannister to combine his sound when playing in octaves with another instrument so that a completely new sound came from the combination...I have often wondered if either or both of them employed some special way of 'coupling' their sounds to that of the other instruments by employing a sound with less harmonics than normal and using a very relaxed lip than would normally be necessary for projection in a soloistic way? (Bennett, undated)

Bennett poses a question tailor-made for this research inquiry. In searching for new knowledge about how flute tone combines and projects in combination with other instruments, an opportunity for exploration leading to significant new insights is presented, offering the potential to inform new pedagogical approaches. Toff, Baxtresser, Bennett and Bernold each highlight the importance of being physically able to vary timbre and apply this know-how in an ensemble context with other instruments, but how this works in practice and how this might be addressed pedagogically remains opaque.

3.13 Extended Techniques

Many performer-teachers use extended techniques as a vehicle for developing awareness and technical control of a variety of timbres. Techniques include harmonics (already discussed in this chapter), whistle tones, whisper tones, bamboo tones, alternative fingerings, and multiphonics. Investigation of extended techniques falls beyond the scope of this investigation, but for readers interested in exploring this area the books of Robert Dick (1986) and Wil Offermans (1992) are often recommended by expert performer-teachers as a good starting point; they contain many exercises that focus on using extended techniques to develop tone and timbre.

3.14 Chapter Summary

This review has aimed to map current knowledge and practice relating to tone and timbre in flute playing, exploring historical, academic, and performer-teacher-authored literature. It addresses all the main themes and issues, or ‘ingredients’, that affect tone and timbre in flute playing, and highlights areas of agreement and common thinking, as well as areas of disagreement, inconsistency, and doubt. Where inconsistencies and conflicts of opinion occur, this perhaps reflects that there is often more than one way to achieve an outcome in a domain where so many variables exist, but also highlights the idiosyncratic nature of many of the author’s approaches. In the absence of research-based knowledge, claims to universal truth need to be approached with caution.

The main imbricating themes and issues covered in this review are summed up in the Venn diagram below.

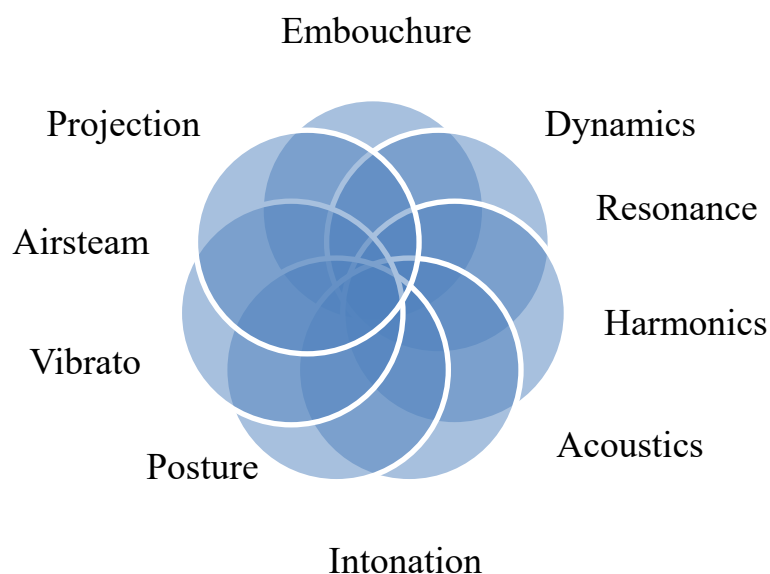


Figure 21: Main Themes and Issues Relating to Tone and Timbre in Flute Playing

Other issues explored include the dominant and problematic use of subjective and opaque descriptive and metaphorical language commonly utilised to describe tone and timbre, which has been identified as often being misleading and open to misunderstanding, misinterpretation. Where language fails, it does so in a domain that has perhaps not sufficiently searched for alternative ways to communicate ideas. There is significant potential for what is currently a limited use of auditory models of tone and timbre in pedagogy. For example, audio and video recordings offer the potential to model what we mean without recourse to language, and to communicate more effectively ideas and concepts of tone and timbre, allowing communication based more in sound than word. Placing adjectives and word-based descriptions in secondary position and placing sound as the primary model of ideas might be one way of empowering learners to discover their own understanding and meaning.

In Chapter 2 I argued for learners to develop and generate their own personally meaningful metaphorical language and imagery, believing that process to be more powerful than adopting the ideas of others. Much of this may remain subjective, and it would not be my intention to dogmatically label specific timbres, or present ideas that might restrict learner self-discovery. I acknowledge that whilst my work might hope to create a framework that enables flute players to understand and communicate concepts of sound more freely and objectively, this may prove to be too simplistic or optimistic an objective.

It is important to acknowledge that many of the themes and issues relating to tone and timbre in flute playing identified in this review have not been meaningfully researched to date, and all data, but especially the areas of disagreement and uncertainty to emerge in this review, present an opportunity for my research to provide new insights and clarity, and to inform advancements in pedagogical knowledge and practice in this domain.

This review acts as a starting point, a springboard, from which to engage with expert professional knowledge within the one-to-one instrumental teaching studio in pursuit of a collaborative researcher/professional practitioner unveiling of insights. It sets the researcher on a path, searching to unveil new insights that might inform the development and mastery of my *Synthesis of Multimodal Musical Cognitive Processes*⁹⁰ through engagement with *The Entangled Web of Musical Learning*. The aim is to create new, research-based, flute-related pedagogical materials and approaches that might empower learners to discover and author their

⁹⁰ See Chapter 2.5.

own know-how-in-action by becoming heuristic researchers of their own technical and artistic practices, acknowledging the idea (already cited in Chapter 2.7) that:

Via learning by doing, knowledge can be acquired which is implicit in the action itself. Mastering new challenges is thus accompanied by a knowledge which does not already exist, and which only arises in doing, in other words by trying things out and experimenting. (Huber et al., 2021, p.17)

I acknowledge that much ‘learning by doing’ already takes place in instrumental lessons and practice rooms, and on its own this idea is not new. However, moving away from the master-apprentice model of unidirectional knowledge transfer and embracing the idea of training students to become heuristic researchers of their own practice, by training their abilities to explore and develop the skills set out in my *Synthesis of Multimodal Musical Cognitive Processes* within *The Entangled Web of Musical Learning*, is a new approach.

Chapter 4: Methodology

In choosing a methodology for this investigation it was important to choose a way of working that was practice-based and that would resonate with expert performer-teacher participants as practitioners themselves. To gain depth of insight into performer-teacher practices traditional data gathering methods such as interviews and verbal exchanges were always going to be insufficient. I required a methodology with the potential to facilitate a collaborative, instrument-in-hand, approach that might evolve over time within the one-to-one teaching studio. It was important not only to unveil and articulate expert knowledge, but also to experience, from an embodied and enactive perspective, expert know-how as part of the investigation; to develop expert-practitioner informed PAPAPI within a ‘brain-body-world’ (Beer, 2000) in order to inform both my own practice and the development of new pedagogy for others.

The idea of developing pedagogical resources that might empower learner-centred, personalised heuristic exploration of the issues relating to tone and timbre in flute playing was always at the forefront of intended research outcomes. The objective was not to create another vehicle for unidirectional, master-apprentice⁹¹ knowledge transfer, so I never sought to simply document previously undocumented expert practice. I sought to create research outputs that would empower the learner-authoring of personalised know-how by inviting learners to try out the ideas that I had unveiled, moulded, and synthesised from within multiple expert one-to-one teaching studios.

To this end, I wanted to gain insider access to the ‘secret garden’ and forge collaborative professional/academic partnerships in order to unveil and explore both the artistic and pedagogic practices of expert performer-teachers, and to harness the impact that these collaborations had on my own learner and artistic practice for the benefit of the wider flute playing community. It was of paramount importance to create a collaborative space within each ‘secret garden’ in which to discover and experience expert practices, and a parallel space away from the ‘secret gardens’ where, as researcher, I could engage in critical reflexion/reflection and develop new pedagogical materials and ideas. In this way I was engaged in developing two separate practices; the development of my own technical and artistic practice as a flute player, and simultaneously, the practice of developing new pedagogical materials for others. Moving

⁹¹ See Chapter 1.3.3.

between these two spaces would facilitate an iterative process where I might be guided and informed by expert knowledge in the form of ongoing coaching, feedback, and dialogue, and empowered to create new learner-centred pedagogy.

I sought to contextualise expert knowledge and practice within pedagogical resources that offer hands-on opportunities for exploration and personalised discovery. I was aiming to empower learner exploration without being dogmatic or falling into the role of the master, issuing invitations to experiment, and making ‘fuzzy generalisations’⁹² designed to encourage student agency, autonomy, motivation, authenticity, imagination, and individuality.

A methodology was also sought that would enable me as ‘learner-researcher’⁹³ to understand expert performer-teacher know-how through the six lenses of my theoretical framework: (1) Flow Theory; (2) PAPAPI; (3) 5E Cognition; (4) Heuristics and Imagery; (5) Collaborative Learning; and (6) Deliberate/Enjoyable Practice. The first step would be to work collaboratively to experience and receive coaching and feedback on my enacted and embodied experiences of expert practices and ideas. Step 2 would involve taking the insights gained back to my own practice studio, where through an extended, explorative process of deliberate and reflexive practice, I could draw together and critically reflect on the data gathered from multiple ‘secret gardens’, through the prism of my six lenses, to develop my own form of praxis, integrating theory and practice to inform new pedagogical materials and approaches. The process is represented by the illustration below:

⁹² See Chapter 4.4.

⁹³ Which developed into ‘expert-learner-practitioner-researcher’ within Expert Learner Practice as Research (ELPaR) - See Chapter 4.2.

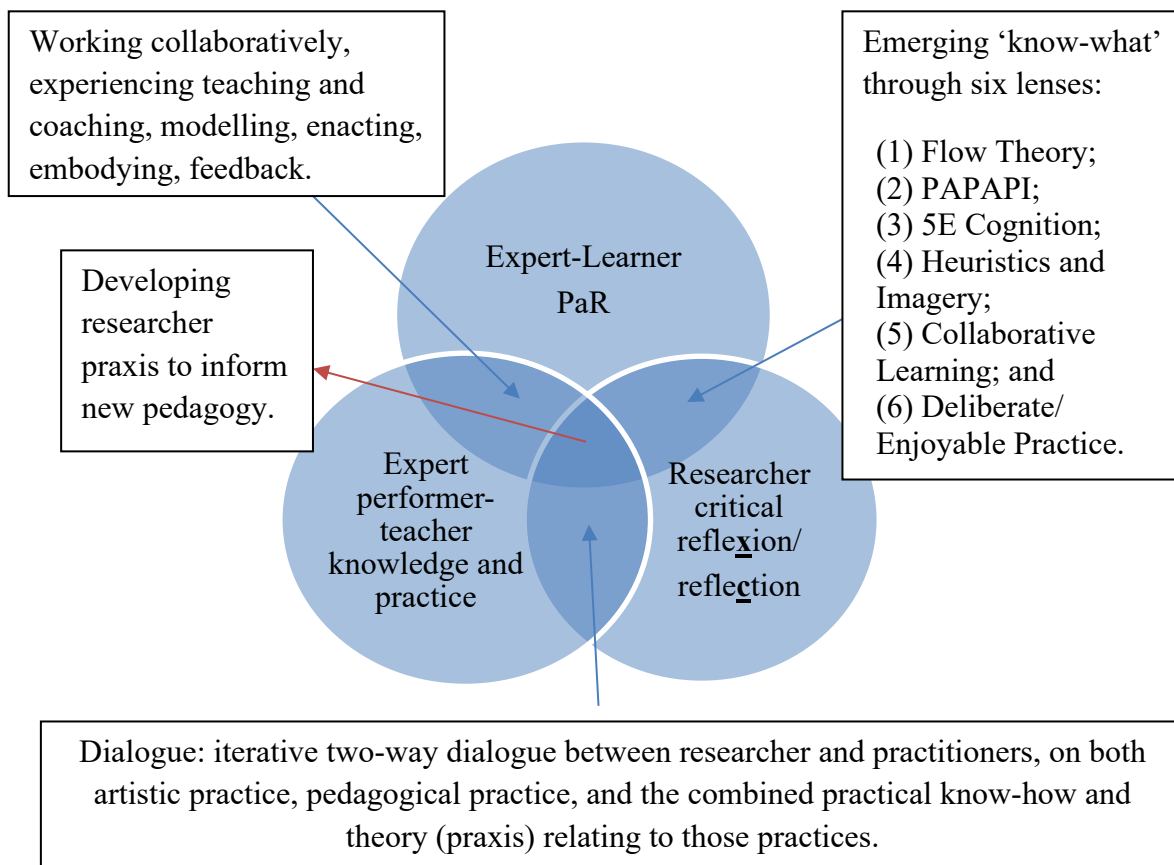


Figure 22: My Praxis

Through successive sessions within the ‘secret gardens’, my enactments of expert practices would go through several stages of development, informed by coaching and feedback, two-way dialogue and questioning, and critical reflexion/reflection, enabling me to iteratively develop, test and refine new materials whilst simultaneously building praxis, evaluating the efficacy of my ideas, and probing for potential problems and issues that might arise from ideas having been miscommunicated or misunderstood.

Once my investigation had resulted in the production of student/teacher-facing pedagogical materials, I planned a final stage of testing my research outputs with a sample group of students and their teachers. This stage would involve inviting a group of students and teachers to collaborate in trying out and evaluating, within the one-to-one teaching studio, the efficacy of the ideas to emerge from this research as presented in The Tone and Timbre Toolkit. After a period of testing, they would be invited to feed back their thoughts and experiences via a Likert questionnaire and interviews via Zoom, and the data from this feedback would contribute to a final, learner-centred, edit of the book. As well as making the final product more user-friendly and learner-centred, this phase was also envisaged as an opportunity to receive objective

feedback from learners who had no prior knowledge of my work, which might highlight if/where my own subjective bias was too present.

4.1 Practice as Research (PaR): Know-what to know how

In searching for an arts-based methodology that was also practice-based, and that would resonate with expert performer-teacher participants as practitioners themselves, I first considered A/r/tography before deciding on Practice as Research (PaR).

PaR was chosen for several reasons:

1. It is a methodology conceived to investigate artistic practice. It acknowledges the tacit nature of artistic practice and proposes modes of working that elevate acts of artistic practice into acts of research, ensuring the necessary rigour.
2. As a practice-based research methodology it is aligned with the professional identity of the expert performer-teachers as practitioners, and can operate within an environment familiar to them (the one-to-one teaching studio).
3. It was important that much of the research took place instrument-in-hand, with the practice of learning acting as the driver for the creation of new knowledge and insights. Situating the act of learning as the driver was most suited to a PaR methodology, and was further strengthened by my ELPaR reorientation of PaR⁹⁴.

A/r/tography, whilst of initial interest as a practice-based research methodology for inquiring into both the arts and education (Sullivan, 2010), seemed to have too much focus on the domains of the visual arts and design, and on acts of inquiry through visual representations, writings, and forms of notating practice (e.g., dance notations) where acts of *art* and *graphy* combine; I found the concept of sound-as-art to be absent in much of the literature on A/r/tography. In contrast, (EL)PaR offered the opportunity to focus on tone and timbre, generating new insights through the combined acts of reflexion and reflection, as discussed in Chapter 2.2, working both independently and in collaboration with multiple expert performer-teachers. My reorientation of PaR to ELPaR empowered me to fully exploit the potential of the collaborations between me, as learner-researcher, and my group of expert practitioners. Having reoriented PaR, the remainder of this sub-chapter considers how PaR had been thus far conceived before Chapter 4.2 explores my ELPaR reorientation.

⁹⁴ See Chapter 4.2 for discussion of ELPaR.

In the UK, Robin Nelson is one of the preeminent exponents of PaR as a research methodology in the arts, and his book ‘Practice As Research In The Arts; Principles, Protocols, Pedagogies and Resistances’ (Nelson, 2013) is a core text in the field. To paraphrase Nelson, PaR is an arts-based methodology whereby research can take place through engaging in acts of artistic practice, with insights gained by actively engaging in rigorous, intellectual, diagnostic critical reflection. Nelson stresses that for artistic practice to become research, critical reflection works in symbiosis with artistic practice. He states that ‘...it is necessary to actively promote critical reflection...Critical reflection on process is an integral part of the research inquiry...’ (2013, p.29).

I chose to engage with Nelson’s model of PaR because it lends itself to the investigation of acts that are performative, and that focus on practices that are embodied and enactive. Nelson’s model also proposes ‘a distinctive pedagogy for PaR, operable at all levels of heuristic learning’ (2013, p.6), and heuristic learning and the development of heuristics as tools to empower elite levels of performance is a central pillar of my thesis. For learners, heuristics seek to encourage personalised knowledge construction by learning-through-doing, training students to become heuristic researchers of their own practice by inviting them to explore and try out ideas to discover know-how through personal discovery. These know-how-heuristics, once embedded and automated, then become an expressive and creativity-empowering tool that can facilitate multimodal performative interactions⁹⁵ within a state of flow⁹⁶.

Many other models of PaR, like A/r/tography, focus more on the visual arts than music. This is often explicitly stated from the outset, as in *Art Practice as Research: Inquiry in Visual Arts*, by Graeme Sullivan, (2010), or Cazeaux, who states that he is ‘primarily interested in fine art or visual arts research’ (2017, p.1); other models, such as Barrett and Bolt’s, also notably omit music when they state that ‘the research projects to be considered cover several creative arts disciplines: Design, Creative Writing, Dance, Film/Video, Painting and Theatre’ (Barrett & Bolt, 2010, p.1).

As well as being well suited to performative musical inquiry, Nelson’s model of PaR also better suited the dual focus of my research activities. Before engaging in researching my own artistic and learner practices I needed to first engage with expert practice, using my learner-practice as a tool to investigate the artistic and pedagogical practices of expert performer-teachers. My role as participant-researcher positioned me as the learner rather than the expert. As learner-

⁹⁵ performer/self, performer/instrument, performer/audience, performer/composer, performer/fellow musicians, performer/acoustic, etc.).

⁹⁶ Refer back to Chapter 2.4.

researcher I sought to unveil the artistic and pedagogic practices of others, and to be able to understand, embody, and enact some of those practices. Anticipating a transformation in my own practice resulting from this process, I would then be able to engage in Nelson's critical reflection. The objective here was to position the practice of learning as research, situating the act of learning as the driver for the development of new praxis, in the form of both new theory and new practice-oriented pedagogical materials.

In discussing praxis, Nelson rejects the 'entrenched binary between theory and practice' (2013, p.11), which seems to be born out of a 'Cartesian, disembodied framework that privileges the mind (and words) over the body (and sensations), and disassociates them from each other' (Petsilas, Leigh, Brown & Blackburn, 2019, p.182). Nelson cites Bolt (2010) writing of a 'double articulation between theory and practice, whereby theory emerges from a reflexive practice at the same time as practice is informed by theory' (2013, p.29). Here the imbrication of theory and practice is what Nelson denotes 'praxis', noting that others have called it 'intelligent practice' and 'material thinking' (2013, p.5). Nelson writes of a 'praxis of 'operational knowledge' (2013, p.76), and I view my concept of spontaneous, intuitive, automated, heuristic know-how as an advanced form of Nelson's operational knowledge.

Key to Nelson's concept of PaR is his focus on different modes of knowing and knowledge production. He identifies three different types of artistic knowledge or stages of knowledge; acknowledging Ryle's, (1945) concepts of *know-how* (tacit, intuitive, embodied knowledge) and *know-that* (propositional knowledge), Nelson interposes between the two a third, intermediary stage of knowledge, coining *know-what*. Know-what, according to Nelson, is the 'tacit made explicit through critical reflection' (2013, p.37), and he illustrates the relationship between these three types of knowing in the diagram below:

Modes of knowing: multi-mode epistemological model for PaR

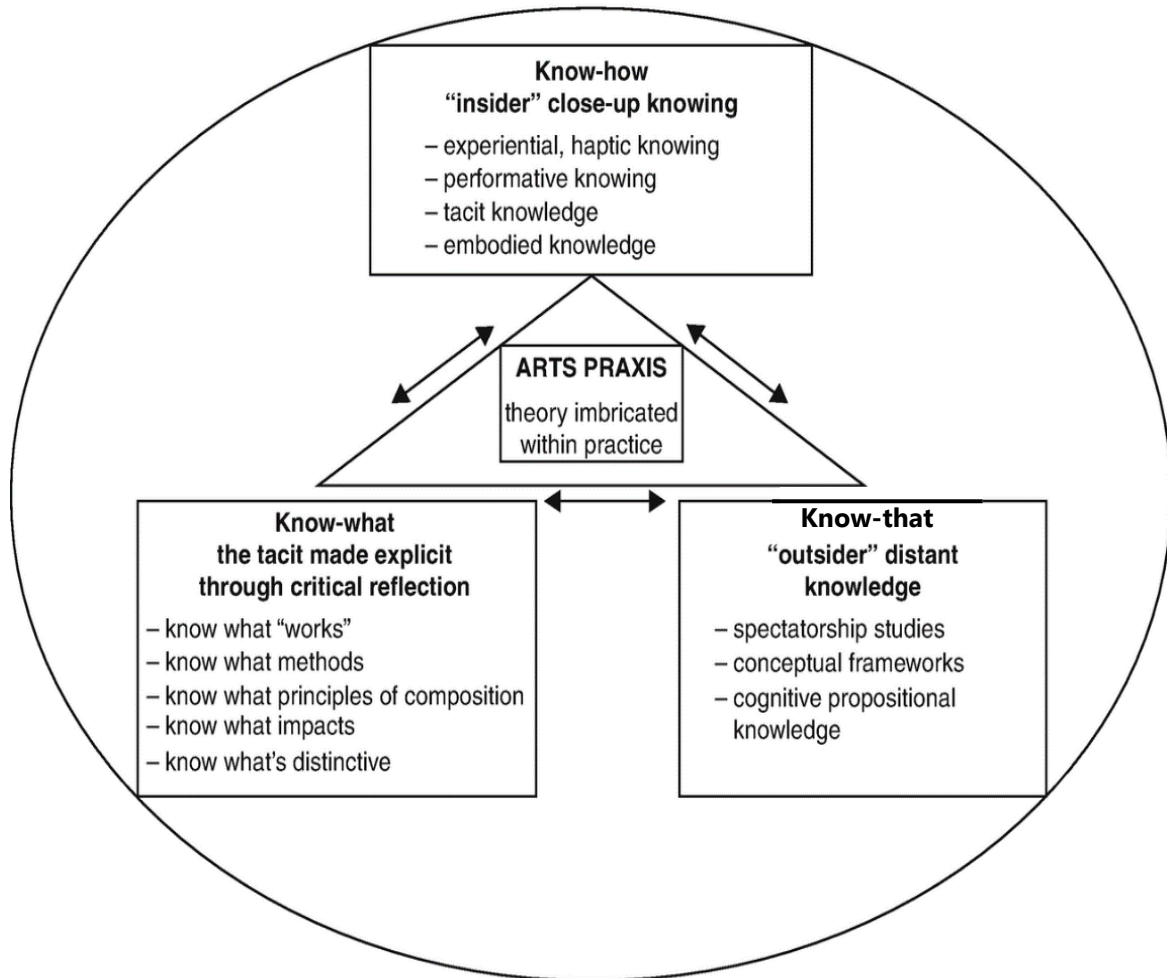


Figure 23: Nelson’s Modes of Knowing

(2013, p.37)

My research engages with know-how in two distinct ways. Firstly, the learner-researcher engages with the know-how of a group of experts, and as a result develops his own know-how. Here, expert know-how is the starting point, the catalyst, and developing learner-researcher know-how is the objective. Secondly, the new learner-researcher know-how is transformed, via critical reflexion/reflexection, to empower learners to develop their own individual, personalised know-how. The intention here is not to pass know-how from expert to learner via the researcher, but to utilise the imbrication of expert know-how and emerging learner-researcher know-how to empower learners to generate their own, personalised, individually meaningful know-how.

For Nelson, *Know-how* (KH) to *know-what* (KW) to *know-that* (KT) represents a journey in knowledge production from the unarticulated and undocumented embodied, performative,

tacit, experiential ‘doing-knowing’, or Schön’s ‘knowledge-in-practice’ (1983, p.69) (KH), through to a more explicit understanding of this doing-knowing gained through the process of critical reflection (KW), and on to the articulation of these new understandings as propositional knowledge that can be disseminated to a wider community (KT). Nelson cites Leonard and Sensiper (1998) stating that:

Knowledge exists on a spectrum. At one extreme, it is almost completely tacit, that is semi-conscious and unconscious knowledge held in people’s heads and bodies. At the other end of the spectrum knowledge is almost completely explicit or codified, structured and accessible to people other than the individuals originating it. (Nelson, 2013, p.38)

Nelson’s view assumes that tacit knowledge already exists as part of the artistic practice and that the objective of PaR is to articulate it, which is something of a conundrum for learners of musical instruments who may not yet possess the tacit knowledge. They are seeking to develop and embed tacit knowledge through a process of developing awareness and know-how of what works; they strive to gain know-how, and to train cognitive processes in order to develop the ability to be intuitive and spontaneous, rather than thinking and rational. They do not seek propositional know-that as an end result, but work to gain know-how that then becomes hidden, automated, embodied, and enacted rather than articulated.

According to Nelson, it is in the know-what stage of the journey where new knowledge and insights form; know-what aims to unveil tacit, experiential ‘doing-knowing’ (know-how) en route to generating propositional know-that. In my thesis, the learner’s objective is the opposite; to develop tacit, experiential ‘doing-knowing’ through exploration and experimentation, discovering and developing know-what en route to embedding and automating know-how.

Nelson: Know-how → Know-What → Know-That

My thesis: Exploration → Discovery of Know-What → Automation of Know-How
 (and Experimentation) (Critical Reflexion/Reflection) (Heuristics and Flow)

My ‘Exploration→Discovery of Know-What→Automation of Know-How’ thesis led to my positing the idea of *The Entangled Web of Musical Learning*⁹⁷, born out of my own personal epistemological journey engaging with my theoretical lenses in the development of my own

⁹⁷ See Chapter 2.1.

praxis. Nelson states that ‘The interrelation between physical and conceptual approaches has recently emerged, to refine understanding of ‘embodied knowledge’ and to posit ‘enactive perception’ (2013, p.57). This idea lies at the heart of *The Entangled Web of Musical Learning*, but by informing and empowering the exploration and development of ‘embodied, performative, tacit, experiential *doing-knowing*’ (Nelson, 2013, p.40) rather than trying to articulate it.

Some of the theoretical lenses that underpin *The Entangled Web of Musical Learning* are already present in Nelson’s vision of PaR; here I offer an overview of how our views imbricate and where they diverge. In the area of 4ECS Nelson notes that ‘it is now argued that all thinking is inexorably embodied’ and he recognises the idea that ‘thinking is to some extent physical, formed in the bodymind’ (2013, p.57). Endorsing the idea of embodied modes of knowing and Noë’s (2004) ideas of ‘enactive perception’, Nelson cites Noë, as have I, positing that ‘perceiving is a way of acting...To be a perceiver is to understand, implicitly, the effects of movement on sensory stimulation’ (2013, p.57). Nelson adds that ‘Noë is at pains to emphasise that ‘[t]o perceive is not merely to have sensory stimulation. It is to have sensory stimulation one understands’ (2013, p.57). I might add to this that the musician also employs prediction, imagining sounds before they are created, which might also be described as thinking which is ‘to some extent physical, formed in the bodymind’ (2013, p.57).

Writing of the power of collaboration, Nelson sums up how my collaborative partnerships have worked, and how learner-teacher collaboration should work. He states that collaboration fosters creativity, and notes the power of collaborative exploration within critical reflection. He cites Vygotsky (1934) proposing that ‘the route to knowledge is through interactive, collaborative engagements based in doing (Tätigkeit)’ (2013, p.61). Furthermore, he references the groundbreaking work of Lee Miller and Bob Whalley, whose collaborative performance project formed a substantial part of their joint PhD submission (2013, p.73) and established the value of a collaborative dialogic PaR approach to generating new knowledge.

Regarding heuristics, Nelson posits ‘a distinctive pedagogy for PaR, operable at all levels of heuristic learning’ (2013, p.6). He cites Moustakas (1990), who:

in outlining heuristic research, refers to a process of internal search through which one discovers the nature and meaning of experience and develops methods and procedures for further investigation and analysis. The self of the researcher is present throughout the process and, while understanding the phenomenon with increasing depth, the researcher also experiences growing self- awareness and self- knowledge. (2013, p.66)

This process of internal search and growth in self-awareness and self-knowledge forms part of the know-what stage of the learning journey, where new knowledge and insights form through understanding the phenomenon with increasing depth en route to building spontaneous, intuitive, automated, heuristic know-how, or Nelson's 'operational knowledge' (2013, p.76).

Thus, in Nelson's core text on PaR I found that most of the lenses of my theoretical framework were already embedded in my methodology, and I sought to organise the six lenses to create a model that unified the various elements of learning-through-experience that generate know-what en route to achieving an effortless, intuitive, spontaneous set of know-how-heuristics, resulting in *The Entangled Web of Musical Learning*.

It is worth emphasising that in PaR there is no expectation that new knowledge and insights be propositional in nature. Any requirement to articulate the know-what of critical reflection should not be confused with a need or expectation to articulate factual, declarative, or even explicit knowledge. Rather, it provides the opportunity to open a window into a world where unknown personal, subjective, tacit, embodied types of knowing can either be accessed, given meaning, articulated, and disseminated, if you follow Nelson's view, or developed, embedded, and automated if you follow my thesis. This resonates with my view on heuristics⁹⁸, which are likewise not concerned with verifiable truth but rather with the fulfilment of an objective; if something works and is effective for the individual, then it is deemed useful, and valid (Mandolini, 2020) and therefore meaningful for that individual.

Nelson talks of detractors of PaR, who misunderstand research based in personal and subjective artistic acts and processes, or where propositional statements of verifiable fact do not result. He writes of 'sceptical scholars who dismiss, or look down upon, PaR as insubstantial and lacking in rigour' (2013, p.9), stating that 'despite the success over the past decades of establishing PaR, scepticism remains in some parts of the academy about this mode of knowing' (2020, p.258). It is possible that this scepticism stems from a general confusion amongst academics outside of artistic practice who do not understand knowledge and knowledge creation in creative domains.

It is important to understand that PaR embraces the personal and subjective without apology, asserting that new knowledge and insights can be acquired, articulated, and disseminated through acts of artistic practice, providing that the aforementioned documented, rigorous critical reflection forms an integral part of the research inquiry as well as the artistic process.

⁹⁸ See Chapter 2.7.

This process of critical reflection requires a level of detachment designed to ensure the ‘rigour’ described above, in order to ‘arrive at more objective conclusions generated from subjective embodied experience’ (Petsilas et al., 2019, p.180).

PaR does not ask that acts of artistic research be considered as, accepted as, or embraced by other research types and does not seek to be accountable to criteria normally applied to other research paradigms; it is happy to be something other, something apart. PaR celebrates that arts research is different from other research types and that arts practice can act as a research vehicle on its own terms, providing a door or window into new knowledge and insights. Moreover, Nelson argues that ‘PaR projects require more labour and a broader range of skills to engage in a multi-mode research inquiry than more traditional research processes and, when done well, demonstrate an equivalent rigour’ (2013, p.9). Nelson also asserts that it is often the ‘subjective experience of making and performing which needs to be captured’ (2013, p. 90) and that the best PaR demonstrates an intellectual diagnostic rigour in the ‘critical reflection on practice, in the movement between the tacit know-how and the explicit know-what and in the resonances marked between know-what and know-that’ (2013, p.60).

In his ongoing blog ‘Desiring Progress’, Ian Pace (2019) reflects on a talk given by Darla Crispin at the Royal Musical Association Annual Conference in 2019 and writes of what he calls the holy trinity of originality, rigour and significance as the criteria for judging scholarship and research. He states that rigour is often the most problematic of the three when discussing artistic creation as research, and reflects on Crispin asking ‘how artistic self-reflexivity might be rethought as conducive to such rigour, rather than antithetical to it, not least through a reappraisal of traditional scholarly distrust of subjectivity’ (Pace, 2019, para.7).

I sought to ensure rigour in my investigation by working with professional experts who constantly questioned my experiences and assumptions, thereby providing vital checks and balances against my own biases and subjective perceptions. It is impossible, and probably not desirable, to totally mitigate against one’s own subjectivity, especially when engaged in developing new know-how as learner-researcher, and I acknowledge that there are numerous truths in the pursuit of know-how relating to the production and artistic application of tone and timbre in flute playing. No one person might hope to be totally objective, and there is clearly much disagreement amongst experts, but working with multiple experts resulted in each having observations and questions about my research findings that helped me to question my subjective and unconscious biases to ensure rigour; all experts contributed, with a keenness to probe my assumptions that helped to leave little unchecked or unquestioned.

In my thesis, deep artistic learning and know-how development can best take place through engaging with *The Entangled Web of Musical Learning* and embracing the personal and subjective as a means of the searching out know-what, and my research outputs aim to provide learners and teachers with a set of tools with which to explore the tangled web as a process for developing personalised, know-how-heuristics.

As learner-researcher I set out to reorient PaR to experience, analyse, and critically reflect on the practices of expert performer-teachers, and to develop and articulate the tools, both technical and musical, which were most effective in developing tone and timbre, as well as highlighting false paths and pitfalls. This led to the creation of a body of work, research outputs, in multimodal forms - written word, audio and visual material, and musical notation - that might empower both learner autonomy and self-discovery of know-how, as well as adaptive and responsive approaches to teaching instrumental pedagogy that might be tailored to each individual student. This reorientation of PaR places learner practice in central position and leads to what I have termed 'Expert-Learner Practice as Research' (ELPaR).

4.2 Expert-Learner Practice as Research (ELPaR): A Learning-Centred Methodology

ELPaR, as I posit it within this study, is a research methodology that situates the researcher as learner and the act of learning as research. Learning becomes the driver for accessing, with a research agenda, the hidden world of the one-to-one expert performer-teacher studio for the purposes of unveiling hidden insights. ELPaR creates a situated position for the researcher to occupy, which I describe as 'expert-learner-practitioner-researcher', and facilitates the forming of a collaborative partnership within the one-to-one expert performer-teacher studio for the purpose of generating new insights.

Rather than observe the activities of the 'secret garden' or carry out empirical studies that question teachers and students about their attitudes and/or experiences, ELPaR requires that the researcher is an active learner, instrument-in-hand, working collaboratively with expert practitioners, whilst also engaging in processes of critical reflexion/reflection. In my research I positioned myself as 'expert-learner-practitioner-researcher', offering my own practice as an instrumentalist as a model to be critiqued and taught, engaging in critical reflexion/reflection, and the articulation of my experiences as a learner through the six lenses of my theoretical

framework⁹⁹. Within my ongoing learning journey working with multiple expert performer-teachers, I endeavoured to open a window onto a wealth of undocumented expert professional knowledge.

By enabling the ‘expert-learner-practitioner-researcher’ to work with multiple expert performer-teachers, ELPaR offers the opportunity to compare, contrast and synthesise expert practices, allowing for a more detached lens through which to create new pedagogy. It affords opportunities to look for resonances and contradictions, and to triangulate data findings across practitioners, leading to a robust consideration of expert practice and facilitating greater possibilities for developing new praxis. Working with multiple experts contributes to the rigour of the investigation, mitigating against individual researcher or expert personal biases. This rigour is further enhanced by the theoretical framework employed, which in my investigation was actively constructed to provide a set of lenses that I, in my practice, found relevant to the phenomenon of learning as I was applying it to the development of flute tone and timbre.

Away from the one-to-one teaching studio, ELPaR also creates a space for a more personal expert-learner-practitioner-researcher critical reflexion/reflection on expert practice, as it creates opportunities to reflect on the impact that each individual performer-teacher’s practice has on the learner-researcher’s practice, and to reflect on where ideas are shared, imbricate, or not working as anticipated. This creates a space to both evaluate the pedagogical materials and interventions that expert performer-teachers employ, and to test, experiment with, synthesise, and hone these practices into new pedagogy.

ELPaR facilitates expert performer-teacher contributions to new knowledge by developing researcher/expert practitioner partnerships, working within the framework of academic research methods but without the experts having to assume responsibility for the processes required of academia. They are contributors to the research but are not accountable. This collaborative approach, with an explicit understanding that the ‘expert-learner-practitioner-researcher’ is responsible for research rigour and outputs, but that expert participants can contribute and be credited as the authors of their own ideas and ways of working, seeks to remove barriers to expert-practitioner participation in research.

Engaging expert performer-teachers is necessary because the skills by which they demonstrate their expertise are not currently rigorously explored through traditional research methodologies. From a shared pedagogy viewpoint, the expert knowledge and skills are hidden

⁹⁹ See Chapter 2.

in the ‘secret garden’; gained through professional practice and experience, the flute-related expertise that I accessed was neither documented nor informed by the rigour that traditional research methodologies afford knowledge creation and validation.

By situating the research as an investigation of the artistic and pedagogical practices that take place within the one-to-one teaching studio, ELPaR offers a research methodology that is aligned with the professional identity of the expert performer-teacher and operates within an environment familiar to them. Thus, ELPaR is based in PaR but specifically reoriented to afford opportunities to mine for new insights in the shared space where participant-researcher and expert performer-teacher converge as practitioners, both as instrumentalists and teachers.

Proponents of learners taking more active roles in the production of knowledge, skills and learning include Healey, Flint and Harrington (2016) who advocate for ‘active learning’, ‘active collaboration’, ‘active engagement’, and ‘active pedagogies’, so that students are seen as ‘active participants in their own learning’ (2016, p.8 & p.36), with the ‘student as co/producer’ and ‘co-creator’ of knowledge and learning. Healey et al. advocate for students ‘working in collaboration with other students and academics in real research projects, or projects which replicate the process of research in their discipline’ (2016, p.44). In the case of ELPaR the student and academic are one and the same, working in collaboration with professional experts in the field to co-create knowledge and produce new pedagogical materials.

The role of ‘expert-learner-practitioner-researcher’ aims to create a learner-situated perspective that avoids the ‘master-apprentice’ model, (Juntunen, 2014, Gaunt, 2011, Nerland, 2007, Triantafyllaki, 2005), creating a more balanced sharing of power between learner and teacher; less an imparting of knowledge and experience and more a collaboration, a series of co-authored contiguous acts designed to explore expert knowledge and develop learner know-what to know-how. It seeks to create the conditions where know-how can gestate and develop rather than the more usual process of knowledge transfer, ‘based on an iterative method in which knowledge flows in both directions’ (Dogantan-Dack, 2016, p.15). This reflects Nelson’s concept of praxis as ‘an iterative process of ‘doing-reflecting-reading-articulating-doing’ (2013, p.32), although my iterative process within ELPaR might be better described as ‘collaborating-doing-reflecting-testing-articulating-collaborating-refining’.

In this way, ELPaR echoes Liora Bresler writing about qualitative research in general when she states that:

The researcher is not seen as separate from the researched, but, to quote the famous Geertzian phrase, "as an animal suspended in webs of significance he himself has spun" (Geertz, 1973). Because researchers are part of the reality they study, their neutrality is impossible. Instead, their goal becomes the "taming of subjectives" (Peshkin, 1988), to be aware and conscious of their biases and prejudices and to monitor them through the processes of data collection and analysis. (2006, p.1)

I see Geertz's 'webs of significance' as akin to my 'entangled web of learning'; a space in which the learner-researcher is 'suspended' whilst engaged in the acts of research, and a space into which to invite learners to become heuristic researchers of their own practice as they seek to develop know-what to know-how.

Bresler's acknowledgement of the participant-researcher immersed in the research web therefore represents both myself as 'expert-learner-practitioner-researcher', and the learners for whom my research outputs are designed. Moreover, her assertions regarding subjectivity are echoed in PaR's unapologetic embracing of the personal and subjective, and the ideas expressed by Bresler/Geertz imbricate in (EL)PaR, as illustrated by Nelson citing Kozel citing Varela et al. to state:

...the strength of the researcher is precisely the ability to give up the guise of detachment and to understand the source...the researcher is an 'emphatic resonator with experiences that are familiar to him and which find in himself a resonant chord'. Although some degree of critical distance is required, the intention is not that of a neutral observer but to 'meet on the same ground, as members of the same kind...'. In particular they (Varela et al.) indicate that sensitivity to another's 'phrasing, body language and expressiveness' is integral to this sort of second-person methodology. (Nelson, 2013, p.67)

These ideas are all core components of ELPaR, with researcher and expert meeting on the same ground and requiring sensitivity to each other's 'phrasing, body language and expressiveness'. The researcher seeks to understand by engaging in acts of collaboration and participation within the expert one-to-one teaching studio, and acts of critical reflexion/reflection away from it, in order to emphatically resonate whilst simultaneously maintaining a critical distance.

In working with expert performer-teachers the aim is to achieve this deep immersion into the phenomenon of tone and colour (or timbre) through embodying, enacting and critically reflecting on aspects of their practice; aiming, through collaboration and critical

reflexion/reflection, to form new insights by developing and articulating know-what to know-how. Through this process, combining the first-person methods of learner-practitioner-researcher and critical reflection with the second-person methods designed to access the expert professional knowledge of others, the ‘expert-learner-practitioner-researcher’ can enter more analytical and introspective spaces, born out of collaboration and critical reflexion/reflection, which in turn might represent ‘both process and product’ (Dogantan-Dack, 2016, p.73).

It is worth noting here the potential for both private and collaborative critical reflection by/between the expert-learner-researcher and the expert performer-teacher. This two-way reflexive process, which I would suggest is a feature of expert teaching, also has the potential to benefit, or even to be transformational for, the expert performer-teacher in their practice. This might prove to be an additional motivating factor for expert participation in this type of research project. For expert performer-teachers, it might facilitate the development of their own pedagogical skills, reflecting the objectives of the Association of European Conservatoires that effective teachers ‘engage in reflective practice and self-evaluation with a view to improving and refining their teaching’ and that they ‘reflect on developments in the profession, expanding their own understanding of pedagogical materials and methods, keeping up to date with relevant research and literature and developments in their professional associations’ (Lennon & Reed, 2012, pp.298-299).

4.3 Study Design

This research required a multi-phase, multi-method approach. Following on from the Literature Review, which had identified many themes and issues, including areas where information was sometimes contradictory, the primary research phases were structured as follows:

- **Phase 1:** a series of semi-structured interviews with seven expert-performer-teachers designed to discover attitudes and approaches to the issues raised in the Literature Review, and to begin the process of developing a trusted connection between researcher and expert performer-teacher that might open access to the ‘secret garden’.

Semi-structured interviews had previously been an effective research tool in the conservatoire-based performer-teacher research of both Nerland (2007) and Juntunen (2014), discussed in Chapter 1, and proved well-suited as a starting point for my initial data collection. Juntunen states that the semi-structured interview format ‘was chosen because it focuses on specific themes while also allowing new ideas to be brought up openly during the interview’; it allows the conversation to flow according to the interviewee and to generate a free exchange of ideas.

Juntunen references Kvale and Brinkmann's (2009) work on semi-structured interviews to add, 'its purpose was to gain detailed insights into the educators' visions, by offering the possibility for the interviewees to think aloud and construct knowledge together with the interviewer through the interview interactions' (2014, p.162).

In order to guide each interview, I compiled a series of questions that formed the basis for conversation, aiming to ensure that by the end of each interview I had covered all of the topics and issues raised in the Literature Review, whilst also allowing for conversational tangents and topics/issues not planned for to be explored. I started by explaining to each participant that the questions in the interview were designed to start a conversation about tone and colour in flute playing and to enquire into aspects of their professional practice as both performer and teacher.

The Phase 1 semi-structured interview questions were as follows:

1. How do you talk about tone and colour? What descriptive language, analogies, etc. do you employ?
2. Does the idea of focussed and unfocussed tone, as extremes along a spectrum of timbre, help in conceptualising tone colour?



3. What do you do physically to create a focused/unfocussed sound? Do you use specific repertoire/materials/exercises in your teaching?
4. Harmonics:
 - a. What role do harmonics play in tone and colour (*in different registers*)? How is the harmonic content of a note adjusted? What happens physically? What materials, method books, exercises, repertoire etc. do find most effective when working with students to develop using the harmonics within the sound?
 - b. What role does a greater or lesser harmonic content, or the way the harmonic partials are distributed in the sound, affect or change the sound?

- c. When learners are working on developing the ability to manipulate the harmonics and the partials in different ways, are there specific materials, method books, exercises, or repertoire that are specifically well suited to that kind of work?
5. What role does vibrato play in tone and colour? How is vibrato adjusted and controlled? What happens physically? What materials, method books, exercises, repertoire etc. do find most effective when working with students to develop use of vibrato?
6. How do dynamics relate to colour?
7. What elements of the music/the performance context prompt decisions about use of colour?
8. Teaching tone...What materials, method books, exercises, repertoire etc. do find most effective when working with students to develop tone? ... And colour? Do you adapt or use these materials in ways not specified by the author? If so, how?
9. Can you give examples of repertoire or extracts of repertoire that you would place at either end of the focussed/unfocussed continuum?
10. If you were writing a study book designed to encourage students to explore colour, what would be important to include? How would you structure/organise it?
11. How important is physical/kinaesthetic/proprioceptive awareness in tone production and how do you help students to develop this awareness?

Additional questions for expert performer-teachers engaged in teaching beginner students and early learners

12. When teaching beginners, how do you lay the foundations of good tone technique?
13. What books/materials/repertoire do you use with beginners and early learners? How well do these materials lay the foundations of good tone technique?

14. What role do dynamics play in tone and colour? How are dynamics adjusted? What materials, method books, exercises etc. do find most effective when working with students to develop dynamic range and control?
15. What would you like to see included in beginner materials that is currently lacking?
16. When you inherit a student, what areas of technique are commonly poor? How do you go about addressing them?

Following the interviews, I provided a transcript of the interview to the interviewee and invited further comment, feedback, and clarification where it might be felt that ideas had not been fully expressed or captured. This engendered a dialogue and a process of refining ideas, concepts, and meaning that resulted in the co-articulating and co-authoring of previously undocumented knowledge.

The semi-structured interviews also served to begin a process of establishing trust and rapport between researcher and expert practitioner. When interviewing conservatoire teachers, Gaunt talks of 'generating an atmosphere of trust around the process of the research' (2006, p.86), and my existing knowledge as flute player gave me an insider connection and helped to engender Gaunt's atmosphere of trust. I aimed throughout the investigation to respectfully acknowledge performer-teacher experience whilst encouraging a depth of critical reflection on practice. Gaunt cites Cooper (1993) to suggest that:

By emphasising the teacher's expertise and showing an awareness of the difficulties involved in articulating craft knowledge, a collaborative relationship was established between teachers and researchers, in which they together explored the teacher's thinking. (2006, p.91)

Finally, the Phase 1 interviews also served to inform the selection of the best candidates to act as unit of analysis in the Case Study phase of the research (discussed in Chapter 4.4). These were chosen based on a variety of factors, some academic and some pragmatic, including: experience and expertise; interest in the project; availability; geographical location; and openness to joint exploration and collaboration.

- **Phase 2: Case Studies**

Using the data collected from Phase 1 as a starting point, a series of 'collective instrumental case studies' (Stake, 1995) of four expert performer-teachers was undertaken. These case

studies took place within the one-to-one teaching studio. They were designed to explore expert practice through the six lenses of (1) Flow Theory; (2) PAPAPI; (3) 5E Cognition; (4) Heuristics and Imagery; (5) Collaborative Learning; and (6) Deliberate/Enjoyable Practice, with the ‘expert-learner-practitioner-researcher’ testing out and experiencing expert performer-teacher ideas and approaches first hand, in a one-to-one lesson/workshop format, in a hands-on, embodied, enactive, performative way.

This workshopping process was ongoing during a three-year period, with different start and end points for each case study, and different foci in each study, informed by the practices and approaches of each unit of analysis/case (expert practitioner) combined with personal requirements within my own ELPaR. All the practical case study sessions that took place within the one-to-one teaching studio were audio recorded and these recordings enabled me to revisit, make notes, and reflect on ideas privately throughout the research process.

There was no attempt to reproduce findings or to replicate data within each case study, for example, by utilising the same repertoire. The aim was to seek and embrace the new and unknown, focussing on exploration and experimentation as a means of unveiling expert practice and developing emerging learner-practitioner know-what to know-how, within both the collaborative space of the one-to-one teaching studio and the private reflexive/reflective space of the learner-researcher practice studio. The intention was to work practically within the ‘entangled web’ to investigate how expert ideas and practices imbricated and melded within my own practice to generate new insights.

In addition to the instrument-in hand, practice-based activities, other methods including reflective journaling and complementary writings, the creation of audio and video work to aid reflexion/reflection, and the curation of online and recorded audio and video exemplar material of other flute players/musicians, were crucial parts of the process.

- **Phase 3:** Developing *The Tone and Timbre Toolkit*

Throughout the Case Study phase I was engaged in the utilising emerging data to create new approaches to develop tone and timbre in flute playing, which gradually coalesced into what became *The Tone and Timbre Toolkit*¹⁰⁰. The *Tone and Timbre Toolkit* contains a practical set of ‘tools’, based in the physicality of learning and knowing-through-doing, and the use of imagery, designed to empower the building of know-what to know-how. These tools aim to offer opportunities for a ‘transformative pedagogy’, as described by Carey and Grant (2014,

¹⁰⁰ See Chapter 7.

2016)¹⁰¹, which is learner-oriented and ‘where process is emphasised over outcome, and where the teacher remains responsive and adaptable to the distinct needs of each individual learner’ (2016, para. 1). In this way ‘greater student engagement in learning, stronger conceptual understanding, and improved learning outcomes overall’ (2014, abstract) are possible.

Further methods that fed into the development of The Tone and Timbre Toolkit included observation and participation in group workshops and masterclasses, and audio/video recordings tracking the evolution of my own practice as I adopted and synthesised expert ideas and approaches. At various stages of development, I sought expert performer-teacher feedback on the emerging book and used this feedback to refine and develop it into a user-friendly resource, before offering it to students and teachers to try out.

Phase 4: Prototyping and Testing

The final ‘first edit’ of the book was then used as a prototype and offered to a sample group of students and teachers to use for a term. Feedback was then sought via Likert questionnaires and further interviews. This feedback data was then utilised to inform a final edit of the book prior to publication.

For a step-by-step outline of the primary research phases see the Study Design schema (Figure 26) below:

¹⁰¹ See Chapter 1.3.5.

Study Design

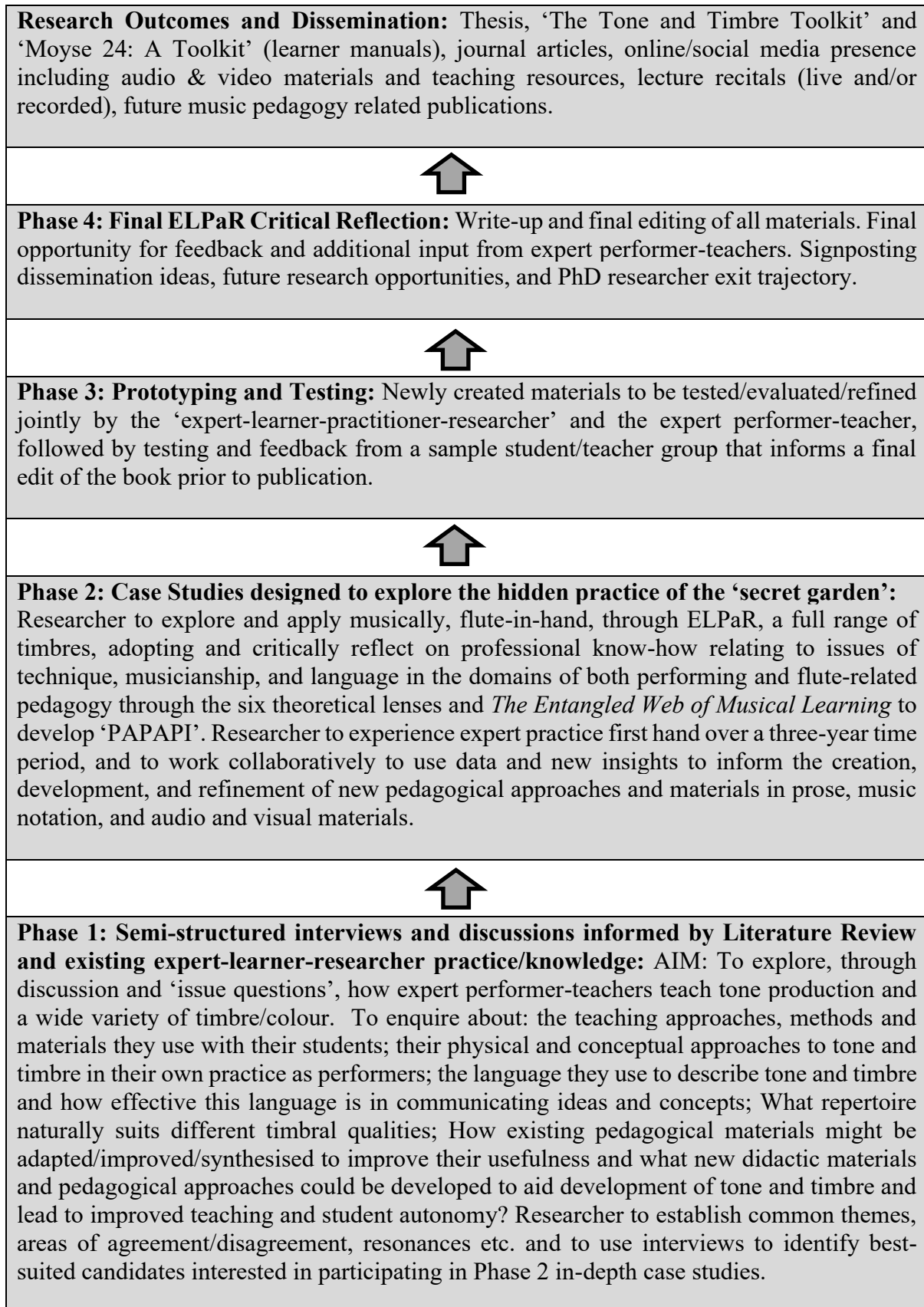


Figure 24: Study Design

4.4 Embedding Case Studies of Expert Performer-Teacher

Practice within ELPaR

In order to explore the knowledge and practice of expert performer-teachers, instrument-in-hand, I decided to undertake collective (also called multiple) case studies. I situated four expert performer-teachers as a case (unit of analysis) in order to investigate the phenomenon of tone and timbre and its related pedagogy, inquiring to identify, experientially explore, and reflect on the methods, approaches and materials they use in their professional practice as both musicians and educators; to develop new pedagogical materials designed to advance the teaching and learning of tone and timbre in flute playing and provide wider access to expert knowledge and pedagogical practices. According to Baxter and Jack, case studies:

- allow researchers opportunities to explore or describe a phenomenon in context using a variety of data sources;
- support the deconstruction and the subsequent reconstruction of various phenomena;
- allow that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood;
- allow that the topic of interest is well explored, and that the essence of the phenomenon is revealed. (2008, pp.544-545)

Several researchers have developed models of case study design, amongst whom Yin (2003), Merriam (1998), and Stake (1995) are preeminent. In this inquiry I acknowledge that it is the phenomenon of tone and timbre from an artistic and pedagogical standpoint which is of primary interest, with the cases (the expert performer-teachers) themselves being an instrument through which to explore the phenomenon; the cases are therefore of secondary importance. With this in mind, I identified the following two case study models, a combination of which I utilised to maximise the effectiveness of this research inquiry. According to Baxter and Jack:

Instrumental¹⁰² Case Study (Stake, 1995): ... provides insight into an issue or helps to refine a theory. The case is of secondary interest; it plays a supportive role, facilitating our understanding of something else. The case is often looked at in depth, its contexts scrutinized, its ordinary activities detailed, and because it helps the

¹⁰² In this context the word 'instrumental' does not carry any musical meaning. In case study methodology an instrumental case study uses the case (in this inquiry the expert performer-teacher) to provide insights into the phenomenon being investigated (in this inquiry tone and timbre in flute playing).

researcher pursue the external interest (in this case tone and timbre). The case may or may not be seen as typical of other cases.

Multiple/Collective case studies (Yin, 2003): A multiple case study enables the researcher to explore differences within and between cases... to analyse within each setting and across settings (Baxter & Jack, 2008, p.549)

As I was working with multiple expert performer-teachers and looking to identify both resonances and differences within and across the practices of each, a multiple/collective case study approach, as described above, was best suited. In this research it is the advancement of flute pedagogy relating to tone and timbre that was of paramount importance. The inquiry was less concerned with documenting the cases and more focussed on the insights that the cases could provide into the phenomenon under investigation and their potential for learner-centred, pedagogical synthesis and application; it was the unveiling and synthesis of their practices, generating my learner-practitioner-researcher know-what to know-how, that informed research outputs.

It is the intention of this investigation to avoid presenting findings as a new doctrine, but rather to open new possibilities for the exploration, experimentation, and development of tone and timbre through my research-based approaches and materials. In case study methodology, 'fuzzy generalisations' are one way of presenting findings that aim to avoid doctrine. Michael Bassey identifies 'theory-seeking and theory-testing' as one case study approach, and states that 'the outcome of a theory-seeking or theory-testing case study should be a worthwhile and convincing argument supporting a fuzzy generalisation' (1999, p.12), with the case study 'contributing to theory through fuzzy generalisations' (1999, p.3). I view the concept of fuzzy generalisations as a means of issuing invites to learners to explore and develop their own, personalised know-what to know-how, and the concept of theory-seeking and theory-testing as akin to a process that integrates theory and exploratory practice in the development of praxis.

Bassey suggests that fuzzy generalisations are an appropriate method for disseminating new insights and generating professional discourse. He states that fuzzy generalisations are:

the kind of statement which makes no absolute claim to knowledge, but hedges its claim with uncertainties. It arises when the empirical finding of a piece of research, such as... In this case it has been found that... is turned into a qualified general statement like this: In some cases it may be found that... (1999, p.12)

Fuzzy generalisations might make ‘claims that it is possible, or likely, or unlikely that...’ (1999, p.12). The idea of generating fuzzy generalisations is an appealing one to me as ‘expert-learner-practitioner-researcher’ as I wish to encourage learners to experiment, experience and discover their own know-how rather than simply impart knowledge. My findings are not intended to limit or constrain by way of making propositional statements of fact, but instead to provide ideas and materials designed to facilitate exploration of *The Entangled Web of Musical Learning*, and to open players to the widest possible range of tonal possibilities. The objective is to enable students and teachers to access a range of knowledge unveiled in the ‘secret garden’ and through researcher critical reflexion/reflection, in order to explore for themselves the issues involved; to provide opportunities to build personalised know-how that enhances individual artistry and agency, and to provide pedagogical materials and ideas that can act as starting points, guides, or stimulus to exploration, emphasising personal development, individuality, and autonomy, on both a musical and technical level. Fuzzy generalisations or fuzzy propositions, as proposed by Bassey, represent an open invitation to others to try things out and author their own knowledge, without making dogmatic claims or offering ready-made solutions. Moreover, they invite others to engage in discourse and contribute to further knowledge development.

In arriving at fuzzy generalisations I note parallels with the knowledge creation methods that lead to what Nelson calls ‘soft knowledge’, when he recognises ‘the importance of close-up, tacit, haptic know-how, seek(ing) a means to establish as fully as possible an articulation of *liquid knowing*’ (2013, p.60). What Nelson articulates resonates with my view of heuristics as tools which are not concerned with verifiable truth, but focus on the effective enabling and fulfilment of an objective; the already cited idea that if something works, if it is effective, then it is useful, valid and meaningful (Mandolini, 2020).

4.4.1 Binding the case

As this is a large-scale inquiry it was necessary to exert some control over the scope of the investigation to avoid it becoming too big. Baxter and Jack state that ‘one of the common pitfalls associated with case study is that there is a tendency for researchers to attempt to answer a question that is too broad or a topic that has too many objectives for one study’ (2008, p.546). Many writers on case study offer suggestions for binding a case; binding a case is intended to place boundaries around an inquiry and delineate that which falls within the scope of the inquiry and that which falls outside of it. For the purposes of this study I considered several ways in which I might bind the case, including ‘by time and activity’ (Stake, 1995) and ‘by

definition and context’ (Miles, Saldaña & Huberman, 2014), before deciding to bind each case study by theme. Breaking the inquiry down into an investigation of themes, or what Stake might call the various ‘issues’ that affect tone and timbre, including: The Colour Spectrum; Vibrato; Support, Breathing and the Diaphragm; Resonance and Colour; and Embouchure, issues were each investigated, from a technical, conceptual, and musical perspective, using the cases as a tool for investigation.

Stake describes ‘issues’ as problems or foci within an inquiry, stating that issues ‘draw us toward observing, even teasing out, the problems of the case’ (or in this inquiry, the phenomenon). Bassey adds that ‘issue questions or issue statements provide a powerful conceptual structure for organising the study of a case’ (1999, pp.16-17). At the planning stage I wished to avoid making issue statements beyond acknowledging those generated by the Literature Review, but issues or foci emerged throughout my primary research activities that informed and influenced the case studies as they evolved.

4.4.2 Data Collection and Analysis

Each phase of the primary research involved data collection and analysis. The data from the Phase 1 semi-structured interviews¹⁰³ were analysed according to Braun & Clarke’s (2006) six ‘Phases of thematic analysis’.

Phases of thematic analysis

Phase	Description of the process
1. Familiarizing yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic ‘map’ of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the

¹⁰³ The rationale for engaging in semi-structured interviews is explored in Chapter 4.3.

	research question and literature, producing a scholarly report of the analysis.
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Table 5: Phases of thematic analysis

(Braun & Clarke, 2006, p.87)

Phase 1: Each interview was videoed and transcribed, and the transcript was sent to the interviewee with an invitation to read, amend or expand upon any information which was deemed to not fully represent their ideas and practice.

Phase 2 and 3: The transcripts were utilised in a process of coding data, which was mostly concerned with separating data that represented existed knowledge from data that might represent new insights and be worthy of ELPaR exploration, discarding the former and grouping the later into themes. I already had a good idea, informed by the literature review, of the themes likely to be identified in the data, but I strived to combine a ‘bottom-up’ (suitable for research questions that are exploratory and open and privileging the participant’s perspective) and ‘top-down’ approach (suitable where the ‘research question and/or design is seen through a specific theoretical lens) to coding and theming (Williamon et al., 2021, p.239), so as to be guided by the themes identified in the literature review whilst not permitting them to dominate or overshadow new insights hidden in the data.

Phase 4: The themes identified in each interview were rendered as a ‘thematic map’ (Braun & Clarke, 2006), illustrated in figures 25-33¹⁰⁴. Data findings were triangulated across all interviews to identify themes that crossed all data sets, identifying both commonalities and differences in expert understanding and practice.

Phase 5: Ongoing analysis then formed part of my ELPaR, where the thematic maps were very useful to me as I explored, instrument-in-hand, the data, putting ideas into action and critically reflecting on how they impacted my practice.

Phase 6: Producing a report was not an appropriate sixth step in my investigation, as my interviews formed only the first phase of my primary research activities. Phase 6 involved using data-informed ELPaR exploration and analysis of the themes and issues to plan subsequent

¹⁰⁴ See Chapter 5.

primary research activities in the phase 2 face-to-face workshopping sessions within the expert one-to-one teaching studio.

In Phase 2, the data from each case study emerged over time as experiential know-how within my ELPaR; it was developed and analysed through an ongoing and iterative process of critical reflexion-in-action, based in learning-through-doing, and reflection-on/for-action, based in learning through dialogue, thinking, and reasoning. The data emerged organically, often initiated by the process of my being taught or coached and often influenced by perceived problems or deficiencies in my playing, which acted as a catalyst for investigation. In turn, this fed into the process of creating new pedagogical resources.

Phase 3 data was collected in the form of Likert questionnaires for student feedback, combined with unstructured discussions with expert performer-teachers. Likert questionnaires were used because they are a simple way to obtain feedback without overwhelming the participant. The data itself did not require complex analysis, but sought to identify areas where ‘The Tone and Timbre Toolkit’ might be improved to make it more user-friendly. Issues regarding layout, content, and general experiences using the book were the focus, intended to inform a final edit. I chose unstructured teacher interviews because I did not want to lead conversations with my own biases, and I wanted the teachers to be free to raise whatever thoughts occurred to them.

It is important to emphasise here that case study methods, including data collection and analysis, were employed within the overarching framework of PaR, accepting the already identified subjective and personal qualities which are a strength of PaR. The data from each phase of the inquiry was used to inform the final versions of ‘The Tone and Timbre Toolkit’ and ‘Moyse 24: A Toolkit’. There was no intention here to emulate the procedures or outcomes of case study in other research domains or to seek to replicate data within each case study, and whilst commonalities did emerge it was expected and hoped that the nature of artistic practice in the domain of instrumental practice and pedagogy would yield a variety of different, possibly conflicting, data that would build to form a complex picture from which to synthesise new ideas that students and teachers can choose to employ (or not) in the pursuit of discovering know-what to know-how.

4.5 Ethical considerations

All aspects of this research were informed by the ‘Ethical Guidelines for Educational Research’ as set out by the British Educational Research Association (BERA), acknowledging the researcher’s: responsibilities to the participants and other stakeholders in research;

responsibilities to the community of educational researchers; responsibilities for publication and dissemination; and responsibilities for researchers' wellbeing and development (BERA, 2019).

The research was designed to ensure quality, honesty, and integrity at each stage and to engender respect and trust between the researcher and the participants. In the planning stages of this inquiry full attention was given to the ethical principles of: quality; honesty; integrity; confidentiality and anonymity; voluntary participation; impartiality; informed consent and the avoidance of personal risk to individuals or social groups. These principles were reviewed by the researcher and key supervisors at regular intervals within the research process in order to guarantee the highest ethical standards.

There was no likelihood of risk, harm or discomfort resulting from this research and there were no health and safety concerns, but the following safeguards were observed:

- Anonymity and confidentiality: Anonymity for all participants was standard practice in order to avoid jeopardising the professional standing of participants. The information (data) collected was treated as anonymous and confidential unless otherwise agreed in writing by the participant; only myself as researcher and my academic supervisors had access to it. It was acknowledged that each performer-teacher had ownership of their own practice and ideas, and may have been interested in receiving recognition for new insights which emanated from their practice and ideas, in which case their explicit written permission was sought.
- Informed consent: All efforts were made to ensure that prospective participants were given as much information as possible so that they were fully informed about the purpose, methods and intended possible uses of this research, what their participation in the research entailed and what risks, if any, were involved in order that prospective participants could make an informed decision about their possible involvement.
- Voluntary participation: All participants were informed that they had the right to stop the interviews or withdraw from the research at any time.

It was acknowledged that the case study phase of this research would occur over a period of time with high levels of face-to-face contact and result in highly detailed information regarding the practice of each participant, requiring additional preventative measures to ensure participants' right to privacy and to avoid inadvertently exposing participants' identities without their permission (Roller, 2016). An ethic of respect and trust was of paramount importance in creating successful working partnerships.

In the final research phase of testing The Tone and Timbre Toolkit, a sample group of students was invited to participate in trialling the book and feeding back their experiences and thoughts. The same procedures as described above were followed, but all student participation remained anonymous and anonymity for students was a pre-requisite of participation.

Both stages of this research were reviewed and approved by the Trinity Laban Conservatoire of Music and Dance Research Ethics Sub-Committee, with approval for working with expert performer-teachers confirmed on 14th May 2020, and approval for working with students confirmed on 11th May 2022, in both cases via email by the Research Administrator and the Head of Research at Trinity Laban.

4.6 Chapter Summary

ELPaR, as a reorientation of Nelson's model of PaR, is a dynamic methodology designed to empower the exploration of expert performer-teacher know-how within the 'secret garden'. It establishes itself as a methodology that situates the act of learning as research, collaborating with expert practice but not subservient to it. It can be replicated and adapted by other researchers to further investigate not only flute pedagogy and the pedagogies of other instruments, but also arts pedagogy and expert practice more widely.

Working within an ELPaR methodology academics can open doors to hidden practices, build trust, form partnerships, and serve as a bridge between professional expertise and wider communities of practice; adopting practices from case study methodology, but embedded within an overall PaR framework, ELPaR can facilitate transformational learner-researcher experiences, and unveil knowledge and ways of working that might benefit others, including informing the creation of new learner-centred pedagogies of personalised discovery. It is a significant contribution to knowledge that PaR has been reoriented away from a method of investigating already existing tacit and undocumented artistic practices, lived experiences, and know-how, into a methodology conceived to generate, build, and embed personalised know-how for learners seeking to know what and how, as yet, they do not.

The chapters that follow detail first the data revealed by my ELPaR (Chapters 5 and 6), before exploring how I have used this data to create new learner and teacher resources (Chapter 7). It is imperative that Chapter 7 be read alongside the two resources that I have created, 'The Tone and Timbre Toolkit' and 'Moyses 24: A Toolkit', in order to understand how ELPaR has worked to translate the data collected into user-facing and user-friendly, practice-oriented pedagogical resources.

Chapter 5: Primary Research Phase 1: Interviews with Seven Expert Performer- Teachers

During July and August 2020 I started the primary research phase of my investigation with a series of semi-structured interviews¹⁰⁵ with seven¹⁰⁶ elite expert performer-teachers¹⁰⁷. As a group they combine to have many years' experience as both teachers at some of the most respected conservatoires in Europe¹⁰⁸ and as players in a variety of professional orchestras¹⁰⁹ and chamber music ensembles.

The purpose of these interviews, as detailed in Chapter 4.3, was to begin a process of exploring expert performer-teacher practice relating to tone and timbre in flute playing and teaching, to begin to build a relationship between me as researcher and a sample group of expert performer-teachers, and to start to reach beyond existing documented knowledge. I wanted to investigate the commonalities and differences that expert performer-teachers have in the way that tone production is understood, developed, and utilised; to discover how varied practices are in this area and how varied possible new pedagogical approaches and materials might be. The interviews were intended to start initial data collection by unveiling previously undocumented practices from within the 'secret garden', and lead to more in-depth, instrument-in-hand, collaborative investigation within the expert one-to-one teaching studio.

The semi-structured design of the interviews was set up to discover approaches and issues, as already listed in Chapter 3, relating to:

- Timbre and Tone Colour
- Embouchure
- Airstream/Air Column
- Resonance
- Vibrato

¹⁰⁵ See Chapter 4.3 for the semi-structured interview questions, discussion of the rationale behind choosing this type of interview format, and the processes involved.

¹⁰⁶ See Chapter 1.1 for a 'family tree' and biographical details of all expert performer-teacher participants.

¹⁰⁷ Ethical approval for these interviews was given by the Research Ethics Committee of Trinity Laban Conservatoire of Music and Dance on 14th May 2020 and all interviewees gave informed, written consent which includes explicit consent to be named for ideas originating in their practice.

¹⁰⁸ The Royal Academy of Music, London, Trinity Laban Conservatoire of Music and Dance, London, The Royal Conservatoire of the Hague, The Gnessin Special School of Music, Moscow, The Purcell School, UK.

¹⁰⁹ The London Philharmonic Orchestra, English Chamber Orchestra, The Netherlands Radio Philharmonic Orchestra, Northern Sinfonia (UK), London Mozart Players.

- Harmonics
- Learning from singers
- Learning from string players
- Dynamics
- Acoustics: The Performer and the Listener
- Blending Flute Tone with Other Instruments

As already discussed in Chapter 4.3, the semi-structured interview was chosen to allow the conversation to flow according to the interviewee and to generate a free exchange of ideas. Juntunen states that the semi-structured interview ‘format was chosen because it focuses on specific themes while also allowing new ideas to be brought up openly during the interview’, and she references Kvale and Brinkmann’s (2009) work on semi-structured interviews to add, ‘its purpose was to gain detailed insights into the educators’ visions, by offering the possibility for the interviewees to think aloud and construct knowledge together with the interviewer through the interview interactions’ (2014, p.162). This collaborative approach to knowledge construction is key to my methodological approach.

I had originally envisaged meeting face-to-face to carry out these interviews. Understanding that much of the knowledge possessed by expert performer-teachers is located in a ‘knowing-doing’ (Nelson, 2013) that might be more easily communicated via modelling on the instrument rather than verbal explanation, a face-to-face approach for gathering initial data seemed the best approach, but due to the Covid-19 global pandemic most countries in Europe at this time were in lockdown. This necessitated a change of approach, and the initial interviews were conducted online. Despite initial concerns on my part that conducting the interviews online might impact the quality of the data, the interviews worked well. Some interviewees did indeed model some of their approaches and ideas on the flute, but the online medium was sufficient for ideas to be communicated effectively and resulted in a rich data collection that allowed for a prolonged period of testing, reflection, and assimilation of ideas into my own practice within the processes of ELPaR.

Each interview took place via Zoom and was video recorded on the Zoom platform, and a transcript was then made using otter.ai. This created a transcript with accuracy levels of approximately 70%, but which required me to listen to each interview and edit the transcript for 100% accuracy. The transcript was then sent to the interviewee with an invitation to read, amend or expand upon any information which was deemed to not fully represent their ideas and practice. At this point one interviewee provided annotated feedback on the transcript and one other requested two further Zoom conversations, which were also recorded and archived.

The data was then coded and themed¹¹⁰ in order to: cross reference it with the literature review; triangulate findings across participants; and so that it might become a useful tool to inform my ongoing ELPaR. The process of theming resulted in my creating ‘thematic maps’ (Braun & Clarke, 2006), presented below as figures 25-33.

¹¹⁰ See Chapter 4.4.2.

Figure 25: Juliette Bausor

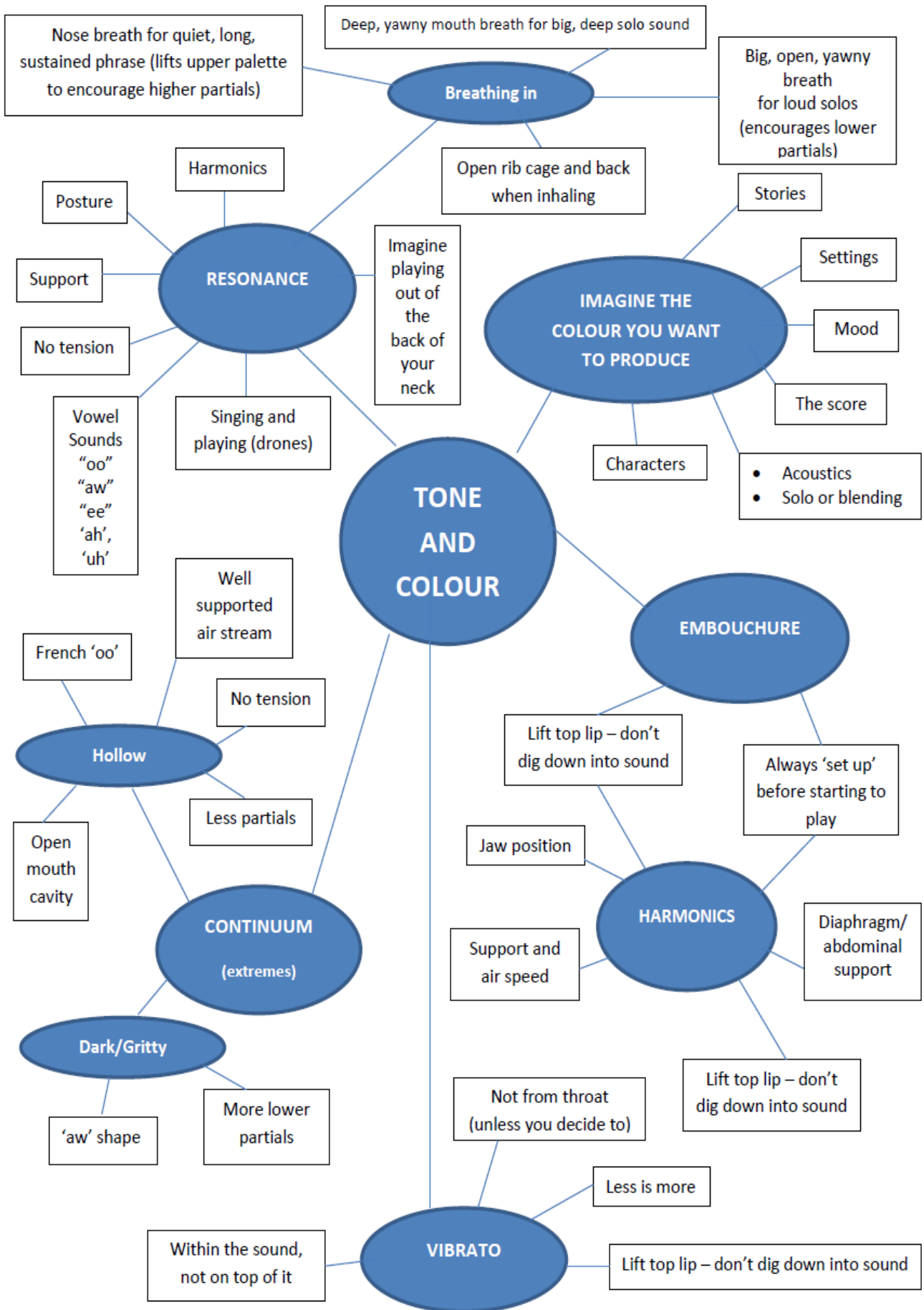


Figure 26: William Bennett

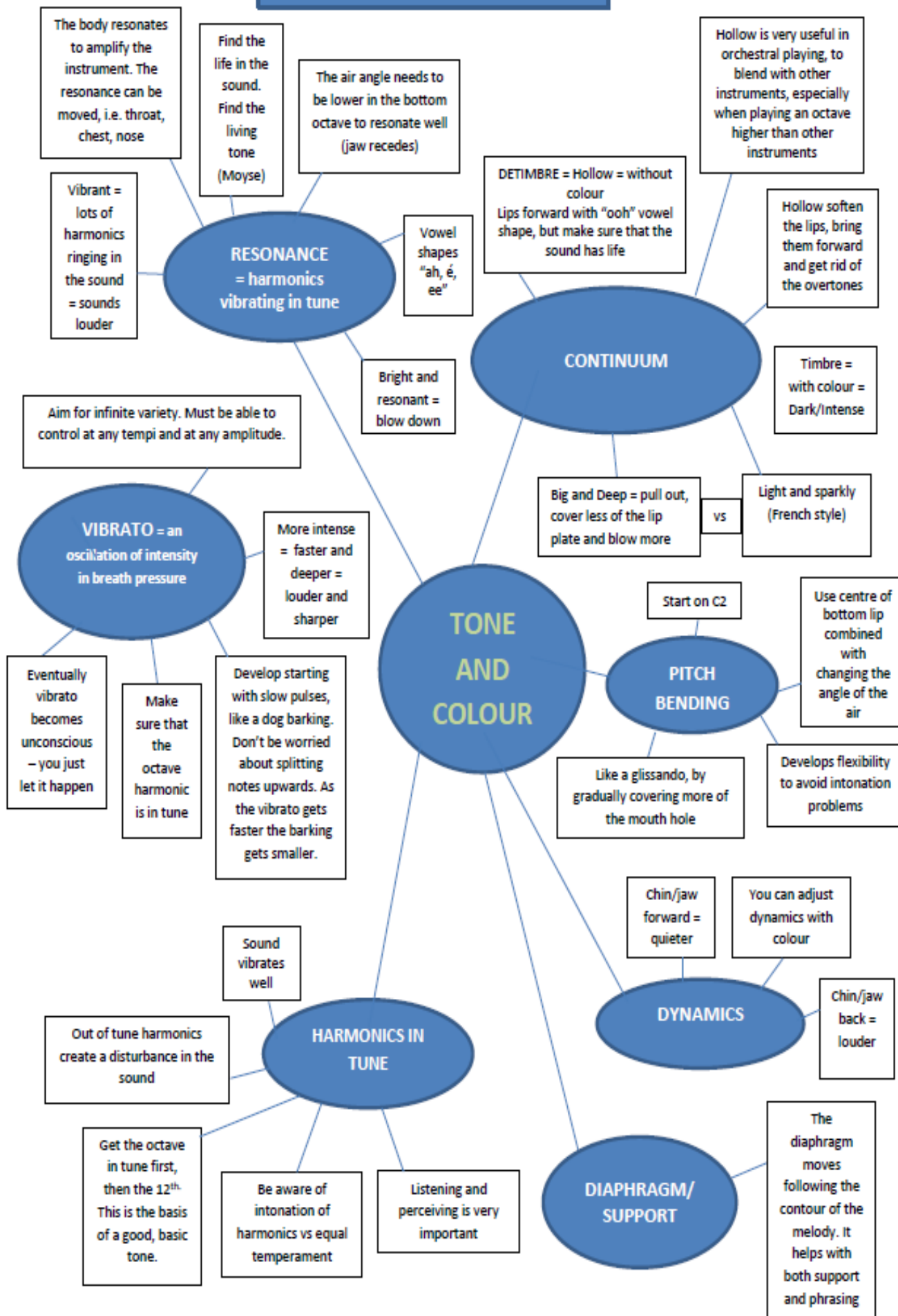


Figure 27: Abigail Burrows

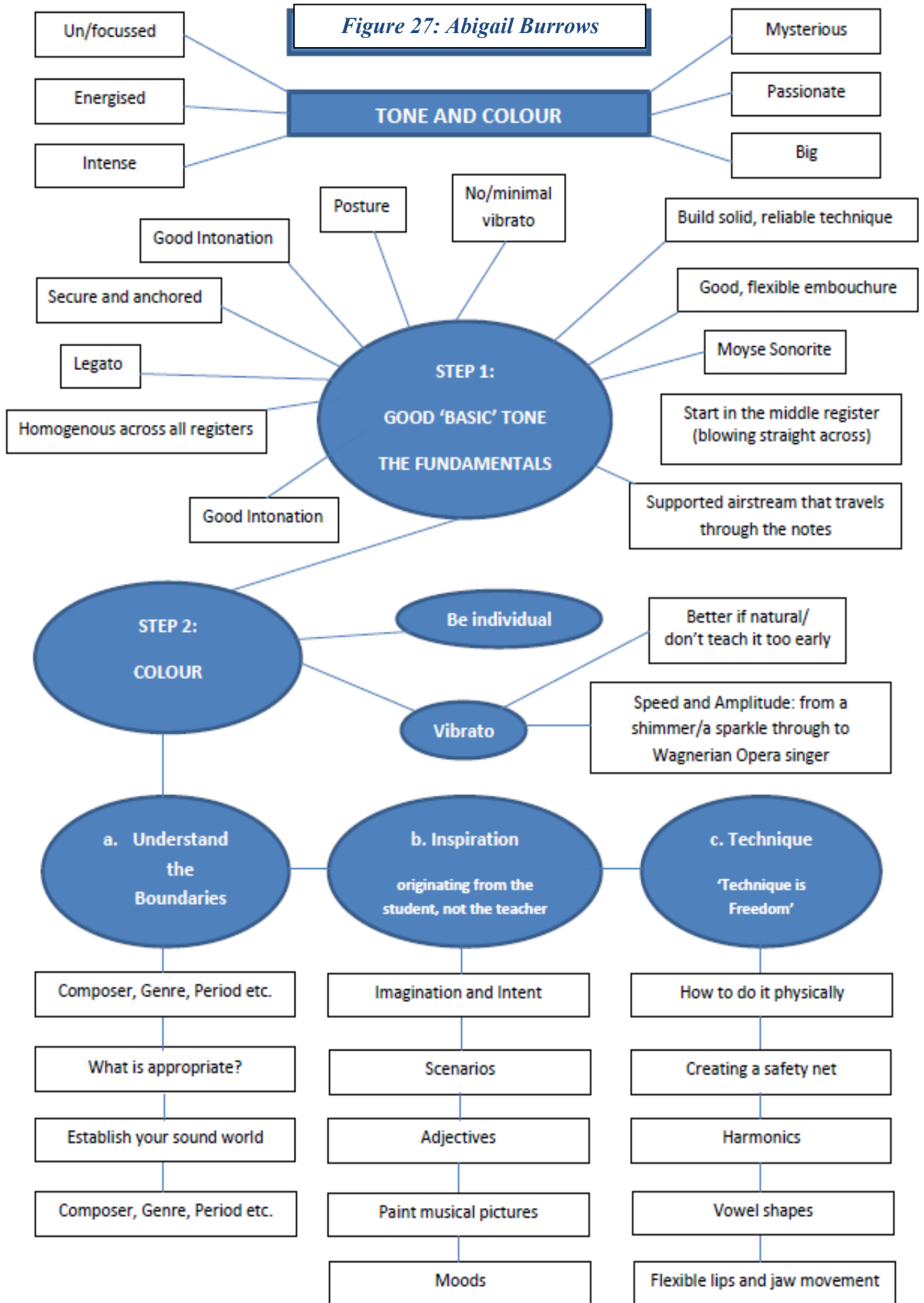


Figure 28: Zoya Vyazovskaya

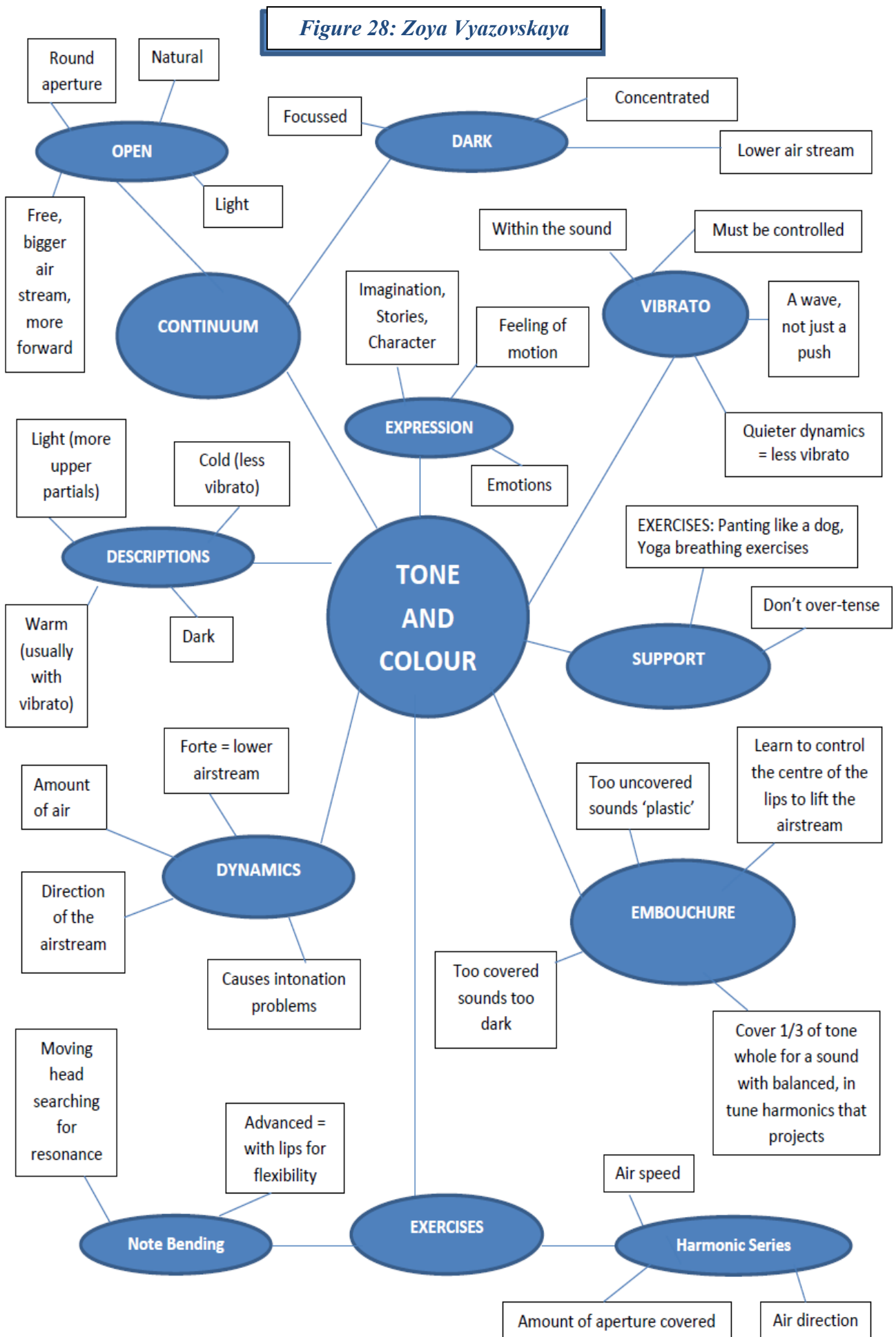


Figure 29: Anna Pope

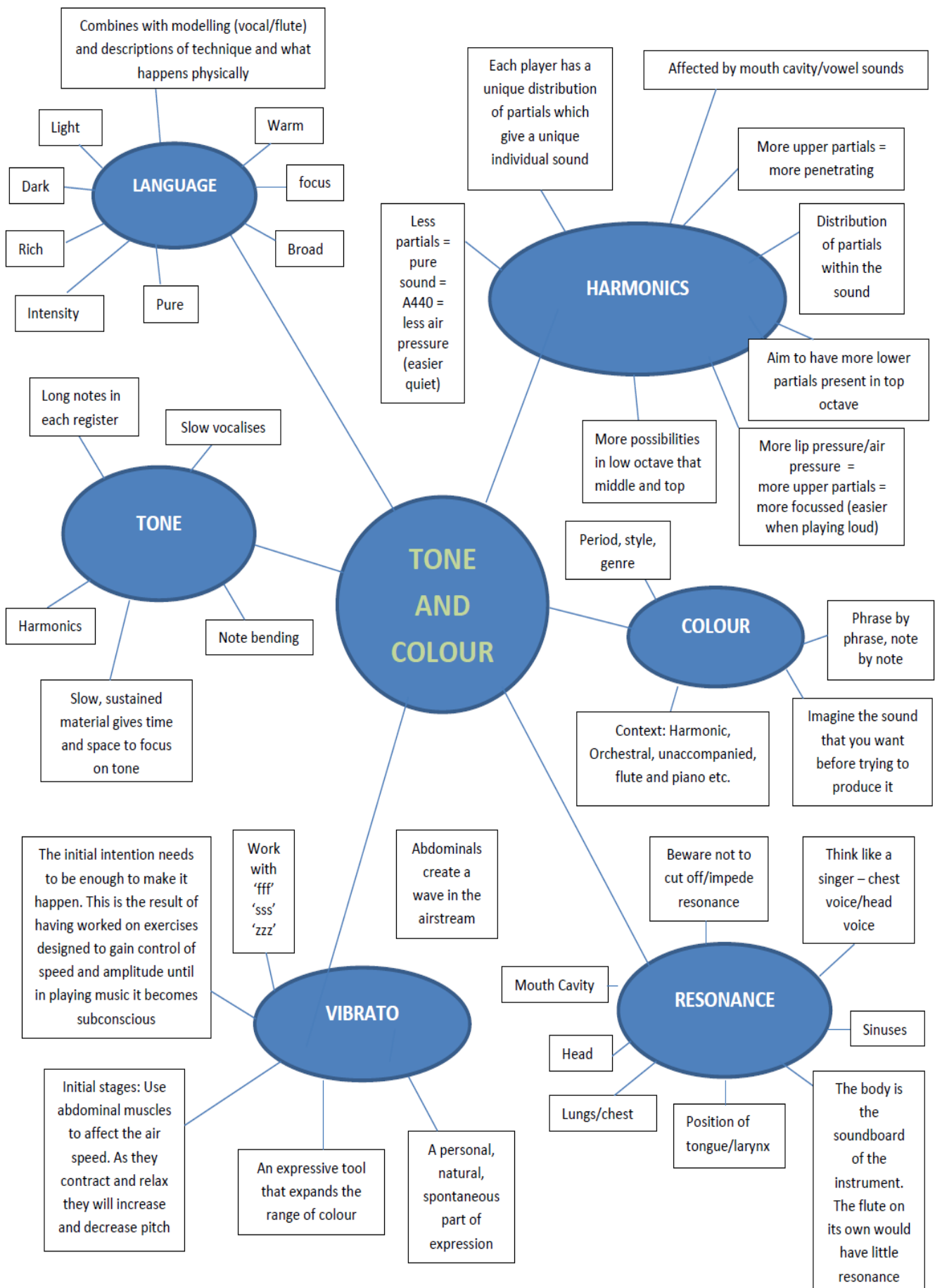


Figure 30: Anna Pope (page 2)

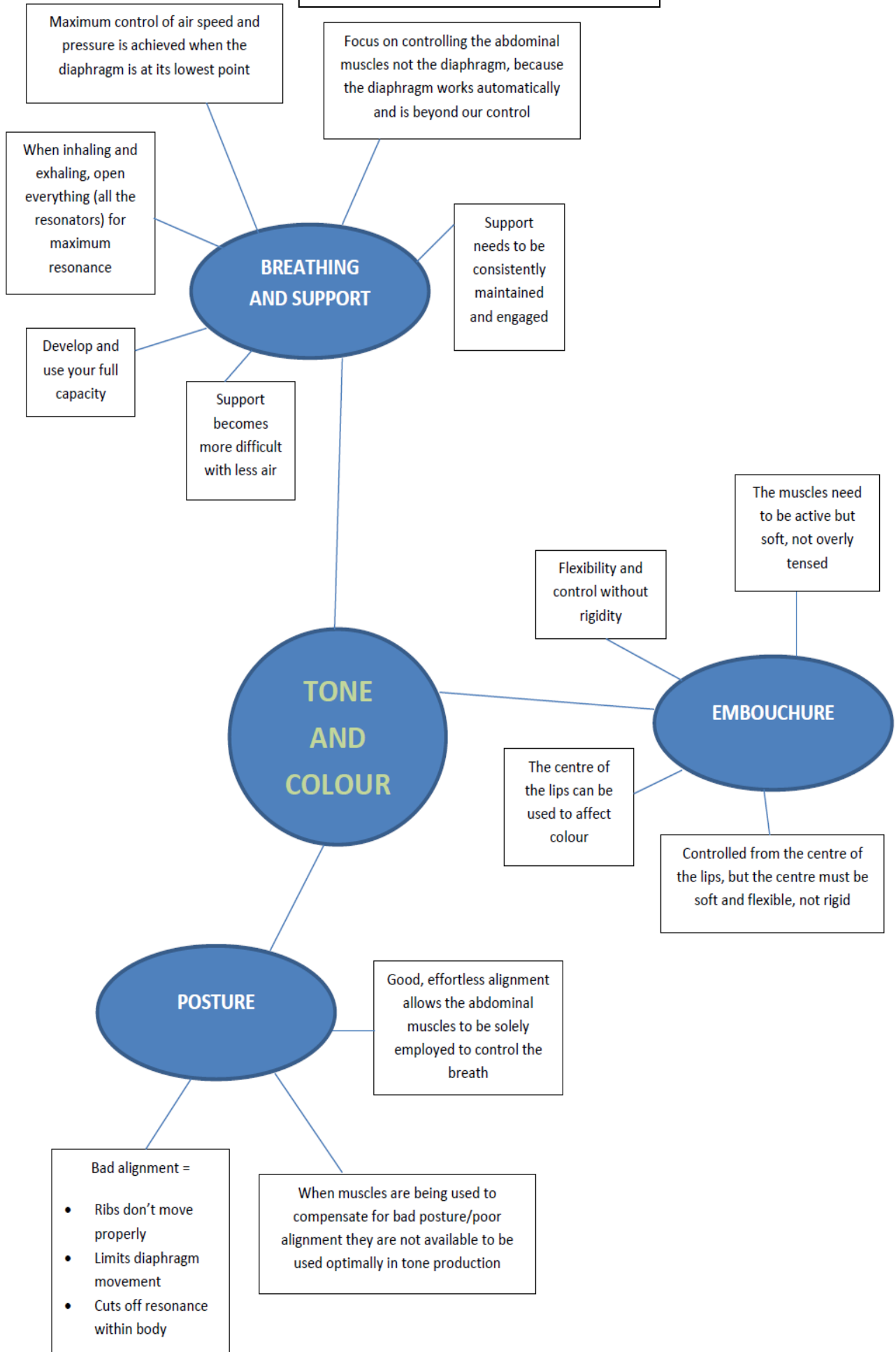


Figure 31: Thies Roorda

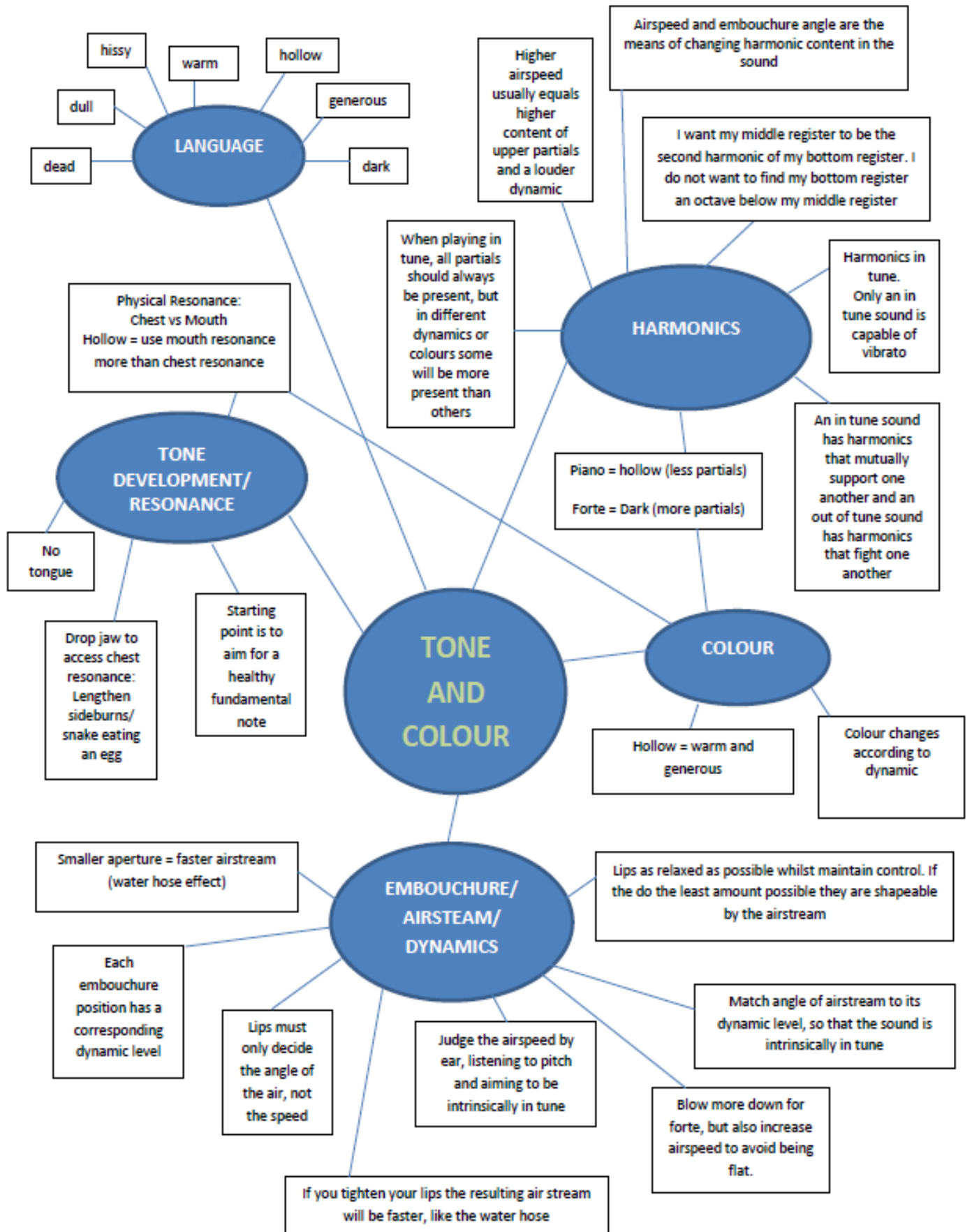


Figure 32: Thies Roorda – page 2

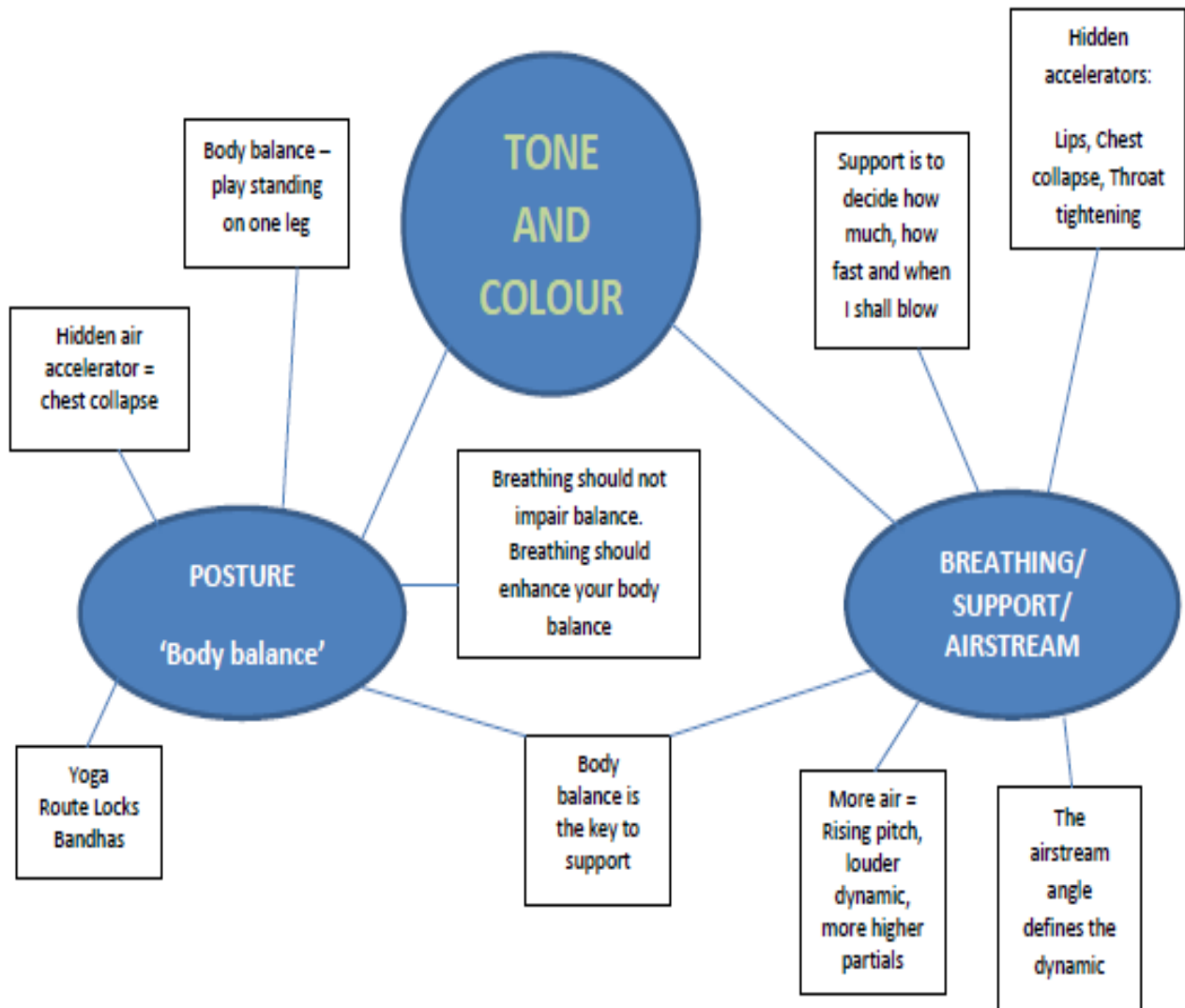
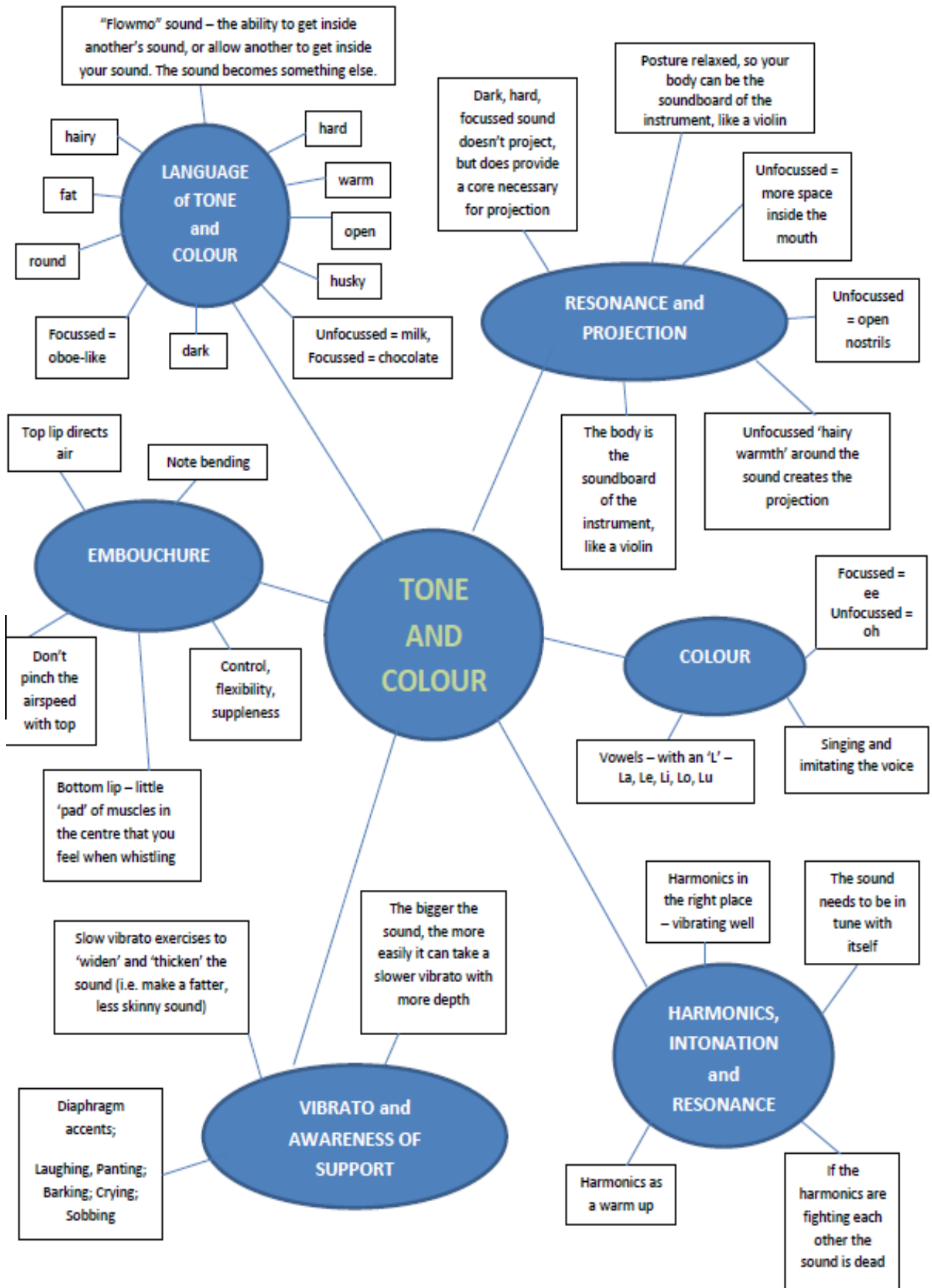


Figure 33: Kate Hill



These ‘thematic maps’ (Braun & Clarke, 2006) were very useful to me as I explored the ideas to emerge from the interviews within my own ELPaR, and they proved a useful tool when planning subsequent face-to-face workshopping sessions within the one-to-one teaching studio; easy to reference in the moment, they enabled me to keep sight of the bigger picture whilst drilling down into specific issues.

Looking at figures 25-33 it became immediately apparent that there were several key recurring themes across most participants, which I list here:

- the language used to describe extremes of the colour spectrum, most often expressed as ‘hollow’ to ‘dark’;
- how the extremes of the colour spectrum relate to a variety of technical and expressive issues, in particular, dynamics; harmonics; resonance; intonation; embouchure; airstream and support (including breathing and the diaphragm¹¹¹);
- musical imagination, creating characters, moods, images, etc.;
- posture and balance; and
- vibrato.

Most of these themes had already been identified in the Literature Review, although often in a manner lacking in detail or usable, applicable knowledge. Glimpses of new insights and ideas for further exploration, alongside knowledge that was already documented, were already starting to emerge.

This chapter presents the main ideas and themes that emerged from the interviews, covering ideas that were either not found in the Literature Review, or that offer a new perspective and new insights that expand existing knowledge. There was, inevitably, a great deal of discussion around knowledge and practice that is already known, including discussion of many of the authors addressed in the Literature Review (Moyses, Wye, Taffanel and Gaubert, etc.). My intention here is to draw out information, ideas and approaches that each achieve some of the following: (1) are not already documented; (2) extend/reframe/repurpose/provide new insights into what is already documented; (3) provide rich concepts and ideas to explore in my own ELPaR; (4) offer possibilities for new pedagogical approaches and materials; (4) clarify areas

¹¹¹ ‘Diaphragm’ is a term that came to be identified as a misused, erroneous concept by some of my expert participants. Where an involuntary action is taking place caused by inhalation or exhalation, the term diaphragm might be used appropriately in some contexts, but for all issues involving controlling the airstream I use the term ‘corset muscles’, which represents a combination of muscles that can be imagined like a ‘corset’ surrounding the body from the belly button up to the rib cage. This idea is a synthesis of expert performer-teacher thinking filtered through my ELPaR. See page 8 of The Tone and Timbre Toolkit for a full explanation.

of disagreement and doubt to emerge in the Literature Review; (5) offer potential and seem worthy of further collaborative investigation within the expert one-to-one teaching studio; (6) might be of use to others, particularly members of the wider flute playing community.

5.1 Starting to Develop Good Tone: No Tongue!

When starting to work on developing tone, Roorda recommends starting with the exercise preceding No. 31 in the *Méthode Complète de Flûte* by Taffanel and Gaubert.



Figure 34: Excerpt from No. 31 in the Méthode Complète de Flûte by Taffanel and Gaubert

(Taffanel & Gaubert, 1958, p.11)

Noting that it may seem strange to take an exercise designed to start the process of learning to tongue as the basis for tone development, Roorda believes that the important element here is that the notes marked with a zero above indicate that the note should start with air pressure only, without the tongue. By teaching students to start notes by saying ‘ha’ with the air stream, but without articulating with the tongue, this begins the process of learning how to blow correctly. Starting on the note C above middle C, Taffanel and Gaubert’s exercise above begins on a short tube note (only one left hand key is in use) and is an easy note to produce. For the G above to sound however, there must be sufficient air speed and pressure, otherwise a low octave G will be produced. This exercise is suitable for any learner once they are learning to speed up the airstream to play in the middle octave.

Hill states that the air speed must be generated by the diaphragm/tummy/support and cautions against pinching the lips to increase air speed. Roorda also cautions against this, describing it

as a ‘hidden accelerator’¹¹² of the airstream. Pope, Bausor and Hill all likewise advocate for developing the ability to start notes immediately, without the tongue, using blowing, support, and airstream to initiate the sound. However, starting notes this way lacks precision, clarity, and finesse, so whilst the airstream, instigated by the breathing mechanism, is responsible for starting the note, it is the job of the tongue to cleanly articulate the beginning of a note, says Hill. The tongue refines the start of a note but should not be used to initiate the sound, and the ability to produce an immediately sounding, energised note without the tongue is a prerequisite of good articulation.

Pope and Roorda recommend working to achieve a good sound in the bottom register before going up to the middle register. Roorda states that the bottom octave has more harmonics available to play with, and so offers more possibilities for changing colour than the middle and top octaves. He recommends working in the bottom octave to ‘edify’ (build) the sound without the tongue, using a selection of different embouchure positions, each of which will relate to a different dynamic level according to its blowing angle combined with the air speed that results in a harmonics-in-tune sound.

By playing a lot of notes in the bottom octave, using only the airstream to start each note, ‘ha ha ha’, there is no risk of notes ‘cracking down’ as the low octave notes form the fundamental from which harmonic overtones layer above; there are no harmonic overtones below these notes to ‘crack down’ to. Problems will arise, however, if the airstream is insufficient; the pitch will be flat, and so students will need to work to increase the airstream to the point where the notes are in tune. This can be achieved by working from the point where minimal air speed/pressure/volume produces an initial sound, and then increasing the blowing until the sound is in tune. Roorda describes this as a process of building the sound by ear, increasing the speed of the air and therefore the intensity of the sound, but importantly not by changing the embouchure; the embouchure should stay constant until an in-tune sound is reached as the air pressure increases, and the player then discovers the corresponding dynamic level of that specific embouchure/air speed combination. A different embouchure position can be selected if the dynamic level desired is different.

¹¹² See Chapter 5.11.1.

5.2 The Colour Spectrum

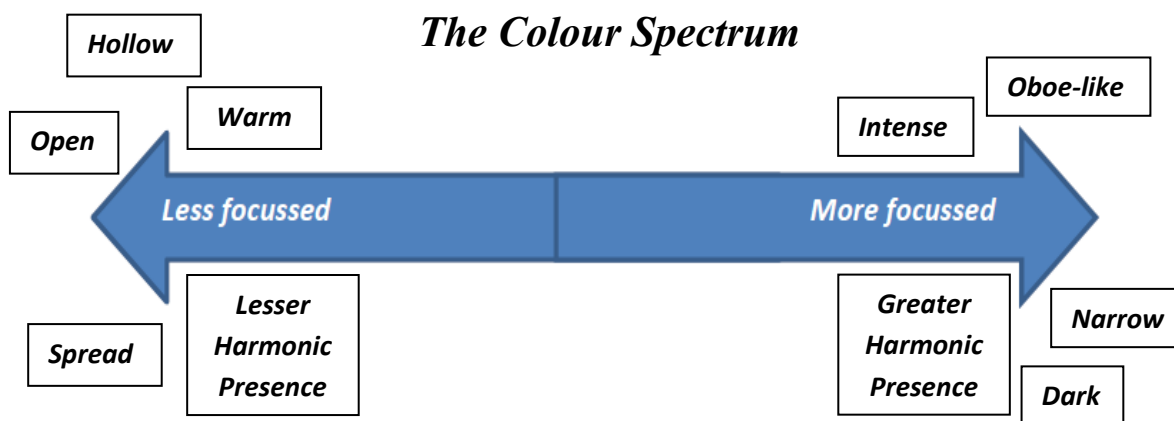


Figure 35: The Colour Spectrum

One of the main objectives in my initial interviews was to establish how the extremes of colour in flute playing were conceptualised, developed, and utilised in expert performer-teacher practice. The most common descriptors to emerge were ‘hollow’ at the unfocussed extreme of the spectrum to ‘dark’ at the opposite end (Bausor, Bennett, Roorda). ‘Open’ to ‘Dark’ was also used (Vyazovskaya) and ‘hollow’ to ‘focussed’ (Hill), although in her teaching Hill employs the image of ‘milk’ to ‘chocolate’, placing ‘milky’ at the unfocussed end of the spectrum and then imagining adding spoons of chocolate to the milk as the tone focusses as more harmonics/partial are introduced.

The full list of adjectives used to describe qualities of flute tone and colour to emerge across all interviews is: *airy, alive, big, broad, bright, cold, dark, dead, deep, dull, energised, fat, focussed, generous, gritty, hairy, hollow, husky, intense, light, mysterious, natural, open, passionate, pure, resonant, rich, round, sparkly, velvety and warm*. This use of descriptive language illustrates the broad range of colour that learners should be aiming to develop and that pedagogy should be aiming to explore, and also confirms a problem area identified in the Literature Review regarding the opaque and subjective use of language and an ensuing, often confusing, lack of clarity, which my further research attempts to address. In two examples of miscommunication around language to emerge in this interview phase, one interviewee acknowledged mid-interview that they were using the word ‘pure’ to mean two totally different things, and another interviewee detailed a real-world example of miscommunication between herself and a conductor regarding the word ‘dark’.

5.2.1 Hollow, Unfocussed Tone Colour

This extreme of the colour spectrum was the starting point of my ELPaR and critical reflexion/reflection. As described in Chapter 1.2, my personal starting point tonally within my own practice was at the opposite end of the spectrum; hard and overly focussed. As I started to explore the unfocussed, *hollow, open, warm and hairy* end of the spectrum I was seduced by its expressive potential and by how colours at this end of the spectrum require the player to allow the sound to ‘ooze’ out. Avoiding unnecessary tension and any physical action that might inhibit the sound or resonance here is crucial, and required me to experiment and reflect on the results. Engaging with *The Entangled Web of Musical Learning*, I practised embodying and enacting a series of physical changes designed to produce new sounds that I first imagined, and subsequently perceived to be happening (or sometimes not), exploring and developing elements of PAPAPI and the *Synthesis of Multimodal Musical Cognitive Processes*. This process of discovering know-what relating to the production of different timbres informed the designing of the ‘tools’, exercises, and repertoire choices that I included in The Tone and Timbre Toolkit¹¹³, all of which were conceived to empower learners to explore and discover for themselves.

5.2.1.1 ‘Ooh’ Lip Shape

Bausor, Bennett, and Hill stated that a hollow tone requires an ‘ooh’ vowel shape, with Bausor and Bennett adding that it brings the lips forward, and Hill saying that this timbre projects well. Hill describes the ‘ooh’ shape as having more space inside the mouth, and Roorda, whilst not advocating the ‘ooh’ vowel shape (Roorda stated that using vowel shapes was not part of his practice), also states that a hollower sound requires using the resonance of the mouth cavity rather than chest resonance. Bausor describes what she calls a French ‘ooh’ sound as having less focus and less harmonic content, and Bennett cautions the player to ensure that this hollow tonal quality is expressive and has life. He states that one of the difficulties is keeping the life in the sound when you make less colour, directly quoting Moyse, with whom he studied, as saying ‘you must find the life in the sound...find the living tone’.

5.2.1.2 Open the Mouth Cavity/Lift the Top Lip

Bausor said that in her practice she creates what she describes as a hollow, open, unfocussed sound by making sure that the inside of the mouth cavity is very big and open (also described by Hill and Roorda). Next, she softens the embouchure a little (also advocated by Bennett and Pope), lifting the centre of the upper lip a little to make sure it is not pressing down or squeezing

¹¹³ See Chapter 7.

the sound. Hill likewise cautions against ‘digging into the sound’ with the top lip, especially in the lower octave, and both Bausor and Hill suggest that widening the nostrils can also assist. Bausor states that it is important that the air is well supported and has direction, otherwise the sound will go ‘flat and flabby’ and will not project. To project a hollow or unfocussed sound the tone must still contain harmonics and a core within it; possibly the ingredients required to achieve what Bennett described as making the tone expressive and alive.

5.2.1.3 Soften the Lips

To create a hollow tone Bennett said that you soften the lips and move them forwards to get rid of the overtones; if you take some of the upper partials out of the sound you get a hollow tone, especially in the bottom and middle register, and conversely, putting more of the upper partials into the sound creates a more intense tone. Pope also recommends softening the lips to create a hollow tone, adding that the parts of the lips that are directly in contact with the air need to be soft.

5.2.1.4 Projection

Hill advises that a hard, focussed tone quality might sound loud to the player but does not project well in a concert hall, echoing findings from the Literature Review. This is also stated by Roorda, who states that a *mezzo forte* hollow sound will have a sense of ‘warmth and generosity’ and whilst it may not sound as loud to the player, it will project well so long as the ‘harmonics are in tune’¹¹⁴.

Hill describes a hollow tone as *warm, open, and hairy*, and states that playing with this tonal quality involves a freedom with the blowing that projects well, especially in solo and chamber music; she cautions, however, that when employed at a quiet dynamic level in an orchestral setting it can be drowned out if the orchestra does not match the quiet dynamic level; it will project but risks being overpowered if the orchestra does not play sensitively.

In her teaching, Hill might advise students to ‘have more milk around the outside’ of the sound, which she describes as meaning more ‘hairy warmth’ around the core. With this description Hill provides us with a classic example of the problems already identified with the use of subjective and opaque language, here layering metaphor upon metaphor in a way that might lead to misinterpretation or misunderstanding. Hill’s way of conceptualising timbre verbally requires active, flute-in-hand, learner-researcher exploration in the Phase 2 Case Study part of this investigation. As stated in the introduction to Chapter 4, gaining depth of insight into

¹¹⁴ The importance of having the harmonics in tune is also an important part of Bennett’s approach and he talked about this in my interview. Bennett’s ideas, with citations from Seed, are already presented in the Literature Review.

performer-teacher practices was always going to require a collaborative, instrument-in-hand, approach; interviews and verbal exchanges were always going to be insufficient.

5.2.1.5 Imagery

As a starting point for making decisions about colour Hill imagines a cup of hot milk to which the player can add one spoon, two spoons, three spoons, etc. of chocolate, thereby gradually getting a more focussed, more centred sound containing more overtones/partials. Hill recommends starting from the unfocussed end of the colour spectrum and then deciding how much focus (chocolate) to add.

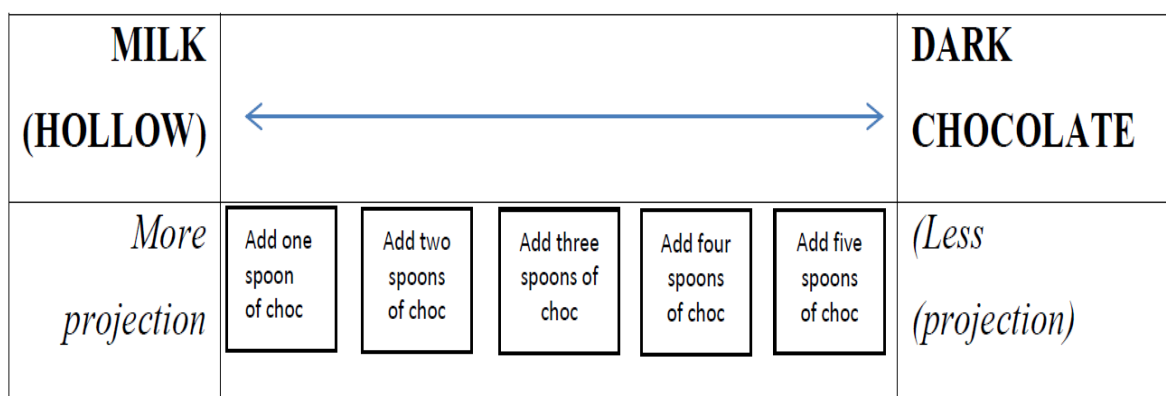


Figure 36: Hill's imagery to explain manipulating the colour spectrum

5.2.2 Dark, Focussed Tone Colour

At the opposite end of the spectrum, Hill states that it is important to understand that a very focussed sound, which both she and Pope describe as oboe-like, does not project as well but does give the centre or core to the sound. To make a very focussed sound, Hill says that the vowel shape inside the mouth is 'ee', with a small aperture (embouchure hole) and that this colour requires a lot of control with the muscles in the centre of the bottom lip, like when whistling.

5.2.2.1 'Bottom Lip Whistle'

To develop sensory awareness of the little pad of muscles in the centre of the bottom lip as they move and contract, Hill advises the student to put their index finger on the centre of the bottom lip and then whistle. If whistling is problematic, I discovered in my ELPaR that a similar muscle action in the bottom lip can be experienced by miming a 'peck' (kiss) on the cheek. Whistling has the effect of contracting inwards the sides of the lips/embouchure and is the opposite of the

stretched, smiley embouchure, the negative impact of which I documented in the Literature Review. The top lip, says Hill, can be used to direct the air more into the flute, but care must be taken not to overdo this, not to dig into the sound (as already noted). Hill recommends the following exercise:

Play a long note, starting with a very loose, relaxed bottom lip, and gradually contract the centre of the bottom lip, firming it up, to move towards a more focussed sound. Use your finger as described above to develop awareness of the muscles in the centre of the bottom lip and work to gain control of these muscles.¹¹⁵

5.2.2.2 Mouth Resonance/Jaw Position/Vowel Sounds

When aiming for a darker colour, Bausor recommends a more ‘aw’ vowel shape in the mouth, or sometimes an ‘ee’ shape (like Hill), and states that a darker colour requires a lower jaw and more space inside the mouth. Roorda says the opposite and that he uses more mouth resonance to create a hollow tone colour. Bausor also states that a greater content of lower harmonics within the sound adds to a dark quality.

5.2.2.3 The Airstream: Angle, Speed, Lip Pressure, Tongue Position

According to Roorda, the best way to darken the sound is by changing the angle and/or speed of the airstream, but Roorda links this very closely to dynamics, stating that increased airstream usually equates with a darker sound as it results in more higher partials in the sound, as well as an increase in volume. Roorda’s ideas in relation to colour and dynamics are discussed in Chapter 5.5.

For Pope, the extent of focus or darkness in the tone is a question of how much pressure there is on the air, which depends on how much air the player exhales through the embouchure aperture relative to the size and shape of the aperture and the way the lip pressure is influencing it. Furthermore, the shape inside the mouth also has an impact, and this can be altered by where the tongue is positioned; employing different vowel shapes inside the mouth is part of Pope’s practice and is explored in Phase 2 of my primary research.

5.3 Tone Development through Lyrical Melodies

Developing use of tone and timbre through practising lyrical melodies is a key component of the existing flute literature. Moyse’s book ‘Tone Development Through Interpretation’ (1973) is a seminal book that takes one hundred melodies, mostly opera tunes, as material for

¹¹⁵ See ‘Bottom Lip Whistle’ Tool exercise on page 15 of The Tone and Timbre Toolkit.

developing good tone. Since then, many other flute-playing authors have produced similar books; a notable example is Robert Winn's 'Melodies: Musical Exercises for Tone and Interpretation Tone' (2008). One of the potential problems with books of this nature is that they often lack the harmonic and timbral context of each melody; information which can spark the musical imagination and provide vital timbral and expressive clues for players and learners.

Talking about Moyses's 'Tone Development Through Interpretation', Hill says that the student needs to understand the essence of each extract; to understand that you are a drunken Danish person (No.17), or a shepherd's pipe (No.3), and that you are trying to make yourself be something other than a flute player. According to Hill, you need to create a picture and engage the musical imagination, which can be especially important when playing opera arias. Do not just be a good flute player; are you a tenor or a soprano, she asks? Think carefully about the mood or the picture that you want to create and focus on all the nuances and commit to them. You can also draw on your own personal emotional experiences to put into the music, a technique similar to method acting.

Bausor, Burrows, and Vyazovskaya all talk about the importance of sparking learners' musical imagination, and Pope says that it is important to first imagine the colour you want to achieve, which is often informed by the harmonic and timbral context; using excerpts and melodies can be of limited use if the student is not familiar with the orchestral or harmonic context, says Pope. With this in mind, as I worked to choose and develop repertoire for inclusion in The Tone and Timbre Toolkit, I resolved to provide teachers and learners with printable piano accompaniments and YouTube video recordings of accompaniments with which learners can play along, that provide these vital clues.

5.4 Harmonics/Partials in the Tone

Awareness and control of the harmonics or partials contained within the tone was of paramount importance to most interviewees. The presence and distribution of harmonics was said to affect colour, dynamics, resonance and projection, and the harmonics were said to have to be in tune (Bennett, Hill, Roorda, Vyazovskaya,) for the sound to resonate and project. Bennett said that for a note to have a good tone, the harmonics must always be in tune; a good tone will vibrate well, which means that the harmonics are 'ringing in tune'. When the sound is vibrant it has lots of harmonics ringing within it and it sounds louder as a result.

To get the harmonics in tune, correct air speed is key. Both Hill and Roorda proposed very strong links between how you blow, how you use the air speed and blowing angle, and the

harmonic content of the sound. Bennett added that how you hear the harmonics is also extremely important and suggests that awareness of the harmonic content within the sound can be built using the piano as a starting point. He suggested that if you play a low C on the piano and let it ring you can hear the higher partials that are part of the fundamental note, i.e., hear the middle C, E, G and even the B flat. The resonance of the piano makes the partials easier to hear and can help learners to develop awareness.

Roorda states that an in-tune sound contains harmonics that mutually support one another, and an out-of-tune sound has harmonics that fight one another. This is similarly explained by Hill, who states that the sound needs to be in tune with itself, and talks about having the harmonics in the right place, which results in a ‘happy’ sound that vibrates freely; when the harmonics are ‘happy together’, the tone works, says Hill. The opposite means that the harmonics are fighting with each other and impeding resonance, creating a ‘dead sound’. Roorda states that any sound with the harmonics-in-tune will project, regardless of colour.

For Roorda, the priority when seeking a good tone quality that projects is to focus on the fundamental in whichever register you are playing. With a good fundamental and a full range of harmonics present and in tune, albeit with some harmonics more present than others, the tone will be good, intrinsically-in-tune and project well, at all dynamic levels. Note however, that more upper partials will be evident when playing *forte* (as this goes hand in hand with a faster air speed) than when playing *piano*; in *piano* playing the partials are still present, but less evident. It is also important to note that the partials do become more evident as soon as they become out of tune.

Pope states that the distribution of harmonics or upper partials within a note is crucial, and making adjustments is a question of influencing where the resonance is focussed within the body. She believes that this can be influenced by:

- how much lip pressure there is on the airstream, which depends on how much air you are blowing through the embouchure aperture relative to its size. The more lip pressure there is on the airstream the more you bring in the upper harmonics, and exactly how you do it influences the distribution of harmonics and which ones are more dominant;
- the size and shape of the embouchure aperture;
- the shape inside the mouth (where the tongue is), including different vowel shapes; and
- the position of the larynx.

5.5 Harmonic Content and Dynamics

Bausor, Bennett, Pope, Roorda and Vyazovskaya all make a strong link between the harmonic partials present in the sound and dynamic levels, and Bausor, Roorda, Pope and Vyazovskaya all discussed what the flute does/does not do naturally. Roorda states that the airstream involved in playing loud creates a sound with a high saturation of upper partials and is therefore more naturally dark in colour. In contrast, the airstream involved in quiet playing generates less partials, and so playing quietly is naturally hollower in colour, although these parameters can be altered by the player. Roorda states that the acoustical properties of the flute mean that it is not very natural to play *pianissimo* with a very dark tone and that it is not very natural to play *fortissimo* without a high saturation of upper partials.

Bausor agrees that some combinations of colour and dynamic are easier, whilst others 'go against the natural instinct'. She states that if you are trying to use what she describes as a 'dark, gritty colour' within a *pianissimo* dynamic you are probably going against the natural instinct, which would be to soften up and use a hollower sound, and vice versa, that one wants a more focussed sound in a very loud dynamic, which Roorda says is inevitable due to the increase in upper partials caused by the increase in air volume/speed. Bausor's concept of 'natural instinct' relates to Roorda's concept of the acoustical properties of the flute and what the flute does/does not do naturally, which affect that which is easy or difficult for the player. To go against the 'natural instinct' requires learning how to overcome the natural tendencies of the instrument and impose something less natural.

Vyazovskaya likewise agrees that it is very easy to produce a concentrated (focussed) loud sound but not so easy to produce a concentrated, dark, quiet sound without experiencing intonation problems that will need to be adjusted for. Bausor, Pope and Vyazovskaya say that going against the natural instinct of the instrument means that you have to work harder to achieve certain colour/dynamic combinations, with Vyazovskaya adding that work to develop the (lip) muscles is necessary if players wish to develop a varied colour palette in order to be able to project more emotional differences using more colours within the instrument.

Roorda also relates dynamic levels to the angle of the air stream, stating that for forte the blowing angle is more downward, but that if you maintain this downward angle in piano you will be flat. According to Roorda, each blowing angle has an optimum blowing speed which will achieve an intrinsically-in-tune sound at its own corresponding dynamic level. When you increase the intensity of blowing, both the quantity and the velocity of air increase, and it is

important to note that this affects both the dynamic level (it gets louder) and the colour of the tone, as the faster airspeed increases the presence of upper partials within the tone.

Roorda therefore asserts that *piano* is basically hollow and *forte* is dark, and that these are the two contrasts that students need to develop at the beginning of their exploration of dynamics and colour. He notes that you can darken your *piano* by changing the embouchure/blowing angle, and conversely, you can lighten up your *forte* sound, but only up to a point because boundaries are set by what he calls 'intrinsic intonation'. The process of lightening the *forte* sound means that certain partials will have less prominence within the sound, thus changing the colour, but all partials will still be present, because if not this will have a negative effect on intonation. Pope agrees with Roorda, saying that a more focussed sound with greater harmonic content is easier in loud playing and less harmonic content is easier to achieve when playing softly, but she cautions that students need to work at what comes less naturally to achieve a whole range of harmonic content, and therefore variety of colour, at any and all dynamic levels in all registers.

Roorda states that in the dynamic extremes, options for changing colour are limited. Hill notes that this is the case when playing *forte*, where she advocates getting the sound as 'fat' as possible, whilst acknowledging that this may create limitations regarding what can be played in one breath as it requires more air. Despite the natural limitations of the instrument, Roorda believes that there is space between both the extremes of dynamic and the extremes of register where choices can be made between the balance of hollow and dark. Roorda cautions that playing fortissimo may get to a point where the player is out-of-tune because the harmonics sharpen, which will lead the player to take measures to flatten them, and the result is that the sound is no longer 'intrinsically-in-tune. He says that there is a limit to how loud you can play unless you accept being intrinsically out-of-tune, which is hard work and will not project, thereby rendering this approach a waste of energy. In order to be intrinsically-in-tune, Roorda states that all partials must be present, but when making a lighter, hollower colour some partials will be much less evident.

Bennett said that it is possible to create quite a lot of dynamic contrasts by altering tone colour, stating that one can sound quieter if one takes away some of the harmonics/partials in the tone, but regardless of the colour a player is aiming to create, he cautioned that making either a hollow or an intense sound does not always necessarily equate with good tone. He emphasised as a basic rule that the octave harmonic must be in tune first; otherwise, it is no use mixing in

the other harmonic partials as that will make the tone worse. Hill and Roorda also assert this, stating that out of tune harmonics fight each other.

5.5.1 Crescendos and Diminuendos

Roorda states that, from a technical point of view, crescendos and diminuendos both have a primary action required to achieve the phenomenon (to get louder or softer) and a secondary action that takes care of pitch correction. The primary element for crescendos is the breathing apparatus. A crescendo is, above all, a matter of blowing more; adjusting the embouchure by dropping the jaw is a secondary action, used to correct pitch, guided by the ear. The opposite is also true; what comes secondary for crescendos (the embouchure change), is the primary element for diminuendos. For a diminuendo the embouchure lifts the airstream to get softer, and to avoid a hissy sound that is sharp the player must blow less; blowing less is the corrective element to adjust pitch and to be in tune. Thus, crescendos are primarily achieved by increased blowing and diminuendos are primarily achieved by the embouchure raising the blowing angle.

5.6 Vibrato

Bennett described vibrato as an oscillation of intensity in the breath pressure and said that the pitch goes up and the volume increases as the vibrato intensity increases. Pope describes vibrato as an expressive tool that expands the range of colour, stating that it should be personal, natural, and a spontaneous part of expression. She adds that the initial intention needs to be enough to make it happen, but that this is the result of (deliberate) practice, utilising exercises designed to gain technical control of vibrato speed and amplitude until, in playing music, it becomes a subconscious part of expression. Pope also notes that certain dynamic levels naturally seem to fit with certain speeds of vibrato in each register¹¹⁶ and that players need to work to master what comes less naturally. For instance, Pope says that a very fast vibrato tends to go easily with louder dynamics and a slower vibrato naturally works more easily with softer dynamics. It is important to practise the reverse of what comes naturally because players do not always want to use the same vibrato speed with the same dynamic level.

Relating vibrato speed to pitch, Morris¹¹⁷ and Roorda both spoke about this relationship as evidenced by observing string players. Morris noted that when watching violin players using

¹¹⁶ This idea can be linked to Morris and Roorda's observations about the relationship between pitch and vibrato made by observing string players in Chapter 3.8.3.

¹¹⁷ Morris did not participate in the Phase 1 Interviews, but I had some face-to-face sessions with her as part of this investigation.

vibrato on the G (lowest) and E (highest) string, the difference in speed was clear to see, with lower pitched notes employing a slower, and perhaps more pronounced, vibrato, in comparison with the E string, where higher pitched notes were produced with a faster vibrato. Roorda took this analogy one step further, comparing the vibrato speeds on a violin with those of a double bass, but reaching the same conclusion about the relationship between pitch and vibrato speed.

As already identified in the Literature Review, some students develop vibrato naturally whilst others need to learn it. Both Bennett and Hill described a similar process by which they themselves learned vibrato, adding new insights to already existing knowledge in the form of imagery and anecdotal detail not found in the literature. Bennett described working with his teacher Geoffrey Gilbert, using a metronome and doing diaphragm pulses every semibreve, then every minim, crotchet, quaver, triplet quaver, semiquaver, and so on. He said that it did not matter if the note split up an octave or more, so long as it returned to the starting note, and stated that when overblowing and letting the note break the octave one soon begins to find it sounds better if the octave is in tune, echoing what he said about the harmonics being in tune. Bennett described the slower pulses with a ‘whoop’ sound, moving to a ‘whoa’ sound as the speed increases¹¹⁸, and says it is like a dog barking (a description also used by Hill and Vyazovskaya).

According to Bennett, Gilbert’s approach was informed by time he spent studying in Carl Flesch’s violin school, where he was very impressed with the way that Flesch made his pupils learn vibrato and the way that they could push and control vibrato at different speeds at will. For Bennett, like Pope, being in control of vibrato is very important, with Bennett cautioning that to ‘shimmer and shake’, which he sees as an effect superimposed onto the tone rather than an integral part of the tone, is to be avoided. Roorda also cautions that any sound can be shaken, but to shake your sound is not the same thing as to vibrate it; to vibrate it is to exercise an expressive intention that shaking does not achieve. Furthermore, Roorda believes that only an in-tune sound is capable of true vibrato, and that having an intrinsically-in-tune sound is a prerequisite of vibrato. Roorda uses the analogy of a taut violin string; if it is taut it will vibrate but if it is slack it will not. The slack string here is a metaphor for a flat flute sound requiring more air speed (sufficient air speed is ‘taut’, insufficient air speed is ‘slack’) and it is the string (i.e., the sound) that vibrates, not the player. Roorda is clear that he believes that the sound must vibrate, not the player. Roorda distinguishes here by saying that he ‘plays with vibrato’ but that ‘he himself never vibrates’; it is ‘the sound that vibrates, as and when he wants it to’.

¹¹⁸ I am unsure whether this change of vowel sound is intentionally linked to the increase in tempo.

This idea conflicts with many other practitioners, who encourage bodily vibration throughout the cavities of the thoracic, throat, mouth, and sinus regions.

The process of learning to master vibrato, is described by Hill as follows:

- Play a very straight note, making sure to remove any throat vibrato that might be present.
- Add ‘diaphragm¹¹⁹ bumps’ to a continuous straight note. Here Hill uses imagery, imagining a flat landscape with a row of regularly planted trees; the trees have their roots below the ground as well as the branches above ground. It does not matter if the harmonics split (as noted by Bennett) but the note must be continuous. The bumps should originate in the diaphragm, and it can help to think of (a) a dog barking ‘woof’ (also described by Bennett and Vyazovskaya), (b) sobbing, (c) laughing (d) panting (also described by Bausor).
- Without the flute, notice/feel/experience the diaphragm as the area originating the ‘bumps’. You can do this by putting your hand between the bottom rib and the belly button and prompting the diaphragm into a natural action. To achieve this you can try:
 - Going ‘woof woof woof woof’ like a little Yorkshire Terrier;
 - Saying ‘Sh sh sh sh’ as if blowing out the candles on a birthday cake that will not blow out;
 - Laughing ‘huh huh huh huh’; or
 - Panting.

Then try to replicate this on the flute, keeping the action simple and natural; do not over complicate the image. As described by Bennett, Hill also works with a metronome, crotchet = 60, to do a ‘bump’ every 4 beats, then every three, two, and one beat. If the diaphragm is not working well and is not creating enough of a bump the student can start by using the tongue (an approach also recommended by Pope), and then gradually fade away the use of the tongue as the diaphragm gets stronger. Once progress is being achieved with the diaphragm you can start to slightly vary the metronome speed each day (crotchet = 60, 66, 63, etc.) so that you begin to control the vibrato at varying tempi. Hill notes that this approach can be dispiriting if the tone quality is poor to begin with as the sound cannot take the bumps, and then it is necessary to ask whether it is a vibrato exercise or a tone exercise that the student requires; the tone must be good before starting to work on vibrato, a point also stressed by Roorda.

¹¹⁹ In using the word ‘diaphragm’, Hill was in fact referring to the abdominal muscles, which form part of the ‘tool’ that I have named the ‘corset muscles’ in *The Tone and Timbre Toolkit*.

To develop vibrato Hill repurposes Wye’s exercise ‘The Middle Register I’ (the first line of which is shown below) from his book ‘Tone’ (2015, p.15), which was designed by Wye to encourage students to take good low register tone quality up into the middle register. Hill repurposes these exercises for vibrato work, asking students to practise making four vibratos on each quaver, which she says involves a lot of breath, and work with a metronome to slightly change tempo as previously described (crotchet = 60, 66, 63, etc.) to develop flexibility of vibrato tempi. She also recommends repeating these exercises in the upper register.



Figure 37: Wye’s exercise ‘The Middle Register I’

(Wye, 2015, p.15)

Hill says that this is hard work and that students are sometimes reluctant to engage. If students are reluctant to practise vibrato in this way Hill says that they can achieve similar results by doing the same exercise using the tongue, as this requires the diaphragm to work in the same way. Hill notes that students are often keener to practise tonguing than they are to practise vibrato in this way. Pope also talked about using the tongue in this way as a starting point for building vibrato for students who struggle in the initial stages.

In addition to developing control of vibrato, Hill believes that working on these vibrato exercises can also ‘widen’ the sound, creating a tone quality with greater depth, stating that if a student has a ‘skinny’ tone in the middle or top octave, these vibrato/diaphragm exercises can be very effective in developing depth of tone. I followed this idea up with Hill in my Phase 2 case studies, where a vibrato exercise emerged that I called ‘cranking the vibrato’. This exercise employs exaggerated use of the ‘corset muscles’¹²⁰ to create large pulses of air, combined with the use of harmonic fingerings, as a means of ‘widening’ the tone in the middle octave¹²¹.

¹²⁰ The ‘corset muscles’ in my name for a combination of muscles that can be imagined like a ‘corset’ surrounding the body from the belly button up to the rib cage. The idea is a synthesis of expert performer-teacher thinking filtered through my ELPaR. See page 8 of The Tone and Timbre Toolkit for a full explanation.

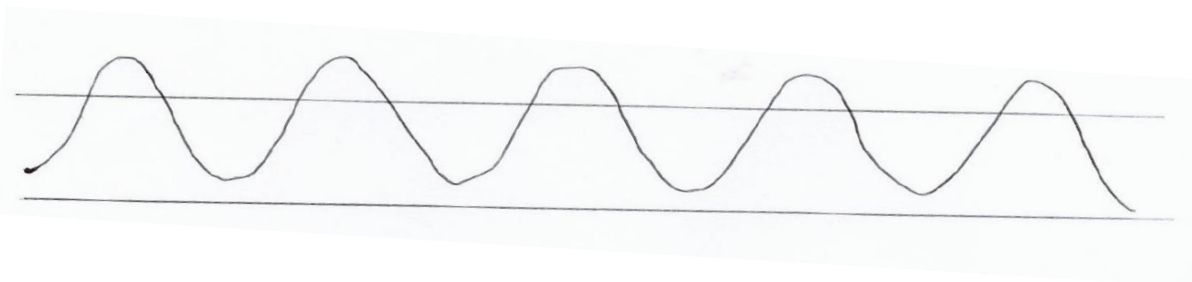
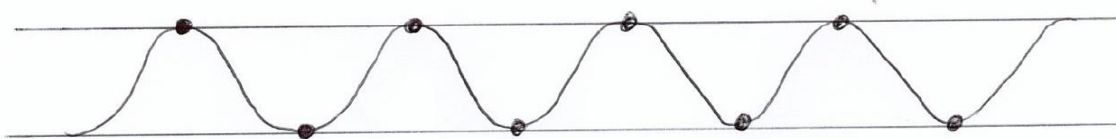
¹²¹ See Chapter 6.3.4.

Bennett also advocated to produce a 'basic' tone that he described as 'big and deep', citing the American player Mariano as an inspiration in his early career. He stated that this sound can be achieved by pulling the flute (headjoint) out more than usual and opening/uncovering the embouchure hole, and he contrasted this big tone quality as being different in style to the light sparkly sound of the French players.

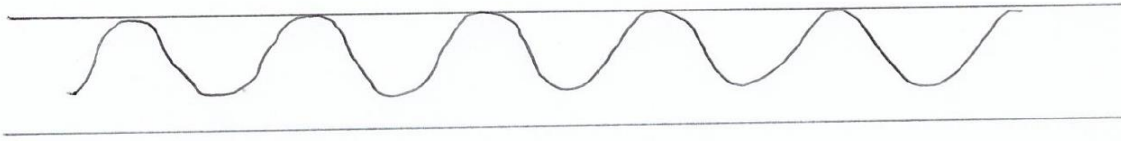
Hill observes that, as a general rule, the bigger a player's tone the slower the vibrato can be, and for any player wanting an orchestral job they must be able to produce a big sound in order to be heard above the orchestra. Obviously, not every student will be aspiring to play in a professional orchestra, but for those who might, or who are as yet undecided, failure to master playing with a big sound will almost definitely stop them getting an orchestral job, no matter how beautiful their playing might be, says Hill. To develop a 'satisfying' vibrato Hill says that it is necessary for the player to 'light up' both the top and bottom of the sound, using a vibrato depth that fills the core of the sound. I instinctively feel a connection here between Hill's way of conceiving this issue and Roorda's assertion that only an in-tune sound is capable of true vibrato and that having an intrinsically-in-tune sound is a prerequisite of vibrato, lest it be merely shaken; Hill's perception of what is 'satisfying' is linked to the idea that the full range of available harmonics are 'happy' and vibrating freely, described by Roorda as mutually supporting rather than fighting one another; when the harmonics 'fight', resonance is impeded.

Hill drew me the following illustrations:

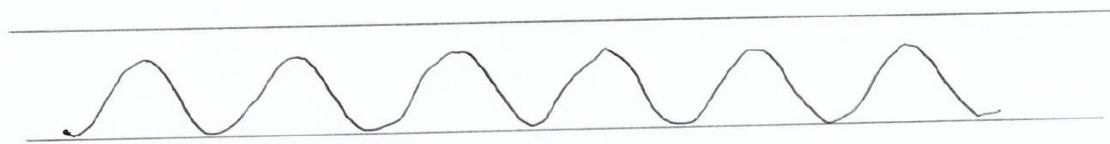
- a) This diagram represents the ideal, with the sound lighting up both the top and bottom of the vibrato. This is what players should aim for.



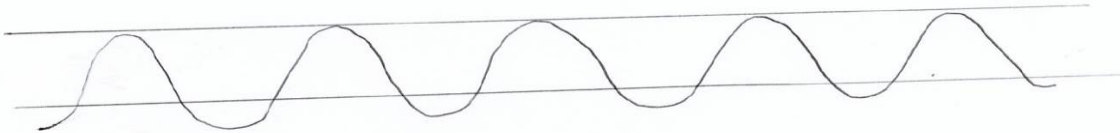
- b) This diagram represents a vibrato lacking in depth and not lighting up the bottom of the vibrato.



- c) This diagram represents a vibrato lacking in upper partials and not lighting up the top of the vibrato.



- d) This diagram represents a vibrato that digs too low into the sound, making a dead tone quality.



- e) This diagram represents a vibrato lacking depth but that also has too many upper partials, most likely created in the throat.

Figure 38: Hill's Vibrato Illustrations

To create a good vibrato, Hill recommends maintaining the origin of the 'bump' low down in the diaphragm area and to avoid using the throat, as then you lose the depth to the sound, losing what Hill imagines as the roots of the tree below ground.

Hill notes that vibrato practice can seem very counted and mechanical, but states that students need to train the muscles in the same way that an athlete trains their muscles, to gain control and consistency. In addition, Hill states that a high, throat-based vibrato is to be always avoided.

get the muscles moving at the faster rate because the act of expelling the air and making little articulated accents at a faster speed causes the pulsation necessary for vibrato, and when the tongue is removed, the vibrato will hopefully continue at the same speed.

Pope also cautions against doing too much work in this way; it is a starting point designed to initiate vibrato development. She stresses that vibrato should feel spontaneous and not counted or calculated, as this kills the expression. It is necessary to engage in (deliberate) practice to develop the control, but an over awareness of the number of vibrato pulses per beat is very dangerous as it comes out sounding mechanical.

5.6.1 Vibrato, Air Support, and Intonation

Continuing the analogy of a taut violin string that vibrates whereas a slack string cannot, Roorda describes what he calls his ‘push up’ exercise, which is designed to produce a sound that vibrates, is in tune, and carefully matches the correct air speed to its associated correct embouchure position/blowing angle. Roorda states that the key to a successful ‘push up’ is to get the air to the correct speed within a fast timeframe and that the contraction of the abdominal muscles makes this happen. When it works well, it achieves a resonant, ‘harmonics-in-tune’ sound.

Using a shoestring to demonstrate, Roorda says that the shoestring needs to be slightly slack, representing an in tune or slightly flat note, in order to ‘push up’ and start vibrating. If the sound starts sharp and the shoestring (overly taut) has to be relaxed to bring the pitch down it will not start to vibrate, so never start a note sharp (which additionally would also mean that you are starting with the upper partials rather than the fundamental). Roorda makes a comparison between starting a note slightly flat and ‘pushing up’ to begin vibrating and a technique that was common in singers like Enrico Caruso, Alfredo Kraus, and Kirsten Flagstad between the wars. Roorda explains that they had a technique of starting very slightly flat and then reaching the desired pitch. As an example, we listened to Alfredo Kraus sing ‘Che gelida manina....’ from Puccini’s ‘La Bohème’ on YouTube and we noted that this often manifests itself as a slight glissando up to the correct pitch, adding that whilst it forms part of Kraus’s expression it is also a pragmatic technique designed to be in tune and vibrate.

Nowadays this would be considered poor vocal technique, but as a means of training the body to get the airstream vibrating Roorda believes it useful. Getting the vibrato going energises the sound, and the speed of the ‘push up’ affects the energy; the ideal is that this happens so quickly

that any upwards glissando is imperceptible. When the ‘push up’ reaches its optimal resonating energy it also achieves a ‘harmonics-in-tune’ sound.

To encourage his students to understand and experience how this works physically Roorda uses yoga¹²² as a teaching tool in his studio, and talks of the ‘bandhas’ in yoga, which he describes as being gentle breath locks located from the pelvic floor upwards. These locks are located at the central point from where our air pressure starts to move. To describe this further Roorda recommends that I imagine pressing a football between my hands; my hands are acting like the abdominal muscles pressing on the outside, but the air pressure builds up in the centre of the ball, creating an equal opposing pressure pushing back in the opposite direction. The pressure at the centre of the ball is not a physical reality because there is only air there, but you get a physical feeling in your hands, an awareness of that central space and the air pressure pushing back. For flute players, the abdominal muscles work in the same way, exerting light pressure on the diaphragm and the centre of the air, and Roorda says that this needs to be constantly active.

5.7 Posture

The issue of good/bad posture emerged in the Literature Review¹²³, and most interviewees¹²⁴ talked about the importance of good posture and balance. Pope talks of body alignment and Roorda of body balance; these concepts are basically the same. The body must be in good alignment, using as little effort as possible to keep standing or sitting, with minimal muscular activity; in flute playing effortless body alignment allows the abdominal muscles to be solely employed to control the breath, whilst poor alignment means that muscles are being used to compensate for bad posture, and they are therefore not available to be used optimally in tone production. If you are standing or sitting in bad alignment, your ribs do not move properly and your diaphragm is unable to move to its full extent, which cuts off the resonating ability of your body, says Pope.

Poor posture is a cause of another of Roorda’s hidden¹²⁵ (air) accelerators that occurs if the chest is allowed to collapse, which results in the air unintentionally accelerating beyond the player’s control. This can cause the sound to crack and get sharp before a real *forte* is achieved and is a common problem for students. According to Roorda, avoiding the chest collapsing is

¹²² In-depth investigation of Roorda’s yoga for teaching might be a possible avenue of future investigation, but falls beyond the scope of this investigation.

¹²³ See Chapter 3.5.

¹²⁴ Bausor, Burrows, Hill, Pope, Roorda, Vyazovskaya.

¹²⁵ accidental, unintentional, unplanned, uncontrolled.

a matter of body balance and a well-aligned posture, making sure that the body is positioned to avoid the chest collapsing.

Another casualty of poor posture can be a tightening of the throat, which Roorda also cites as a hidden accelerator. To avoid tightening the throat, Roorda suggests trying the following exercise.

Hum a long note. Make a huge crescendo. Avoid allowing the pitch to rise. Drop your jaw as you hum to help the throat to not tighten and to avoid a rise in pitch. Notice the sound sinking into the chest - by dropping the jaw you allow access to the chest, avoiding the rise in pitch and increasing thoracic resonance.

Roorda states that this use of the chest as a resonator possibly has a bigger impact on the tone than the actual instrument being played, hence why certain players (he cites Galway) can change flutes but always sound equally good.

As already mentioned, Roorda teaches regular yoga classes to all his students, focussing on aspects of posture, body balance and good alignment, which he believes are fundamental to good tone production. Pope works with muscle and movement specialist David Katz, running joint classes that focus on posture and breathing, including workshops titled: The Importance of Physical Awareness for Musicians; A Holistic Approach to Posture and Biomechanics; A Holistic Approach to Breathing, “out-flow of air” (blowing); and Articulation.

Talking about teaching young players, both Burrows and Vyazovskaya say that it is very important to concentrate on developing good posture to achieve a good sound; Burrows states that a well-balanced posture is crucial. Vyazovskaya says that when attempting to achieve a good sound, children often play with a lot of tension and unnecessary physical pressure and effort. She says that a lot of lesson time is spent aiming to ‘free children up physically’ so that they feel comfortable, without unnecessarily bracing muscles.

5.8 Support, Breathing and the Diaphragm

Most of my interviewees discussed the importance of ‘support’, but Roorda and Pope are the two who discussed it in most detail. Roorda asked me, what is support and what is it for? On a practical level, he says that support is deciding how much to blow, how fast to blow, and when to blow. Pope says that support is just control of airspeed and pressure, and notes that it becomes increasingly difficult the less air you have in your lungs. Roorda cautions that these are factors that are not always easy to control. When the player takes a lot of air into the body,

the body becomes larger as more space is created inside the body as the air is sucked in, and as soon as the muscles are relaxed, the body wants to expel the excess air and resume its original size. If not properly controlled this results in the air starting to flow out automatically, resulting in playing produced by air that is escaping rather than being intentionally released.

According to Roorda, support should offer the opportunity to keep the air in and to take away the reflex to escape; the process of exhaling to play should be at the control of the player. Support is about the consolidation and control of the physical state between inhalation and exhalation. Roorda says that a common mistake among many wind players is that they fully relax their abdominal muscles when they inhale. He says that this is understandable because it enables the diaphragm to move down more easily as it offers very little resistance, but in doing so the player disengages the abdominal ‘corset’¹²⁶, which is a crucial enabler of good posture and of controlled exhalation, and this leads to the chest collapsing. Whilst focussing on support and the part that the diaphragm and abdominal muscles play, Roorda reminds us that we should never forget that our lungs are in the chest, not the belly.

Fully relaxing the diaphragm downwards means that you gain space vertically (above the diaphragm) when you breathe, but the collapse of the chest outweighs this gain as you unintentionally lose quite a bit of what you gain through collapsing. Thus, it may seem economic from the diaphragm’s point of view to fully relax, but when you consider your lungs, you gain some but you lose even more.

In his teaching Roorda says that for quite some years he has taught that breathing comes in two steps; first you breathe down and then you add more breath on the top.

As a breathing and posture exercise, Roorda suggests:

Stand on one leg with knee raised in front. Notice that standing like this requires the involvement of the whole abdominal ‘corset’; it is not hard work, but without this involvement you would lose your balance. Now breathe in and notice that your ribs move straight away; even when breathing downwards the ribs move straight away, because the abdominal ‘corset’ is already engaged to stop you falling over. You are not actively engaging the abdominals, but they are automatically working for a higher purpose, i.e., to maintain upright balance. Now, if you take a deep breath, your

¹²⁶ The concept of an abdominal ‘corset’ is also utilised by Pope, and explored in detail in Phase 2 of this inquiry.

diaphragm will start working in the state of inversion, and as you breathe down, as the diaphragm lowers, you also automatically breathe up into the ribcage.

Roorda says that this demonstrates that the focus of many wind players to breathe down and to 'stuff their gut into their pelvis' is a mistake. Roorda additionally notes that when you stand like this (on one leg), and breathe, you can stop, start, and pause breathing, and this control is what he calls the essence of breath support. Working in this way, support is something that is controlled by the player rather than helped or aided by mechanisms beyond our control; it should be something that you 'take care of' rather than actively do, and it should exist to give you freedom of action. If you need to 'do' support, Roorda says that you are in great trouble; it should be a condition that enables you to simply breathe and blow.

After experiencing the exercise on one leg, where your muscles automatically engage so that you do not fall over, the challenge is then to be balanced on two legs and maintain the same engagement of the abdominal 'corset', which on two legs will not automatically engage and will need to be controlled by the player. If the player does not engage the correct muscles to do the job of staying stable and well balanced, support will be lost. Roorda states that standing on two legs and not falling is not the same as being balanced, whereas standing on one leg and not falling is definitely a matter of balance.

Pope's concept of the diaphragm and support has much in common with Roorda. Pope explains that in normal, non-flute playing breathing, the diaphragm is the muscle that keeps the body breathing. It is directed by the brain; the brain sends a message to the diaphragm saying, 'I need oxygen' and the diaphragm contracts in order to pull air into the lungs. It is the pump that sucks the air into the body as and when required, and works automatically and unconsciously, like the heart, to ensure that the body receives enough oxygen. Pope explains that it is not possible to control the diaphragm (as it is automated) so in flute playing we have to use other muscles, especially the abdominal muscles, to influence the position of the diaphragm and therefore the movement of air both in and out of the body.

Pope, like Roorda, says that in flute breathing we have to control the outflow of air. We are not just letting the air out as it naturally wants to go out; we are controlling the speed and the pressure of it. That means maintaining some tension in the muscles which normally just relax completely for the air to come out. In relation to the abdominal muscles, if we want the air to come out very slowly, we cannot immediately release them; we must keep some tension in the abdominal muscles. If we want the air to come out very fast, or suddenly, we can contract the abdominals more effortfully to expel the air more forcefully.

Pope says that we are not able to control the diaphragm itself, but that we can use the surrounding abdominal and intercostal muscles to keep the chest cavity more open than it normally would be, so that the diaphragm is free to move. If we push a lot of air out suddenly, the abdominal muscles will contract and push the internal organs up under the diaphragm, which means the diaphragm will suddenly come up, and that will push a lot of air out.

Finally, when talking about young students, Vyazovskaya cautions that they can sometimes try too hard, overworking the support muscles and having too much support or air, which forces the sound, impeding the harmonics being in tune, and creates negative tension in other areas, such as the throat.

5.9 Resonance and Colour

Roorda states that physical resonance is a very important element in changing tone colour, and he contrasts using and moving between the resonance of the mouth cavity and the chest. Pope explains that the shape inside the mouth influences where the resonance is focused and that the position of the tongue and the larynx affects the resonating spaces. Bausor, Bennett, Burrows, Hill, and Pope all advocate experimenting with vowel sounds/shapes inside the mouth as a way of developing variety in tone colour and affecting resonance, because each vowel shape changes the shape of the cavity inside of the mouth, which creates opportunities for a greater variety of tone colours. To make different vowel shapes easier to apply in flute playing Hill recommends putting an 'L' in front of the vowel sounds (La Le Li Lo Lu), which she says helps the flute player to create the vowel shape on the flute. Vyazovskaya does not relate vowel shapes to colour but did advocate using them as a way of altering pitch and adjusting intonation, which is related to Bausor and Bennett using colour as a means of tuning.

When changing the shape of the mouth cavity Roorda acknowledges that many practitioners employ vowel shapes as a tool, but this is not his approach. Rather than vowel shapes, Roorda uses two images: (1) Visualise a snake that can eat an egg without breaking it. They first swallow it and break it only when it is inside their bodies. They swallow the egg whole by disconnecting their jaw, dislocating it where the bottom jaw hinges from the skull so that the egg can pass whole. Roorda states that students can use this image to help feel that they are dropping their jaw, increasing the resonating cavity inside the mouth, and engaging chest resonance. (2) Imagine that you have sideburns that you can lengthen at will. Lengthening the sideburns will result in the jaw dropping, with similar results as the snake image. In this way Roorda recommends that students experiment with moving the resonance between the mouth

cavity and the thoracic region as a means of manipulating colour and resonance. Roorda also uses this technique to drop the jaw during a crescendo to prevent going sharp.

Bausor, Hill, Pope, and Roorda all state that poor posture and bad body alignment can have a negative impact on resonance, creating unnecessary tension that impedes both support and resonance, cutting off the resonating ability of the body by impacting the ability to open the chest and breathe to full capacity.

5.9.1 Tightening the Neck and Throat

Bausor states that tightening up in the back of the neck and throat can impede resonance. To avoid this, in her teaching Bausor uses the image of a microphone or a speaker in the back of the neck, just behind the mouth, telling students to pretend that the sound is coming out of the back of the neck rather than projecting forwards. Bausor says that this adds a resonance from behind and helps to avoid the common problem of poking the head forwards. This sort of imagery is also very common in vocal pedagogy and illustrates observations made by Leech-Wilkinson and Prior (2014)¹²⁷ about use of imagery as a tool for developing and employing heuristics.

Roorda also cautions against tightening the throat, stating that tightening can be an unintentional cause of increased airflow as it can pull the vocal cords tighter together, but that dropping the jaw can counteract this whilst also encouraging more chest resonance. It seems to me that although they express it slightly differently, there are commonalities in how both Bausor and Roorda talk of avoiding tightening in the neck, lowering the jaw, and increasing resonance.

5.10 The Harmonic Series as a Tool for Developing Better Flute Playing

Bausor says that harmonics are a quick fix for many different things because they require so much physical and muscular control, in particular diaphragm control, jaw control, and control of the centre of the lips, which should be fairly relaxed/not too tight. When practising pieces, she recommends choosing specific notes to play with harmonic fingerings within a phrase or at the end of a phrase, or playing whole passages with harmonic fingerings. This is an approach that Bausor always uses when practising very high, quiet material, to check that she is

¹²⁷ detailed in Chapter 2.7.

supporting the sound, has a fast enough airstream behind the sound for quiet playing, and is blowing through the lines and through the intervals, supporting the space between each interval. Bausor says that it is necessary to make sure that the centre of the upper lip is not pinching the sound in general, and harmonics encourage her to free up the top lip a little, even in a quiet dynamic; she advises to relax the upper lip muscles a tiny bit so that you are not pushing down on the airstream and do not have too much tension.

Roorda states that you can choose to play the notes of the harmonic series with a hollow tone or with a dark tone and the colour you start with will be maintained throughout the series as long as you do not change the blowing angle. Roorda states that there are two ways to achieve playing harmonics:

1. Blow more and more whilst maintaining the same embouchure. This way the increasing airstream at some point breaks upward into the next note in the harmonic series. This involves a momentary increase in dynamic, but once you achieve the next harmonic in the series the dynamic should return to the level you started the previous note with. If you continue to increase the blowing you will get louder until you break upward again achieving the next harmonic. The idea working this way is to lose the lower fundamental note once you break upward. The next note in the harmonic series then becomes the fundamental of the remaining sound. For example, if we start in the bottom register, we get first the octave, then the octave + fifth (12th), and so on. Roorda advocates this way of working to improve tone quality in the bottom register.

As an exercise, Roorda suggests:

Play a bottom E flat; start increasing the airspeed/pressure, until you break upwards to achieve the middle E flat (without lifting the first finger so it is a genuine harmonic). Increase the blowing further until you break upwards achieving the fifth above, B flat. Then, change from the harmonic fingering (low E flat) to the normal fingered B flat. Ask yourself: do you find a difference in pitch?¹²⁸

Ignoring the fact that the modern flute is supposed to be a well-tempered instrument, you should aim to make the harmonic note have the same pitch as the fingered B flat (ignore the difference between perfect fifths and well-tempered fifths). This will involve either aiming the air more down into the flute if the fingered B flat is sharp, or lifting the airstream higher if the

¹²⁸ See The Tone and Timbre Toolkit, page 40, for an extended version of this exercise.

fingering B flat is flat (both are possibilities – listen and decide where your pitch is). Once you have both the harmonic and the correctly fingered note at the same pitch, then you return to playing the original fundamental (the low E flat) which should now be exactly centred. It is important to note that as you are adjusting the pitch up or down, both notes (the harmonic and the fingered note) will move, but the short tube note (the fingered B flat) will move faster than the long tube note (the harmonic B flat fingered on the low E flat), allowing for the pitch of each to meet as one rises and one falls.

Roorda says that working this way is good for improving tone in the bottom register and should result in making the bottom register easier. It also results in having a better connection between the registers. The middle register should be the second harmonic of the bottom register rather than your bottom register being an octave below your middle register. The middle register should already be hidden in the bottom register; it is only for the player to make it evident. Always work up from the bottom octave.

2. The second way to achieve notes in the harmonic series is to raise the angle of the airstream. Here you should try not to change the intensity of the blowing. If you raise the airstream, your pitch will rise because you need less speed to be in tune when the airstream rises. At some point you will flip into the next note in the harmonic series, and you will also find it softer. When you push your lips forwards and when your flute comes forward and up, if you do not reduce the blowing intensity you will, one by one, get all the harmonics in the series, but the dynamic will get softer all the time.

Roorda says that this is how he likes to practise diminuendos, because when you push your lips forwards and crack into the octave or even into the fifth above, when you maintain the same embouchure position and then blow less, you will return to the fundamental but with the lesser dynamic of the harmonic that you have just left.

5.10.1 Dynamics / Harmonics / Colour

Roorda used an x y axis graph, as shown below, to illustrate the relationship between lip movement forward and backwards and the tonal spectrum from dark to hollow (not hollow to dark).

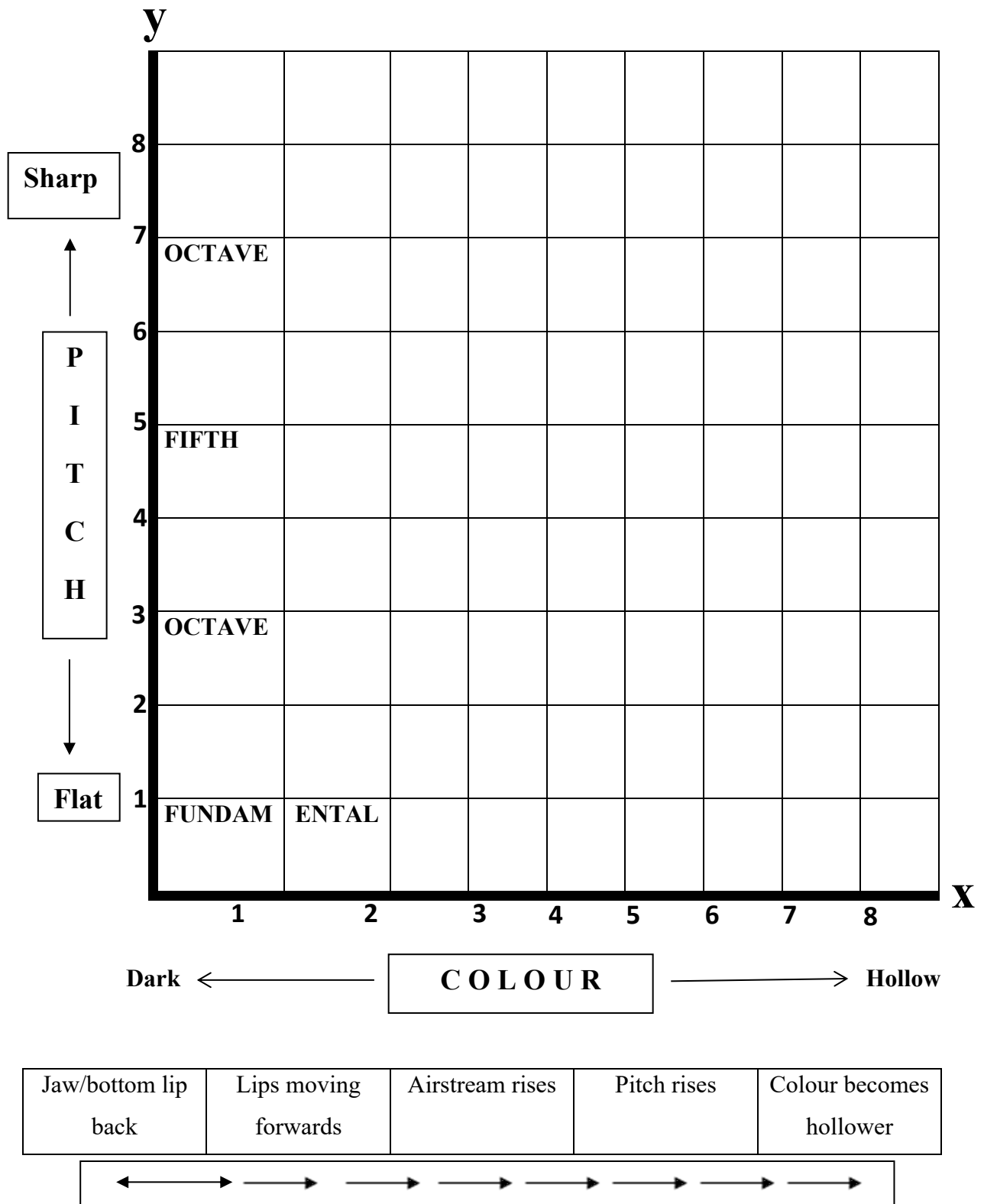


Figure 40: Roorda's x y axis graph relating lip movement to the Colour Spectrum

As explained by Roorda, the x axis represents a colour change from dark to hollow that occurs as the jaw/lips move forward along the x axis. As the lips move forward the angle of the airstream rises, the colour gets hollower, and the dynamics get softer. It is inevitable that the pitch will also rise. With increased air pressure, moving along the x axis will also result in the notes of the harmonic series appearing. Roorda's explanation of the relationship between these factors is not found elsewhere in the literature, and represents a new insight into how these imbricating factors work.

Roorda says that experimenting with the x axis can be used as an exercise for practising diminuendos and for practising the harmonic series. Exploring a natural curve on the x/y axis, from a range of starting points (different colours, dynamics, notes/registers, etc.) will help the student to understand where there is freedom of movement, both physically with the lips, and tonally with the colour, pitch, and dynamics. There is a certain freedom of decision in how and when you shape the curve but there are also limitations and inevitabilities. Awareness of this curve and how to control and manipulate it can then allow the player to make judgements about jumping part of the curve when playing larger intervals, and here Roorda imagines drawing a dot at specific points along the x/y axis, pinpointing where you want to land and at what dynamic.

Focussing on the x axis with the lips enables more precision in placing notes at the desired pitch along the y axis. If you play a large interval up you may want to jump a section of the curve and pinpoint your destination, arriving higher earlier, but on the other hand, you may want to try keep the line down and delay the curve on the x axis for as long as you can; "that's where your game lies", says Roorda.

This is especially true in harmonics exercises, where the player unintentionally jumps a note in the harmonic series. Here, what usually happens is that the player thinks about the y axis prematurely, and accidentally skips a note in the series (e.g., skips the octave and goes straight to the fifth above). If this happens the solution should be to stay down longer on the x axis until you pass through the octave and then find the fifth above, without any effort, but making sure you do not go up more than the natural movement requires.

5.11 Embouchure

Various observations about the lips and embouchure have already been covered in this chapter. Lip and embouchure flexibility have been established as being of paramount importance, affecting colour, dynamics, intonation, legato playing, etc., and issues regarding the amount of

tension, or otherwise, required in the lips have been discussed. Some specific issues relating to both the top and bottom lip, such as problems caused by pressing or digging into the sound with the top lip, using the little pad of muscles in the centre of the bottom lip to focus the tone, and a general lack of flexibility caused by a tight, smiley embouchure have also been highlighted.

Hill notes that many notable players play with a crooked embouchure but advises students to try to minimise any off-centred embouchure traits, recommending trying to keep the embouchure and the lips even where possible. She cautions against ending notes by going ‘skew whiff’ with the embouchure, as it is then necessary to return to a central position for the next note; it is better to use the bottom jaw to control note endings as it is very flexible and easily utilised to direct the airstream up and down (this ease is also noted by Bennett). Hill recommends aiming to move both sides of the jaw evenly from where the joints hinge in either side of the skull. This way the jaw only moves forwards and backwards, not sideways, and developing awareness and control of this can be very helpful.

As an exercise, Hill suggests:

Put your fingers where the jaw joint is on both sides of your face and open your mouth slowly – you should be able to feel the bones moving simultaneously on both sides.

Notice if one side moves before the other. This can be indicative of tension on the side that moves last and be the cause of an embouchure that moves towards the side to become crooked.

5.11.1 Embouchure and Airstream

Bausor talks about the importance of setting up the embouchure and having it ready to use before starting to blow, and of the importance of the type of breath you take before playing. Depending on various parameters such as colour, dynamic, phrase length, acoustic of venue etc., Bausor might choose to breathe in through the nose, which she says goes right the way down to the diaphragm whilst simultaneously opening the upper palette inside the mouth, and is suitable for a quiet, open sound, or for adding more upper harmonics to the sound; or she might take a big open-mouth breath, which sets her up when she wants to add more lower harmonics to the sound and have more depth to the resonance by opening the throat and chest. Each breath taken through the mouth disturbs the embouchure, and Pope recommends opening the mouth as little as possible when breathing to minimise disruption to the lips and make reforming the embouchure as quick and easy as possible.

Roorda states that the function of the lips is to direct the angle of the airstream whilst minimising any effect on air speed or pressure. The lips are employed to control the angle of blowing, but not the size of the embouchure aperture, which is a causal result of the volume and speed of the airstream; the lips should direct (i.e., decide the angle of blowing) and focus (i.e., decide the timbre) the airstream, whilst the size of the aperture should be determined by the volume and speed of the air.

In this way the lips do the minimum possible, but, resulting from a lack of unnecessary tension, are flexible enough to move and respond to the airstream whilst still being actively employed to direct and focus. When the intensity of blowing increases there is (inevitably) more pressure behind the lips and the lips need to exert just enough pressure so as not to be disrupted by the additional air; with insufficient lip control the increased air pressure will unintentionally change the blowing angle.

Roorda states that each embouchure position has an associated blowing angle that requires a certain amount of air speed and pressure to produce an in-tune sound at its own dynamic level. Roorda says that the player should always blow as much as the blowing angle allows and that blowing in this way the player will find what that particular embouchure position is capable of, and the resulting sound should be intrinsically-in-tune. He recommends never changing the embouchure to get a note¹²⁹, or to improve a note, but if the dynamic level is not what you want to produce, you may then adjust the embouchure to change the angle of the air and try again in order to achieve the desired dynamic level. The player should be guided by their ear and prioritise intonation, says Roorda.

Roorda cautions that the player must be aware of what he calls ‘hidden accelerators’ of the air speed. These include a tightening of the lips, which creates a smaller aperture, the effect of which is to increase the air speed and pressure (imagine a garden hose where the nozzle is tightened and the water increases in speed and intensity) and a tightening of the throat, which has the same ‘garden hose’ effect on the air speed. Roorda’s concept of ‘hidden accelerators’ has a negative implication, suggesting that the air speed is affected in a manner that is unintentional or accidental due to a lack of physical control; the resulting tonal effects and the impact on expression are therefore unplanned and involuntary. Of the two examples given above, I agree that tightening the throat is generally negative and is unlikely to have a positive impact on tone or timbre, but the use of a smaller embouchure aperture to create a more

¹²⁹ This is a recommendation also found in some of the literature, but not everyone agrees and opinions are somewhat contradictory.

focussed timbre can be employed intentionally as part of good technique; here the ‘garden hose’ effect has strategic potential as a bona fide technique for controlling and manipulating timbre.

5.12 The Upper Register

Bennett said that it is very difficult to play with a hollow sound in the top register and for him the most common problem in the upper register is playing sharp, which he attributed to unnecessary tension and lifting the air stream too high. As a possible remedy, Bennett suggested creating more space inside the mouth by dropping the jaw to make the space between the top and bottom teeth a couple of millimetres further apart¹³⁰.

Hill advocates trying to keep high notes sounding ‘warm and round’. Hill uses the Robert Dick scales in his *Tone Development Through Extended Techniques* (1986) book, which have exercises that alternate between normal fingerings and harmonic fingerings; Hill says these build stamina in the lips and air speed, and highlight problems with pitch and intonation. She also highlights the need to play using the whole body as this anchors both the tone and the vibrato, especially in the upper register.

Both Pope and Roorda state that there are more harmonics available in the low register and as you go up the compass of the flute the availability of harmonics decreases. Pope says that if you are playing a high note and capturing more of the lower partials the colour is likely to be warmer, richer, and broader, whilst a tone with fewer lower partials will be purer or cleaner, and she reiterates that it is easier to have a greater harmonic content in the sound when playing loudly, also stated by Roorda.

5.13 Blending Flute Sound with Other Instruments

Bennett stated that the hollower end of the colour spectrum can be effective in an orchestra if you are playing with other instruments and aiming to get a blend of sound. He noted that the flute is often used as an ‘octaviser’, and if you play with a hollower sound in the high notes it can help to blend with the instrument that is an octave lower.

Bausor states that using colour to blend orchestrally is often an effective way to ensure good intonation. For example, tuning chords when the flute is playing very high pianissimo notes in

¹³⁰ The idea of widening the space between the teeth to develop resonance is identified in the Literature Review by Floyd writing about Gilbert’s practice, but not applied as Bennett suggests here to avoid playing sharp in the upper register.

the top register can often be achieved by blending, through appropriate choice of colour, and is not always solved by adjusting the pitch. She notes that this can sometimes be achieved through alternative fingerings, but that she prefers to avoid this method where possible in favour of listening to the sounds around her and trying to hear the sound that she wants to create in her head before playing. She notes that it is necessary to be 'on form' and safe in the knowledge that the sound will speak the way she intends, which comes from control gained through (deliberate) practice and experience.

Pope states that the fewer harmonics there are in the sound, the closer you get to having just the basic wavelength, $\lambda = 440$, which could be described as the most 'pure' or 'clean' sound. She also states that the flute is the instrument that can get closest to that pure sound, by having little air pressure. Pope contrasts this to an oboe sound, which the flute can work towards emulating by having more lip pressure on the air and thereby bringing in the upper harmonics and creating a more focussed sound. Bennett noted that the oboe's sound is full of high harmonics that cannot be removed by the oboist, and that when the flutist wants to match the oboe it is necessary to keep some of the harmonics in the tone and play with a more focussed colour.

Hill was a member of the Haffner Wind Ensemble for over 20 years and recalls playing with oboist Nicholas Daniel. She describes what they termed a 'floboe' sound, which means getting inside someone else's sound. Hill says that to go inside the oboe sound the flautist needs to use a more centred, more focussed sound, and to allow an oboe inside your flute sound requires a more open, hollow tonal quality. The sounds of both instruments then blend and become something else and create sounds that you cannot make on your own. This idea originated in a coaching session with George Caird from the Albion Wind Quintet. Hill says that it is a very special feeling to be playing a note and have another player come inside your sound (or vice versa and enter inside someone else's sound) but that you have to allow it to happen. To be able to join, to 'mesh or meld', with someone else's sound is a very special musical feeling and creates a new, unique timbral quality, says Hill.

Hill's description gives some insight into Bennetts' observations presented in the Literature Review about the flautists Fernand Dufrêne and Oliver Bannister, whom he considered to have the ability to blend their sounds with other instruments extremely well, and to Toff's citation of Bloom quoting Toscanini, also cited in the Literature Review, where in rehearsal Toscanini says: 'No, my dears, I am conscious of a flute and a bassoon. That's not what I want. I want to hear a third instrument, the result of a happy marriage between the two' (Toff, 1996, p.100).

5.14 Chapter Summary

The semi-structured interview phase of my primary research explored a wide range of tone and timbre-related themes and issues. It revealed ideas that supported and resonated with each other, as well as some differences or contradictions in approaches and ideas. Furthermore, I unveiled ideas that resonated with my existing approaches and practices as well as ideas that were new to me and challenged some of my assumptions. The interviews yielded much more information than I had initially anticipated and provided me with a wealth of ideas to explore as I embarked, instrument-in-hand, on my ELPaR journey, feeding a fertile period of experimentation and discovery.

I engaged with the data through the lenses of *The Entangled Web of Musical Learning* to immerse myself in an iterative cycle of PAPAPI skill development, and to inform my critical reflexion, based in learning-through-doing, and critical reflection, based on learning through thinking, reasoning and ongoing dialogue.

The result of Phase 1 for me as a practitioner was to have embarked on a transformational journey that introduced me to many new ideas and possibilities. The interviews generated new insights and suggested various avenues where greater depth of understanding might be achieved through future collaboration and exploration between myself, as learner-practitioner-researcher, and a group of expert performer-teachers, within the one-to-one teaching studio.

The interview process also contributed to establishing new professional-academic relationships and building the trust, cooperation, and rapport necessary to enable deeper working partnerships to evolve in Phase 2. Moreover, it contributed to the creation of new pedagogical approaches and materials, as detailed in Chapter 7, that have the potential to empower students and teachers to explore and discover in the process of developing a personalised know-what to know-how. The aim for Phase 2 was now to work collaboratively with the expert performer-teachers, face-to-face, instrument-in-hand, within the ‘secret garden’, in order to ‘dig deeper’.

Chapter 6: Primary Research Phase 2: Case Studies – Pope, Bausor, Hill, Marcusson

As described in Chapter 4, the case study phase of this investigation involved me, as ‘expert-learner-practitioner-researcher’, engaging in four ‘Instrumental Case Studies’ (Stake, 1995), working within the one-to-one teaching studio of four expert performer-teachers to unveil previously undocumented, hidden practices that might inform new pedagogical approaches and materials.

The four experts, each representing a case, were chosen because between them they have many years’ experience of teaching at both pre-tertiary level¹³¹, and at undergraduate/postgraduate level¹³². The purpose of the Case Studies was not to document the practice of each expert, but to unveil new insights relating to the pedagogy of teaching tone and timbre in flute playing; and to filter these insights through my own ELPaR in order to synthesise and blend ideas, ready to present to the wider flute playing community in a format that blends theory and practice in a way that learners are empowered to develop their own praxis.

6.1 Anna Pope: Case Study

Anna Pope has over twenty years’ experience of teaching the flute at conservatoire level, at junior department level at the Royal Academy of Music, London and The Purcell School for Young Musicians, Hertfordshire, UK, and at senior level at Trinity Laban Conservatoire, London. For the past several years Pope has worked with movement and manual therapy specialist David Katz, developing approaches to teaching that optimise the physical side of flute playing. Their work aims to enhance performance by using the whole body as an instrument, with a particular focus on the relationship between posture and breathing, and tone production. They have delivered workshops together at the Royal Academy of Music, The Purcell School for Young Musicians, British Flute Society Conventions, and at the William Bennett International Flute Summer School.

As part of my research I attended many of their workshops, both in person pre-pandemic and online, and I incorporated many of their ideas and approaches into my own ELPaR.

¹³¹ Chetham’s School of Music, The Purcell School for Young Musicians, Junior Department of the Royal Academy of Music.

¹³² Royal Academy of Music, Royal College of Music, Trinity Laban Conservatoire.

6.1.1 Posture and Breathing Exercises for Tone Development Without the Flute

Many interviewees in my Phase 1 interviews talked about the importance of good posture and body alignment¹³³ as a prerequisite for resonant tone production, and this highlighted the need for further investigation, to both understand its effect on flute playing and flute players, and to unveil and illustrate ways of working that can be incorporated into new flute-related pedagogy.

According to Pope, students need to know what good body alignment looks and feels like, as good, neutral, balanced body alignment is fundamental in allowing the abdominal muscles to be freely employed to control the breath, and the air is what we use to produce the sound. If the posture is not correct the breathing will not work well. Bad postural alignment means that the ribs cannot move properly; it limits the diaphragm movement, and it cuts off resonance within the body.

See the illustration ‘Types of Standing Posture’ below: notice that in ‘neutral balanced’ posture, working up from the floor, there is a straight line from ankle joint to knee joint to hip joint to ears. The other examples (a-e) illustrate the five most common postural problems, all of which will usually have a negative impact on breathing and flute tone. Teachers need to be aware of what good postural alignment look like and be able to spot and help learners to correct poor posture.

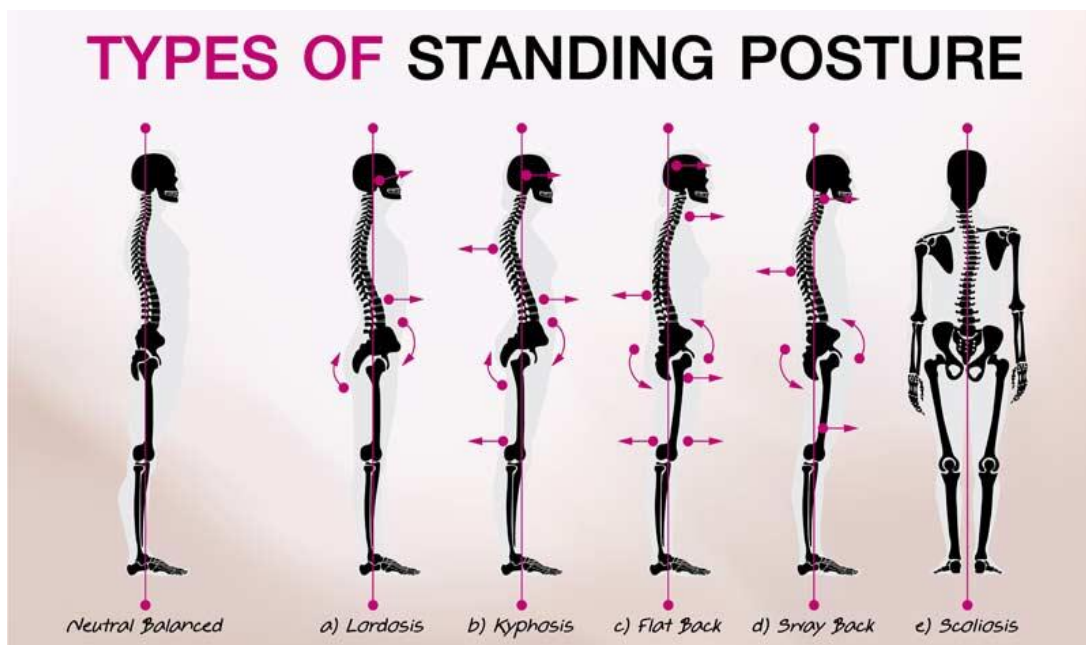


Figure 41: Types of Standing Posture

(Valle, 2019)

¹³³ See Chapter 5.7.

The sequence of exercises that follow was developed by Pope and Katz, and with each exercise Pope says that players should avoid trying to achieve an outcome. The idea is firstly to check that the body is working in the way that it is designed to work, and secondly to understand how these mechanisms need to be adapted for effective flute playing and tone production. I additionally assert that, through deliberate practice, these exercises can help develop 5E cognitive processes. I found that after an initial phase of personal sensorimotor discovery I developed a heightened proprioceptive/kinaesthetic awareness of what was happening bodily that led, over time, to the ability to control my bodily enactments, and enable these enactments to become less conscious and eventually automated but purposeful. Noting Schlumpf's (2013)¹³⁴ call for muscular training and warm ups, this was my initial focus.

6.1.1.1 Warm Up One: Exercise Routine without the Flute – For Body Alignment and Breathing

Step 1¹³⁵: Lying down in the semi-supine position, as illustrated below; lying on the back, knees raised 90 degrees, with a cushion under the head for comfort.

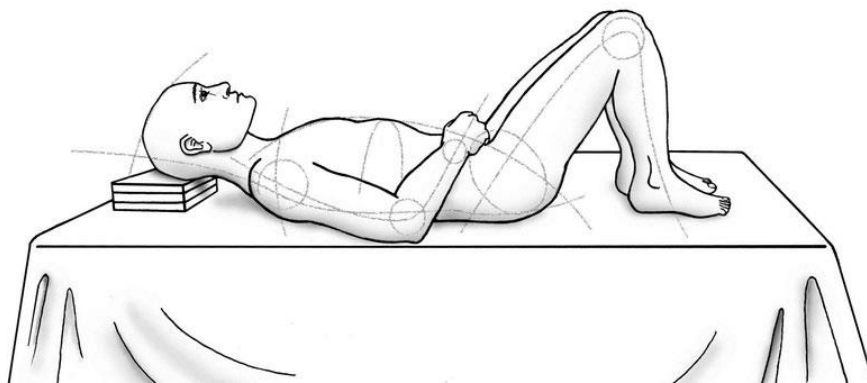


Figure 42: Lying Semi-Supine

(Soar, 1999)

Step 2: Knee floats (Pilate's 'knee folds scissors')

This exercise strengthens the muscles that are required for good postural alignment. It is important to: (1) do all movements in a slow, smooth, controlled way; (2) inhale whilst not moving; (3) match the exhalation to each leg movement. Each exhalation should last at least

¹³⁴ See Chapter 3.5.

¹³⁵ Alexander Technique is well documented and much used by instrumentalists. In and of itself this does not represent new knowledge, but when adopted as part of Pope's more holistic approach to body alignment with a focus on developing good posture for the benefit of flute playing and good tone production, my ELPaR indicates that it does contribute new insights.

as long as the leg movement, and exhalation should continue beyond the end of the movement if air remains in the lungs. Players should breathe in through the nose and out through the mouth. It is important that the trunk remains stable so that the pelvis does not rock from side to side. Players can watch the following video for an example of how to do this exercise.

<https://www.youtube.com/watch?v=edIk68IFF9o>¹³⁶

Pope says that this exercise should make the player aware of the muscles that are responsible for keeping the body aligned; the postural muscles that, if working correctly, will hold the body in a good position without being aware of them doing anything. The muscles will be gently switched on, gently engaged. Note that if it is necessary ‘to do something’ to switch them on, there is a problem and professional help might be advisable. This exercise is also useful to start focusing on breathing because it encourages breathing in a slow, regular pattern. At this stage, the player should aim to take nice, full, relaxed breaths, in through the nose and out through the mouth.

Step 3: Standing balance

The aim here is find a neutral, balanced standing posture, as shown in Fig. 39, which is not necessarily the posture the player would adopt for flute playing (this comes later). The player should look to stand with their feet a fist width apart and their weight equally distributed on both feet (left and right) and on the front and back (the balls and the heels) of each foot. Standing this way, check that when the knees bend, they go straight forward, over the ankles¹³⁷. The player can try gently swaying backwards and forwards and side to side, and then try making little circles with the hips, moving from the ankles. It is desirable to take time to develop an awareness of a position where the body is most lined up, over its centre of gravity. The player should aim to be at their most relaxed, without having to use extra muscles to hold themselves in that position.

NOTE - Ideal posture for playing the flute or doing anything requiring a little bit of effort would be with the weight ever so slightly forward, because that switches on the back muscles and allows all the breathing operators to work optimally.

¹³⁶ Please note that Pope does not refer to the concept of ‘core engaged’ in her practice.

¹³⁷ If they do not, specialist advice should be sought. Orthotics are a common solution that help realign joints in the feet/ankles to improve posture.

Step 4: Single leg balance

From the neutral standing balance position the next step is to be able to stand in a balanced way on one leg, with the body's centre of gravity correctly aligned over the one leg. Roorda also spoke about a similar exercise in the Phase 1 interviews. For beginners, this exercise is best done standing next to a chair or table for support, just in case balance is lost. Single leg balance can be achieved in the flowing stages:

1. From a neutral balanced standing position (on two feet) gently move your weight to one side until the opposite foot starts to lose contact with/unstick from the floor, and find your balance;
2. Move this unstuck foot (bending at the knee) so that you can lightly rest the big toe on the floor behind you;
3. When you feel balanced, raise the heel behind your bottom so that your center of gravity moves over the remaining standing leg, not somewhere in the middle, and so your head is over the standing leg, as in the illustration below.

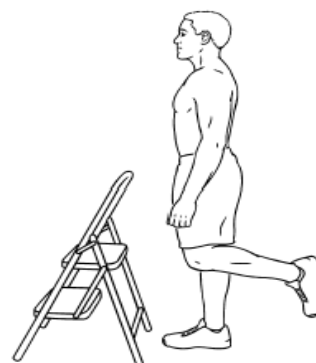


Figure 43: Balance Exercise Standing on One Leg

(Balance Exercises on One Leg Stand, n.d.)

4. Slowly move the foot back to the floor so that you are again in the neutral, balanced standing position on two feet, and repeat on the opposite side of the body. Repeat several times.

The crucial thing in this exercise is that the body remains straight; that the whole body inclines from the foot, avoiding curving the body sideways (for example, by jutting the hip out sideways).

Step 5: Standing to sitting

This is another classic Alexander Technique exercise¹³⁸. Observations from my own ELPaR are that the player must: (1) bend at the ankles, the knees and the hips; (2) lead backwards with

¹³⁸ Alexander Technique is well documented and much used by instrumentalists. In and of itself this does not represent new knowledge, but when adopted as part of Pope's more holistic approach to body alignment with a

the bottom heading towards the chair; (3) maintain the whole of the back and the head in neutral alignment, as it is when in neutral standing position (do not allow additional curving or pulling of the spine or neck); (4) keep their centre of gravity over their feet until the back of the thighs touch the edge of the chair; (5) try to move very slowly and gently, in a controlled way. Note that the shape of the back should be the same whether the player is standing or sitting, and that the angle of the pelvis should be the same whether they are standing or sitting. Also note that for a person who often slumps back when seated, this upright seated position might feel as if they are leaning forward. The diagram below illustrates some of this.

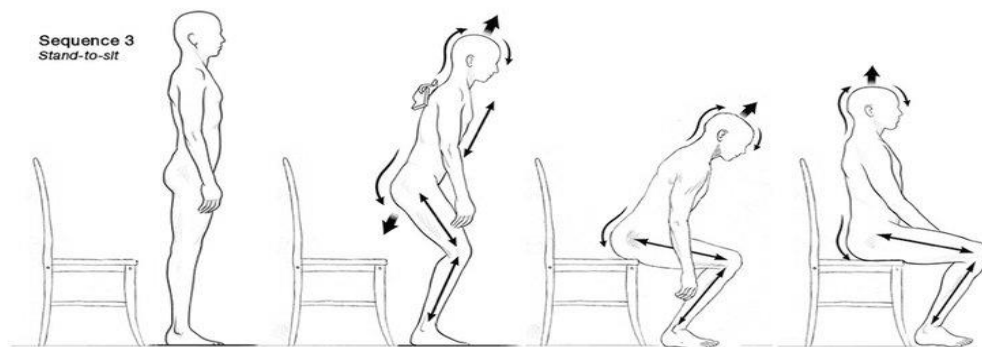


Figure 44: Alexander Technique – Standing to Sitting

(Dimon, n.d.)



I find it useful to imagine the halfway point as being like a skier's posture.

Figure 45: Skiing Posture

(Index Of Skiing: How To Ski Graphics, n.d.)

For further assistance, players might watch the YouTube video (link below) from an Alexander Technique teacher. Note the height of the chair, allowing the hips to be slightly higher than the knees so that the thighs slightly slope downwards from hip to knee. Pope says that the pelvis will not be in the neutral position unless the knees are slightly below the level of the hips. The thighs need to have a slight downward slope and the height of the chair is of utmost importance;

focus on developing good posture for the benefit of flute playing and good tone production, my ELPaR indicates that it does contribute new insights.

if necessary, the player might consider using books or cushions to raise the height of their chair and avoid chairs that have dips in the seat or slope backwards.

<https://www.youtube.com/watch?v=re-2dLk0HGU>

Step 6: Position of the head

Whether standing or sitting, the position of the head is of utmost importance to flute playing, and incorrect head position can be the cause of many problems. Pope recommends keeping the back of the neck long, as if being gently hung up from the crown of the head, noting that the crown is slightly back from the top/centre of the head (see illustration below). This should elongate the back of the neck, maintain the line of the spine, and cause a very slight drop of the chin towards the chest which creates maximum openness in the windpipe.

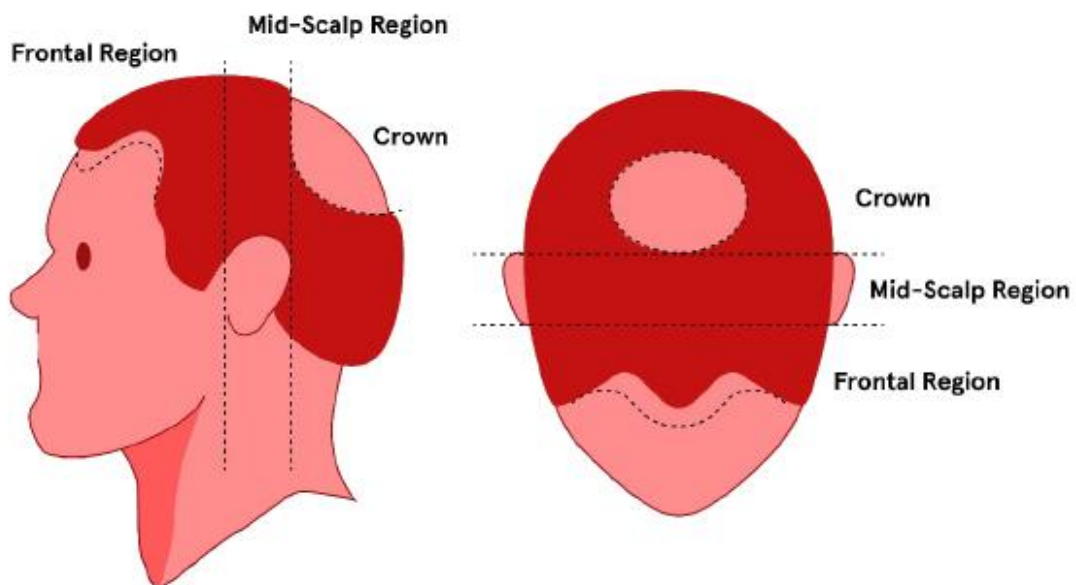


Figure 46: Position of the head

(The 4 Regions of the Scalp | Keeps, n.d.)

With good postural alignment, the player might try moving their head slowly from side to side, like an owl, keeping their eyes on the horizon and not rotating the shoulders, chest or back; the head should pivot around the top of the spinal column. This is a very important movement for flute players because it is common for the neck to ‘get stuck’, says Pope. See the illustrations below to assist in visualising these movements.

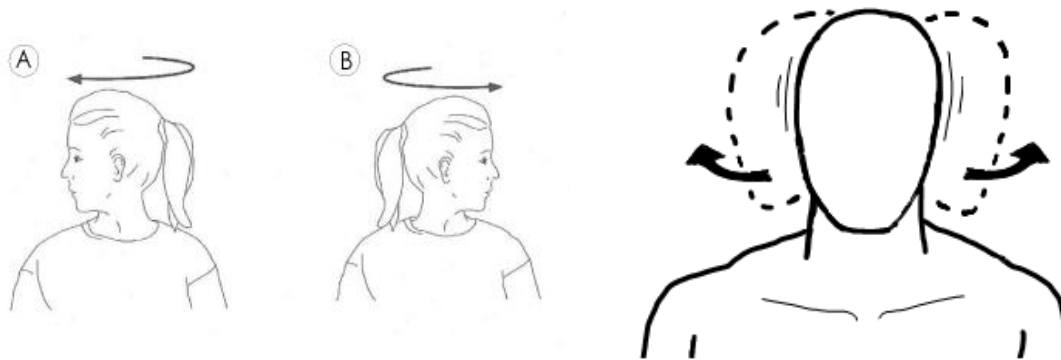


Figure 47: Head Rotation

(‘CT Rotation’, n.d.)

(‘Golf Fitness Training Programs at FitGolf Performance Centers’, 2021)

Step 7: Learning to inhale

Pope recommends starting with inhaling through the nose. Nose breathing tends to help keep the head in a good place and gives the opportunity to set up the embouchure without the in-breath disrupting it. It also encourages deep breathing with the air sucked all the way down to the diaphragm. It can be beneficial to notice the sensation of cold air on the back of the throat, behind the nose, and use this awareness to open the back of the throat for resonance and to avoid noisy breathing.

Short, sharp inhalations (sniffs) can also be good for head position, but a good, still alignment must be maintained, and unintentional movement of the head/neck/shoulders must be avoided. It is not desirable to initiate any kind of unintended movement whilst sniffing; the main perceivable movement should be in the belly as the air reaches down to the diaphragm, and then as the lungs fill, the ribcage should start to expand, and the collarbone should ‘float’ upwards. As an exercise, the player can try starting with the lungs empty and filling them up with a series of short, sharp sniffs. This can help to train the body to take in as much air as possible during a quick, time-limited breath, mid musical phrase. Finally, they can combine a long intake of breath through the nose, followed by some short sniffs to take in additional air until the lungs are full, to train the body in taking top-up breaths. Once nose breathing is working well, players can repeat these exercises using ‘mouth breathing’, but with an awareness of keeping the nasal cavities open, aiming to allow air into the nose, or at least to not close off the nasal passages, and keeping the in-breath quiet.

Pope says that this warm-up routine without the flute helps to develop the posture and breathing awareness and control required of good tone production in flute playing, and once mastered, can be done daily in 10-15 minutes.

6.1.1.2 Focus on the diaphragm and breath support

As already explained by Pope in the Phase 1 interviews, the diaphragm works automatically, and unconsciously, like the heart, to ensure that the body receives enough oxygen; it is the pump that sucks the air into the body as and when required to keep us alive. Whilst we cannot switch off the diaphragm's automated working mechanism, what we can do unintentionally is impede it working nicely; this is not desirable, but it is something we might be doing accidentally. Bad posture and body alignment can impede the correct working of the diaphragm and the free movement of the rib cage, thereby having a negative effect on breathing for flute players and non-flute players alike.

It can be difficult to both verbalise and visualise the way that the diaphragm, lungs, and rib cage all work together in symphony, and I found it useful to watch the 'Breathing Mechanism Animation' and 'Art of Breathing' YouTube videos (links below).

<https://www.youtube.com/watch?v=w1QyU9hyHRM>

<https://www.youtube.com/watch?v=apFui6-ffnM>

I discovered the 'Breathing Mechanism Animation' first, and found it very useful in helping to visualise the inner working of the body as I inhaled and exhaled, but Pope pointed out that it does not illustrate the way that the ribs expand outwards when we inhale, described by Roorda in Phase 1 as being like lifting the handles of a bucket; this is clearer in the second 'Art of Breathing' video, so combining the two videos helped me to develop a more embodied awareness of what is happening as I breathe. It should be noted that the order of events is thus:

1. as the diaphragm contracts, it lowers, creating a partial vacuum;
2. the vacuum creates a difference in pressure which sucks air into the lungs;
3. as the diaphragm lowers and the lungs start to fill you should get 'fatter' around the middle and then the ribs should lift and expand, resulting in the collarbone floating upwards.

To experience greater embodied awareness of my breathing, I found it useful to breathe simultaneously with the first animation, watching and enacting the inhalation/exhalation at the same time, and then I slowed down the playback to allow myself more time to breathe simultaneously with the visuals, noticing and developing greater awareness of the kinaesthetic and proprioceptive feedback my body was giving me.

Through the videos, I became aware that the diaphragm is located much higher up than many people imagine, several centimetres above the belly button, and this awareness reaffirmed for me that the lungs are located in the chest not the belly (as stressed by Roorda in Phase 1). The player should avoid trying to breathe into the belly because the lungs are clearly not down there, and this can lead to numerous problems, whilst noting that the belly moves outwards as the inhalation causes the diaphragm to lower and displace internal organs, as shown in the second video. Whilst inhaling, players should aim to keep the abdominal/intercostal muscles neutral and avoid any sense of tension or bracing as this can prevent the diaphragm from moving downwards.

6.1.1.3 Contrasting ‘normal life breathing’ and ‘flute breathing’

To develop awareness of what Pope calls ‘normal life breathing’ as distinct from using the air for playing the flute, Pope recommends the following: start off in the semi-supine position with your hands on your belly. Breathe naturally, as much as necessary but no more. You should notice that there is minimum rib movement because you are not actually filling the lungs fully, but the diaphragm is contracting and pulling down, and you should notice your belly rising and falling, because as the diaphragm goes down it is pushing the internal organs out of the way to create space and create a vacuum inside the lungs designed to suck air into the body. The semi-supine position is useful for aiding awareness of what does/does not move when you are not filling the lungs up; this is normal life breathing and the ribs do not move much. Notice that you are not making any effort; breathing this way is just what happens. Your back should maintain its natural curve; you should not try to flatten it or exaggerate its contact with the floor. Everything should be totally effortless; do not try to do anything apart from be aware and notice.

Now contrast this with taking big, deep, slow, full breaths in through the nose and become aware of the increased movement of your rib cage. Put one hand on your belly and the other hand on your chest to feel the movement of both the belly and the rib cage. It should feel as if the belly moves first, followed by the rib cage as the lungs get fuller.

6.1.1.4 Flute exhalation and support (blowing and maintaining an appropriate air stream)

Next, try taking big, deep, slow, full breaths in through the nose and exhaling through a flute embouchure shape. Imagine that you are playing a very quiet, long note that you want to go on for as long as possible. Notice a minimal, gentle engagement of the abdominal muscles as you exhale through an embouchure shape. The abdominal muscles should be used to control the speed and volume of air exhaled, to slow down the airstream rather than push it, and to avoid the air rushing out too quickly. This is the essence of what Pope calls ‘support’. Support is control of the airspeed and pressure; the ability to control how much, how fast, and when to blow. The player should aim for a consciousness that things are working, but not too much of a doing, and with work this will eventually become subconscious. When exhaling, the airstream should be constant, as when playing long notes, and to heighten the feeling of the abdominal muscles working the player can imitate playing accented notes within the airstream. Blowing without the flute, accents can be imitated by using consonant sounds, such as sss, fff, vvv and zzz. Note also that the bigger the hole in your lips the easier it is for air to escape and the more you will have to use the abdominal muscles to the control and slow the air down as it leaves the body.

6.1.2 Warm Up Two: Exercise Routine with the Flute - Body Alignment and Breathing

a) Combine exercise B ‘Standing balance’ with the nose breathing exercises from exercise F: Practise long notes (e.g., Moyse ‘Sonorité), and simple slow melodies played from memory, taking:

- a. Long, deep breaths in through the nose, letting the cold air open your throat and reach the diaphragm.
- b. Short ‘sniff’ breaths in through the nose.
- c. Air in through the mouth but maintaining the nasal cavities open. Note that when you open your mouth you should not move your head; just release the jaw downwards a little bit to allow the air to enter and relax the tongue to its resting position. Keep all movement minimal.

b) Combine exercise C ‘Single leg balance’ with the nose breathing from exercise F: Practise long notes (e.g., Moyse ‘Sonorité), and simple slow melodies played from memory, moving your balance onto one leg, back to both legs, and on to the other leg, taking:

- d. Long, deep breaths in through the nose, letting the cold air open your throat and reach the diaphragm.
- e. Short ‘sniff’ breaths in through the nose.
- f. Air in through the mouth but maintaining the nasal cavities open. Note that when you open your mouth you should not move your head; just release the jaw downwards a little bit to allow the air to enter and relax the tongue to its resting position. Keep all movement minimal.

Standing to sitting to standing while playing: Referring to the Alexander Technique principles in Exercise ‘d’, play long note exercises and easy melodies whilst slowly moving from standing to sitting to standing. Use nose and mouth breathing. Be very aware of balanced neutral posture, even weight distribution on both legs, and head position. Be very aware of everything discussed in exercise ‘d’, and go back to doing it without the flute if necessary.

Pope states that there is nothing special about breathing on the flute. It is just getting your body in a condition where it is able to breathe properly, and then not doing too much; not inhibiting what your body should do normally and naturally.

6.2 Juliette Bausor: Case Study

Juliette Bausor has been Principal Flute of the London Philharmonic Orchestra since July 2016, having previously held the same position with both Royal Northern Sinfonia and London Mozart Players.

Bausor has performed as a concerto soloist with the London Symphony Orchestra, Ulster Orchestra, Academy of St Martin in the Fields, European Union Chamber Orchestra, Royal Northern Sinfonia and London Mozart Players.

Bausor gives regular masterclasses at all the major London conservatoires.

6.2.1 Exploring Headjoint position

As a starting point for my first ‘flute in hand’ session with Bausor I chose to play the opening twenty bars of Faure’s Berceuse Opus 16. This was one of the melodies with which I had been experimenting and which I thought would be a useful inclusion in The Tone and Timbre Toolkit as a more extended piece that covers the flute’s three octave range; the opening section played in this session with Bausor offered the opportunity to explore the lower and middle octaves of the flute’s register. Furthermore, I chose to play the same melody three times with the headjoint

alignment in three different positions: (1) slightly turned out; (2) in a straight line with the keys; (3) slightly turned in. I was aware that this would create different timbral qualities and in my own practice I had been experimenting with these three positions in my ELPaR. I was very conscious that what the player hears is often very different to what the audience/listener hears, and I was undecided about how the differing timbres came across to the listener, so I wanted to get her expert performer-teacher feedback on how she perceived these timbral differences, her perspective on how headjoint alignment can affect tone and colour, to understand her personal preferences, and to better understand what works best for me and if there is much variation player to player.

Headjoint turned out: Bausor described this sound as ‘open and free’ and felt that this represented a good starting point from which to work as it offered flexibility and possibilities for manipulation. She perceived this sound to have upper harmonics within it but cautioned that one possible negative was a tendency to go sharp, which she described as ‘letting the pitch fly’.

Headjoint in straight alignment with the keys: Bausor felt that turning the headjoint a millimetre inwards so that it was in straight alignment with the keys added slightly ‘darker harmonics’ to the tone. In addition, she perceived a risk of sounding covered and starting to sound flat at times.

Headjoint slightly turned in: Bausor noted that this position offers more focus and edge to the sound, but it runs the risk of ‘restricting and squashing’ the sound. To mitigate against this, Bausor suggests lifting the top lip and opening the embouchure to an ‘oo’ shape, which helps to recreate some of the open, free colour of the ‘headjoint turned out’ position. When I listen to myself play in this position I perceive the tone to be bright rather than dark, again raising questions about language and aural perception.

When Bausor herself plays she says that she aligns her headjoint with the open holes of the keys (her flute has a mechanism with keys that are ‘in line’) and then turns inwards a maximum of one millimetre. As everyone has a different physiognomy what works for one person might not work for another, and what works for Bausor might not work for others, but this experimentation with headjoint alignment can help learners to discover how to maximise their own personal physical characteristics in tone production.

For the purpose of coaching me playing Faure’s Berceuse Opus 16, Bausor felt that the slightly turned out, more open and free alignment that I started with resulted in the most appropriate

timbre for this particular piece, whilst acknowledging that the other colours would be of use in other repertoire.

6.2.2 Good ‘Basic’ Tone

When talking about what Bausor calls an ideal ‘basic’ tone, she feels that the most important quality is resonance, which she links to a more ‘open’, and therefore less ‘focussed’ sound. She states that the player should always be looking to find the most resonant point in the sound. Next, the tone should have focus or a core, but Bausor cautions that a focussed tone should be devoid of any tightness or restrictions in the sound, which can be caused by pressing down on the airstream thereby producing unintentional harmonics in the sound. She states that it is possible for the tone to be focussed and have a core without becoming edgy or darker in quality.

Bausor states that the player should always be listening attentively to the tone, and if the player perceives that their sound is at risk of sounding flat and/or sounding restricted or squashed she recommends lifting the top lip to ensure that it is not ‘pressing down’ or ‘pushing down’ on the airstream, which will result in an unintentionally ‘darker’ colour. In addition, and equally important, Bausor recommends opening the space inside the mouth, creating an ‘oo’ shape with the embouchure, and she talks about lifting the soft palette and the feeling of yawning at the back of the throat¹³⁹.

In my initial thinking about a continuum of timbre from unfocussed to focussed, I had conceived that as the tone becomes more focussed it equates with getting darker or edgier as the harmonic content within the sound intensifies, but Bausor believes that the tone can be gently focussed, thereby giving the tone a core, whilst avoiding a hardening or darkening of the colour. This kind of gently focussed tone is neither hollow nor dark, but it is resonant and will project well, and it represents a point from which the colour can be made hollower or darker by making the harmonics/overtones less or more evident. Resonance, particularly creating as much space as possible inside the mouth and at the back of the throat, is Bausor’s starting point for achieving this gently focussed tone with a core, in combination with ensuring that the top lip is lifted to avoid pressing down on the airstream.

Bausor states that an open sound is, in general, more resonant, will project more, and is a sound that envelops the listener and fills the room as it projects outwards. This echoes Wye in the literature review, and is in agreement with Hill’s concept of tone, discussed later in this chapter.

¹³⁹ References to yawning and lifting the soft palette are also found in the literature – see Chapter 3.8.

Another crucial element involved in resonance and projection is having the harmonics in tune. Bausor did not raise this idea herself in our discussions, but when I raised the issue of having a ‘harmonics-in-tune’ sound¹⁴⁰, which other practitioners speak about at length, she agreed that if the harmonics are not in tune the tone will not resonate. Bausor linked this to intonation, using as an example the difference in pitch between a top octave E played with the real fingering in comparison to a top octave E harmonic played on a low C fingering, with the latter being considerably flatter. This difference in pitch leads Bausor to be guided by both the pitch and the timbre of the harmonic fingering, and to aim to ‘bring down’ the pitch of her real high E by opening the throat, creating a yawning feeling, and lowering the support. However, in aiming to ‘bring down’ the pitch there are dangers; for example, you must be careful not to roll the flute inwards or squash down on the airstream with your top lip, because as soon as you start to bring your top lip down you risk cutting off the resonance in the sound or unintentionally changing the colour.

In her personal warm up sessions Bausor employs two exercises in particular, which, after many years of deliberate practice and refining, offer her the shortest route to checking that her sound is ‘free and unrestricted’, and encourages the physical conditions required to create her desired open, resonant tone. These exercises are: (1) placing harmonic fingerings into phrases or playing whole phrases on harmonic fingerings; and (2) singing a drone whilst playing.

6.2.3 Employing Harmonic Fingerings within a Musical Context

In Phase 1 Bausor discussed some of the ways she utilises harmonics in her practice and her rationale behind her thinking and practice. Working together in her ‘secret garden’ she explained that the timbral quality of notes played with harmonic fingerings contrasts with notes fingered normally; the harmonics usually have greater depth, especially when comparing long tube harmonic fingerings (on low D, Eb, E and F for example) with their short tube fingered counter parts (A, Bb, B and C) in the middle octave. The harmonics are more resonant, and the resonant quality of the harmonic can be used as a timbral model to be mimicked and replicated in normally fingered notes. This idea of replicating the timbre or colour of the harmonic in the normal note is not new, but Bausor’s extended use of harmonics within passages is an approach not found in the literature. Harmonics exercises in the literature¹⁴¹ tend to focus on using the harmonic series to develop technical control. For example, they are used to work on: note placement (Nyfenger, Wye); air speed (Seed, Wye); intonation (Graf, Nyfenger, Seed); and

¹⁴⁰ Explained in detail in Chapter 6.3.2.

¹⁴¹ See Chapter 3.10.1.

adding ‘richness’ to the tone (Nyfenger, Wye). What is new in Bausor’s approach, and provides new insights not documented elsewhere, are ideas relating to using harmonics for musical rather than technical development. Bausor’s approach uses harmonics:

- within the context of a musical phrase to train expressivity and nuance;
- to train the ability to make micro adjustments for the purpose of matching colour as the player moves from note to note within specific musical contexts; and
- to develop and refine tone and colour beyond the idea of ‘adding richness’.

Bausor also notes the differences in pitch between harmonic and real fingerings, coming down on the side of Seed rather than Nyfenger in the contradiction identified in sub-chapter 3.9.1.2 of the Literature Review. Awareness of the pitch differences between ‘real-fingered’ notes and their harmonic equivalent can help players to develop the ability to play in tune, and can also contribute to understanding what is meant by the concept of a ‘harmonics-in-tune’ sound¹⁴².

In my own ELPaR I found Bausor’s practice of placing harmonics into a musical context to be very useful. Substituting harmonic fingerings in passages has, for me, been a good way to develop greater awareness of resonance, maintaining the depth of timbre from the harmonics in normally-fingered notes to maximise resonance, and to ensure that whatever colour I choose has a centre or a core whilst avoiding unwanted dark or edgy timbres. In my ELPaR I have combined this practice with Hill’s ‘cranking the car’ exercise¹⁴³ to further work on developing resonance and depth of tone. Furthermore, it is an exercise that often highlights when neighbouring or nearby notes do not automatically share the same timbral qualities due to the idiosyncrasies of the instrument (all instruments have these idiosyncrasies); it highlights moments when the player needs to intervene physically to maintain a homogenous tonal quality across notes and intervals to avoid unintentional or accidental changes of colour.

6.2.4 Singing a drone whilst playing

Bausor employs singing a low-pitched drone whilst playing as an exercise for checking and ensuring both resonance and appropriate support of the airstream. According to Bausor, this encourages ‘blowing through’ a passage of music with the correct support, and singing low down within the vocal range opens the throat, aiding the yawning idea to maximise resonance. I noted to Bausor that when I sing an octave higher within my vocal range this also helps me

¹⁴² The concept of a ‘harmonics-in-tune’ sound was raised by Bennett, Hill, and Roorda in the Phase 1 interviews, and is explored in depth with Hill inside the ‘secret garden’ in Chapter 6.3.2.

¹⁴³ See Chapter 6.3.4.

to lift the soft palette and resonate inside the nasal passages, but for Bausor the benefit of this was outweighed by losing the open, ‘yawny’ feeling at the back of the neck and throat, which for her is the purpose of the exercise. Some disagreement between Bausor’s ideas on singing and playing and my experimentation with my ELPaR led me to develop several exercises for learners to discover for themselves how singing within different parts of the vocal register whilst playing might affect tone production. These exercises can be found in the ‘Exercises’ part of Section 2 of The Tone and Timbre Toolkit.

Singing a drone whilst playing also works well when focussing on developing the ability to maintain a very legato, ‘really liquid’ line, starting with conjunct movement and smaller intervals, and building to larger intervals as control develops. In the initial stages of developing this skill, the player should focus more on the act of singing the drone than on the simultaneous act of playing the flute; attention should be directed towards maintaining a consistent drone, which in turn should contribute to maintaining a constant, well-supported airstream. Step 2 of this process is then to focus on the flute playing, blowing through the notes with an awareness of the intervals between notes, sustaining a legato line and maintaining maximum resonance in the tone. Playing without the drone, Bausor focusses on the legato line and the air support, but with the addition of the drone Bausor focusses on maximising resonance by opening the back of the throat, and by singing at a low pitch to engage the chest resonance (also identified by Roorda in Phase 1). The low pitched singing also encourages Bausor to imagine that the sound is projecting through a speaker in the back of her neck, as she mentioned in the Phase 1 interview, which is important for Bausor as it helps to combat a personal tendency to bring the head forward and ‘collect tension’ in the back of the neck, which she notes is a common problem not just for her, but for many flautists.

Bausor cautions that working in this way is not a silver bullet and it is still possible to play with unintentional tightness and to force the sound, so attentive listening and a clear idea about the tone and colour that the player is aiming for is key. Attentive listening is also required to notice when unintentional changes in colour occur. I experienced numerous moments working in the ‘secret garden’ where I was made aware of changes in colour of which I had not been aware and had not intentionally instigated. Bausor states that on the flute some notes are weaker than others and some notes have a naturally different colour than their neighbour, and that this requires constant awareness and micro adjustments to achieve a consistent tone quality where specific notes do not stand out unintentionally. To illustrate this point Bausor suggests imagining (or trying out) that one person is blowing the flute while another person is doing the fingering. There will be no attempt by the blower to make airstream or embouchure adjustments

for neighbouring notes as they will not know when the notes are going to change, but the colour of neighbouring notes might be heard to be different. This experiment highlights the need to work at making small adjustments in order to maintain a consistent colour. Bausor talks of making constant micro adjustments based on constant aural feedback, which for her, with years of experience, happens subconsciously, but for the learner requires careful and consistent training, hours of deliberate practice and teacher/peer/colleague feedback, to develop what I have termed PAPAPI. This concept of constantly making micro adjustment echoes Holmes (cited in Chapter 1.4.2), who states that:

An advanced performer will have developed sufficient technical command to be able to draw on a wide range of tone colours, evolving from a continuum of large and small-scale physical movements that embody Seashore's concept of 'sonance'¹⁴⁴. (Holmes, 2012, p.304)

Regarding making the best use of deliberate practice time, Bausor suggests that students should ask themselves: how can I condense my practice time and how can I make this sound better quickly? This is the ultimate objective; to have clear goals and a clear way to achieve those goals in the shortest amount of time possible.

Bausor's observations represent the professional manifestation of some of the ideas from the academic literature cited in Chapter 2 that form part of my theoretical framework, including Krampe and Ericsson's (1995) thesis on deliberate practice, Coulson and Harvey's (2014) thesis on Reflection for/in Action, and Csikszentmihalyi's thesis on flow. When Bausor talks of things happening subconsciously as a result of years of experience, she is alluding to having developed the kind of PAPAPI skills and know-how-heuristic tools, detailed in Chapter 2, that enable her to (re)act intuitively whilst inhabiting a state flow, as theorised by Csikszentmihalyi.

6.3 Kate Hill: Case Study

Kate Hill was a member of the English Chamber Orchestra for thirty years and a founder member of the Britten Sinfonia. Her freelance musical activities were widespread, encompassing orchestral playing, concerto performances, chamber music and recording.

Hill was professor of flute at the Royal Academy of Music, London for twenty-five years, and prior to that she also taught at the Royal Northern College of Music, Manchester for ten years

¹⁴⁴ Seashore defines the term "sonance" as 'the successive changes and fusions which take place within a tone from moment to moment' (Seashore, 2012, p.9).

and Chetham's School of Music for nine years. She has many successful students who are now working in the music profession all over the world.

In 2021 Hill retired from professional playing and from teaching at the Royal Academy of Music, but continues to teach from her private teaching studio in Oxfordshire, at the annual Oxford International Summer School, and to work as an examiner for conservatoire end of year recital examinations.

I had several one-to-one sessions within her private teaching studio in Oxfordshire, where we explored her approach to teaching tone, tone colour and what she perceives to be the associated issues.

6.3.1 Exploring Tone and Colour

In my first face-to-face session with Hill I started by requesting to explore her concept¹⁴⁵ of a 'warm, hairy' sound, which she talked about in my Phase 1 interview. She describes this concept of sound as a big sound, with space around the sound, and states that when it works well you can feel the sound going around the edges of the room; others, like Bausor, similarly talk of sound that 'envelops' the listener.

Hill asked me to imagine my sound echoing around a church or cathedral, stating that when you do not know where a sound is coming from there is a 'wow' effect, and that players can use this as a concept and try to recreate the same effect in smaller, less resonant spaces. Hill added that whilst we may not play very often using this type of warm, open, hairy sound, it is useful to develop the ability to play like this as it encourages resonance, projection and getting the harmonics in tune. It requires the player to 'feed the sound'; to give an energy to the sound (also discussed by Bennett in Phase 1), and Hill stated that the player needs to be aware that the flute is 'fed' by air.

This concept of tone aims to encourage a depth to the sound and avoid a shallow tone, or what Hill describes as 'losing the bottom of the sound', and is achieved in part by maximising the space inside the mouth. To increase space inside the mouth Hill says that the player can:

- visualise making the gap between the upper and lower teeth bigger;¹⁴⁶

¹⁴⁵ Hill states that she separates her teaching ideas into 'concepts' and 'technique'. The 'concept' is the idea of the sound you want or what is possible, akin to imagining and predicting as theorised in this thesis, and the technique is the ability to produce that sound employing the kind of know-how heuristics that I theorise.

¹⁴⁶ Found in the Literature Review as one of Gilbert's techniques.

- yawn¹⁴⁷ - this helps to learn how to lift the soft palette at the back of the mouth.

She also cites Gilbert talking about ‘tasting the air on the back of your throat’, echoing Pope’s instruction to ‘let the cold air open your throat’; the objective is to open the mouth cavity and the throat. Additionally, Hill cautions against pinching the airstream with the top lip, reiterating a problem that both Hill and Bausor had raised in Phase 1.

Thinking in this way and applying these ideas should begin to help the player to fill the room with sound instead of just playing to the person in the front row. Hill recommends asking yourself where you are sending your playing to. She talks about projection and choosing a point in the distance to project to, or imagining projecting like a laser through walls. One possibility is to choose an audience member near the back of the room and play everything to that person; direct all your sound and all your music to that person or that point in space, says Hill.

A large part of Hill’s concept of sound revolves around having the harmonics in tune, which was a recurring theme with many participants during the Phase 1 interviews. Hill says that having the harmonics in tune means that the tone is in tune with itself, and results in what she describes as a ‘happy sound’. According to Hill a happy sound can manifest itself in a multitude of different colours and dynamic levels. A happy sound is not about colour or timbre; it is only happy when the harmonics are in tune with each other. A sound might be clear and have energy and tick many boxes that might be perceived as desirable, but if the harmonics are not in tune Hill deems it unpleasant to listen to and unlikely to project sufficiently. For Hill and others, this is a fundamental of good, ‘basic’ tone production and requires that students: (a) understand the concept; (b) can hear when the harmonics are or are not in tune; (c) constantly listen and re-listen to their sound, making what are often frequent micro adjustments. An important starting point for Hill in developing this happy sound is to develop maximum flexibility in directing the air stream, and she works using note bending exercises to achieve this. Note bending encourages flexibility in the embouchure and the ability to direct the airstream in any direction. This aids intonation and the ability to find what I have called the ‘sweet spot’ (the place of maximum resonance) in each note.

In The Tone and Timbre Toolkit I provide two YouTube links¹⁴⁸ to an explanation / demonstration of note bending by Denis Bouriakov (*Note Bending for Flutists - Part 1*, 2013),

¹⁴⁷ Also advocated by Bausor and found in the Literature Review – see Chapter 3.

¹⁴⁸ Click on the YouTube links below to see Denis Bouriakov¹⁴⁸ explain and demonstrate note bending.
<https://www.youtube.com/watch?v=5u3VYim6OcY>
<https://www.youtube.com/watch?v=5u3VYim6OcY>

Principal Flute of the Los Angeles Philharmonic Orchestra and ex- Principal Flute of the Metropolitan Opera in New York. Where I can provide YouTube examples of famous players to model or explain concepts or techniques to learners in a way that resonates with my research findings, I believe this to be a powerful way to engage, motivate and empower learning.

6.3.2 ‘Harmonics in-tune’ Sound¹⁴⁹: Understanding the Concept

I had always been aware of the concept of a ‘harmonics-in-tune’ tone but working with Hill I realised that I had never fully understood the concept; I had taken it to simply mean a good, resonant, in-tune sound. We usually make judgements about sound being in tune by making comparisons between notes (intervals) or by comparing two or more people playing the same note. The idea of a harmonics-in-tune sound is not concerned with how one note relates to another note; it is concerned with maximising the resonance and projection of the tone by ensuring that the overtones from the harmonic series that are present within a note ‘mutually support each other’ (Roorda), rather than ‘fight each other’ (Hill, Roorda) so that the tone vibrates and resonates optimally, to the full potential of the player/instrument interfusion. Roorda additionally describes this concept as a sound that is ‘intrinsically in tune’, meaning a sound that is in tune with itself rather than with a comparative note or pitch; the idea of being in-tune in this way in a concept that some find challenging. In Phase 1 both Hill and Roorda stated a strong link between how you blow, how you use the air speed and blowing angle, and the harmonics or partials contained within the sound, and Bennett suggested an exercise using the piano to develop auditory awareness of the harmonic content of a single note¹⁵⁰.

The following represents how I came to understand the concept of a ‘harmonics-in-tune’ sound through my collaboration with Hill and my critical reflection within ELPaR. It is a difficult concept to explain in words; it is something that you hear and feel to be happening when you know what to listen for. My explanation may be slightly simplistic, but I attempt here to impart an understanding of the concept that will be sufficient to empower flute students to start to explore the concept heuristically for themselves. In order to communicate the concept in a succinct way to students I used a mixture of pictorial depictions, with video examples as exemplar material. I emphasise that this is not a scientific representation, but rather the way that I came to make sense of the idea through working collaboratively in the expert one-to-one

¹⁴⁹ See Appendix 4 to watch a video explanation/demonstration of what I mean by a Harmonics-in-tune sound. This video is also accessible, via a QR code, in The Tone and Timbre Toolkit on page 29.

¹⁵⁰ See Chapter 5.5.

teaching studio and resulting from the processes of critical reflexion/reflection that took place within my ELPaR.

This explanation is specifically conceived with flute players and learners in mind, and may not make complete sense to non-flute players.

1. The blue circle represents the centre/core of the tone of any particular note, and all notes, regardless of timbre or colour, require a whole centre/core if they are to project and have the harmonics-in-tune. However, a note that is all core and not surrounded by an even distribution of partials/overtones/harmonics will not resonate or project.



2. The green circle represents the whole note played - with its distribution of partials/overtones/harmonics - that should surround the core; every harmonics-in-tune note should contain a centred blue core surrounded by evenly distributed green overtones.







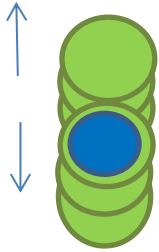
NO	NO	NO	YES
			
No centre/ core to the note	Partials are concentrated below the core, which has its upper part 'squashed' or 'flattened'; the partials need to be more evenly distributed	Partials are concentrated above the core; which has its lower part 'squashed' or 'the legs cut off'; the partials need to be more evenly distributed	A centred core within an even distribution of upper and lower partials that will vibrate 'happily' and project.

Figure 48: Harmonics-in-Tune 1

- Using note bending exercises, the player can direct the airstream up or down to place any given note above or below the centre/core of the sound within a given pitch range (dependent on how flexible the player's jaw and lips are), *squashing*, *flattening*, *cutting the legs off* and poorly distributing the partials; but if the whole of the centre of the sound (the blue circle) is not contained within the distribution of upper/lower partials (the green circle), the harmonics will not be in tune. I used to think that placing a note above or below the centre of the sound was a decision regarding colour, but according to Hill's thinking, these notes are not in tune with themselves and are not resonant; they are simply placed too high or too low, thereby not containing the full centre of the note and having harmonics that fight each other rather than happily resonating with each other.



This illustration represents bending the pitch of a note up and down by directing the air higher or lower, thereby having a wide range of flexibility in directing the air above and below a harmonics-in-tune note.

Each green note will be played using the same fingering, but only the green note with a blue centre has the harmonics-in-tune. The others will be sharp or flat in pitch, but also contain partials that fight with each other, lack resonance and do not project. The harmonics-in-tune note may or may not be at the desired frequency (i.e., $A=440$), or in tune with other instruments that are fixed in pitch, such as the piano, and other factors, such as pushing in/pulling out the headjoint, may need adjusting to arrive at the desired pitch.

By moving above and below the place where the note is most resonant, and experiencing where the harmonics are not in tune, note bending can help to find the ‘sweet spot’ within the possibilities of pitch variation on any given note where the harmonics align at their most resonant.

Figure 49: Harmonics-in-Tune 2

4. Developing the ability to bend notes up and down gives the player the opportunity to explore above and below the centre of a note, and to discover for themselves the place where the note settles and is centred and resonant, with the partials all ‘happily’ resonating with each other.
5. Within the following illustration, tone colour or timbre is represented by the size of the green circle. A smaller green circle represents a more focussed tone where the partials are concentrated within a more restricted space, whilst a bigger green circle represents a more open, less focussed tone, where the distribution of partials is more diffuse, spread over a greater area.



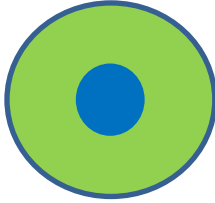
Good 'basic' tone containing a core and an even distribution of partials	Narrow, overly focussed tone; all core with insufficient content of partials	Less focused, open, wider tone, containing a core and an even but diffuse distribution of partials
		
Resonant and will project	Not resonant and will not project	Resonant and will project

Figure 50: Harmonics-in-Tune 3

According to my description, a bigger green area of a note means that there is more space for a wider, more diffuse distribution of partials, resulting in a less focussed, more open, hollow tone. A wide, more open tone should project well, so long as the partials are 'happily' distributed around a centred core.

A narrow tone, with a centre but without much space around the sound for the partials to occupy, will not project very far.

The harmonics are out-of-tune within the sound when the green note does not contain a full, blue centre.


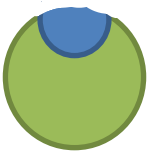

Open sound containing too many upper harmonics, insufficient lower harmonics, and not enough centre	Open sound containing too many lower harmonics, insufficient higher harmonics, and a squashed, flattened centre	Narrow, focussed sound containing too many upper harmonics, insufficient lower harmonics, and not enough centre
		

Figure 51: Harmonics-in-Tune 4

I found in my own practice and critical reflexion/reflection that within note bending exercises I started to hear where the sound is too above or too below the centre, and to ‘start to get it’, as Hill says. I conceived the point of maximum resonance as ‘the sweet spot’, where the harmonics align and vibrate freely and unimpeded. Within Hill’s teaching this is the starting point for developing the foundations of a settled, harmonics-in-tune, good ‘basic’ tone.

It is worth noting here that prior to my research, academic inquiry into a harmonics-in-tune sound had focussed on only two areas: (1) to measure the impact on hearing in different age groups caused by listening to speech where the harmonics were in/out of tune (Alain & McDonald, 2007); (2) on whether musicians, due to their training, demonstrate more acute hearing of harmonics that are in/out of tune than non-musicians (Zendel & Alain, 2009). Both studies focus on the impact on listening/hearing caused when the harmonics are in/out of tune, and neither are interested in artistic implications or applications. My research represents the first time that the concept of a ‘harmonics-in-tune’ sound has been investigated from the viewpoint of instrumental musical performance, and my inquiry, exploring how to develop and manipulate a ‘harmonics-in-tune’ sound in flute playing, as well as linking it to other related issues such as vibrato and projection, represents a total reimagining and recontextualising of the phenomenon. The scant attention given to this issue from a performer’s viewpoint is indicative of the wider paucity of attention paid to performer-related issues of timbre, which, as noted by Holmes (2012) and cited in Chapter 1.4.2, has tended to focus on either the acoustic phenomenon, or the perceptions of timbre from the listeners’ point of view, rather than its role in expressing individual musical identity or the musical imagination of the performer.

6.3.3 Avoiding the ‘Pyramid Effect’

The next step in Hill’s process is to start ‘bending’ the pitch of low octave notes, starting with F, beginning each note ‘airstream only’, i.e., without articulating with the tongue¹⁵¹, to find a good, centred, harmonics-in-tune note; a note that has ‘belly’, says Hill. I note here that ‘belly’ might also be conceived as a note that maximises the ‘bass’ partials within the tone and has a strong fundamental, which makes a good base from which to work up through the harmonic series. Exercises working with harmonics in this way are common in the literature, starting with a note that has a quality you like, and always returning to the same good quality. What is new in Hill’s approach is the note bending before starting with the harmonic series, that she

¹⁵¹ This requires controlled use of the ‘corset muscles’ – See The Tone and Timbre Toolkit.

hopes means the exercise will start with a resonant, harmonics-in-tune, note, and her intention to use these exercises to combat what she describes as the ‘pyramid effect’ in flute tone.

Hill has observed that many students make a ‘thinner, skinnier’ sound as they go up into the middle and top octaves of the flute’s register, and Hill describes this as a ‘pyramid’ of sound that starts wide and fat in the bottom octave but gets gradually narrower as it goes up. Hill uses exercises on the harmonic series, preceded by note bending, to work on countering this ‘pyramid effect’ in order to maintain the ‘thick’ sound of the low octave in the middle octave and beyond. She starts with the note bending in the low octave to find a sound quality that is worthy of being taken into the middle octave, with the aim of then maintaining the same width of sound as the player moves up the register. Many flute players are criticized for having a thin or shrill sound in the higher register, and this process is the first step in combating that tendency.

Hill notes that one possible cause of the sound getting thinner higher in the compass can be an unintentional altering of the vowel shape inside the mouth, moving away from an ‘ah’ vowel shape towards a thinner ‘ee’ vowel shape. Maintaining an ‘ah’ vowel shape in the middle and upper octave can be difficult, and unintentionally moving towards an ‘ee’ shape can be a symptom of unintentionally tightening the embouchure, says Hill. Students often tighten their embouchure as they make more effort playing high notes, but Hill says that this is counterproductive and the opposite is required.

To avoid this, one exercise for relaxing the sides of the embouchure is to pretend to ‘eat/chew disgustingly’ whilst blowing a legato octave from the low to middle register. In this exercise the player should not be concerned about the tone quality and should aim primarily to keep the air/sound going. The disgusting eating action whilst blowing aims to release tension from the sides of the lips, avoid squeezing the centre of the lips, and requires additional support of the airstream to keep the sound going. I tried this exercise with Hill, playing G4 to G5, and we both perceived a widening of the sound occur as I ‘chewed’ and loosened my lips. Hill says that the player should aim for a freedom and an ‘opening out’ in the sound that keeps going.

Another exercise for relaxing the lips is to turn the headjoint upside down and place it on the top rather than the bottom lip, using the bottom lip to direct the air. This exercise encourages a beginner-like freedom; the sound quality will be poor, but the lips will be ‘nice and loose’. Having worked like this the player can then return to playing normally, but with the intention of maintaining the looseness of both the sound and the lips; still aim to sound like a beginner, says Hill. You can then return to the harmonic series exercise, aiming to maintain the same

freedom. Working in the same way as before, starting with note bending to find a worthy low note, and aiming to take this thick sound quality up an octave, and then comparing the middle octave note fingered normally and with the harmonic fingering. The harmonic fingering will generally produce a thicker tonal quality as it contains more harmonics within the sound, and this can then be used as a model to reproduce using the normal fingering; the normal fingered note should be filled from top to bottom with the same harmonic content as the harmonic itself. Aiming to match consistency of tone is key here, in both colour and pitch, and always aiming to maintain the same energy within the note as the fingerings are changed from harmonic to normal, focusing on projecting both fingerings equally to a distant point. The sound with both fingerings should have an energy but avoid being forced; forcing will impede resonance. Players should be aware that they might unintentionally tighten the lips and/or the throat as they change from the harmonic to the normal fingering, and if this happens they should refer back to the headjoint upside down exercise to recapture the sensation of beginner-like freedom of having loose lips.

These are experiments, so players should aim to learn by observing what happens without trying to predict an outcome and without worrying about the outcome, says Hill. Hill's instinctive approach here is supported by the literature and echoes my call to train students to become heuristic researchers of their own practice. As already cited in Chapter 2, 'one enters heuristic research without hypotheses or suppositions. The purpose is discovery rather than proof' (Bach, 2002, p.93). Hill's instinctive approach incorporates many aspects of my theoretical framework, as organised within the schema of *The Entangled Web of Musical Learning*¹⁵²

6.3.4 Vibrato and the Pyramid Effect

The next stage in this process is to be aware of vibrato. What generally happens, says Hill, is that the vibrato is bigger in the low octave but narrows in the middle octave, adding to the pyramid effect. The player needs to work to avoid this tendency by aiming to fill the middle octave sound with the same depth of vibrato achieved in the low octave, making sure that the vibrato wave sits firmly within the sound and that it 'lights up' both the top and the bottom of the note, as discussed by Hill in the Phase 1 interview (illustrated below).

¹⁵² See Chapter 2.1.

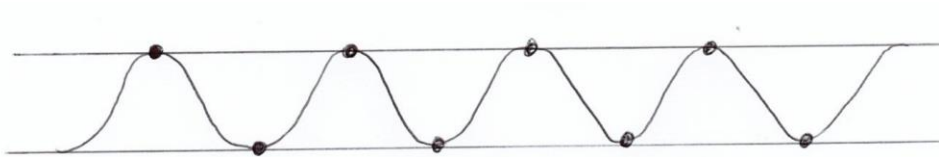


Figure 52: Hill's 'lighting up the vibrato'

It is important to ensure that the vibrato is fully contained within the sound, rather than something that is superimposed onto the sound or sits, unintegrated, on top of the sound, as this creates a shallow tone and leads to the harmonics not being in tune. When the vibrato is contained within the sound, this is what Roorda advocated in Chapter 5.6, where he differentiates between a sound that is made to 'shake' and a sound that truly vibrates.

The aim is to fill the sound with the full range of in-tune harmonics. This may involve working harder with the abdominal muscles, and it can be a useful exercise to employ what Hill describes as an exaggerated, slow, deep 'practice vibrato' ('ha, ha, ha, ha'), as if imitating 'cranking up an old-fashioned car'. Hill uses this 'cranking the car' exercise¹⁵³ to work on creating a broad sound in the middle octave, combining 'cranking the car' with harmonics; starting on a harmonic fingering with the deep, cranked practice vibrato then moving to the normal fingering within one continuous breath, with the aim of maintaining the same depth and intensity of vibrato when the fingers change between the harmonic and normal fingerings.

To explore this approach, we worked together on this exercise using a low D fingering to produce a middle A harmonic. The aim is to maximise resonance and the harmonic content within the sound; to make sure that there is an even distribution of partials within the sound and avoid having an imbalance of either too many upper or lower partials present, as explained in relation to a harmonics-in-tune tone in Chapter 6.3.2 using the illustration below.

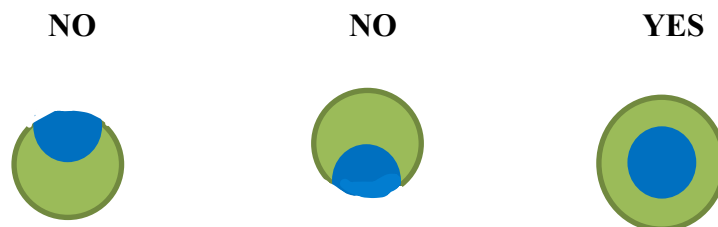


Figure 53: Even/imbalanced distribution of partials (overtones/harmonics)

¹⁵³ See The Tone and Timbre Toolkit, pages 18 – 20.

In my ELPaR I found that this exercise can develop the ability to control a greater velocity of air, which increases the harmonic content within the sound; the increase in air volume adds/emphasises more of the upper partials in the tone whilst the use of harmonic fingerings adds/maintains more of the lower partials contained in the lower fingered note; these factors combine to increase volume, resonance, and projection, thereby ‘widening’ the sound.

Hill states that it is most common that students have too much of the top of the note and not enough ‘belly’, meaning insufficient lower partials. I found that using some of my tools such as ‘snake egg mouth’ and ‘elongated sideburns’ to drop the jaw helped to fix this problem, in addition to ensuring that the sides of the lips were relaxed and flexible.

Hill states that engaging the body as a huge vibrating zone (thorax, throat, mouth, nasal cavities, etc.) is key, explaining that violin players often talk about feeling the violin vibrate on their chest because of the way the instrument is held and the contact it has with the body, and that flute players must aim to feel the vibrations in a similar way. When you can match the tonal quality of the harmonic and the real note, maintaining the same wide tone from the low to middle octave whilst simultaneously maintaining the same wide vibrato from the low to middle octave, which Hill states is very difficult, then you begin to have what she describes as a ‘settled, organized sound’. Hill’s ‘settled, organized sound’ is akin to what Bausor describes as a ‘good basis tone’, and what the academic Bastani Nezhad describes as ‘root tone’¹⁵⁴. Hill and Bastani Nezhad both state that this needs to be achieved before a player can start to think about exploring colour or timbre. Bastani Nezhad states that ‘root tone’ should be taught ‘from the early days of the learning process’ (2012, p.33) and that ‘this should not be confused with teaching various alternative tone colors as instruction in this comes much later when the root sound has been very well explored and established’ (2012, p.33), adding that ‘root tone can molded into various vowels, colors, moods and articulations’ (2012, p.38).

6.3.5 Dark and Focussed

To create a more focused sound, Hill recommends starting by using the top lip to direct the air downwards into the flute and firming up the little pad of muscles in the centre of the bottom lip, which she describes as the whistling muscles¹⁵⁵. Hill uses Wye’s exercise from his book ‘Tone’, based on the melody from Debussy’s ‘Prélude à l’après-midi d’un faune’, to work down towards low C, cautioning against going flat, or ‘blowing raspberries’, which might

¹⁵⁴ See Chapter 3.2.

¹⁵⁵ See Chapter 5.2.2.1 for a description of the ‘Bottom Lip Whistle’ tool.

indicate that the opening of the lip aperture is too small for the volume of air exhaled and lead to extraneous, unintentional noises. This sound is less open, more focused, and narrower, and therefore requires a narrower vibrato than the big vibrato developed to combat the pyramid effect. A narrower, darker, more focussed tone also projects less, and a point is reached where uses for this type of tone quality become more limited. At the extreme it is likely to sound aggressive and to have the harmonics out-of-tune, making it of limited expressive use within most standard flute repertoire and in situations that require the sound to project, but perhaps offering possibilities for special tonal effects in other areas, such as modern classical music (provided projection is not an issue) and recorded music.

When the student has mastered a narrow, focused, non-aggressive sound, they can then start to work backwards, away from this sound, opening it out little by little. Some of the quality of a focussed sound can be maintained to varying degrees within a more open sound, representing a core to a sound that has more openness and freedom around it (think back to the green notes with a blue core).

Having this concept mastered is particularly useful when playing with other wind players. For example, in an orchestra or a wind quintet, where Hill uses the term ‘floboe’, as described in Chapter 5.13, to describe a melding of flute and oboe sound, we might coin similar words to describe a melding of flute sound with other instruments: ‘clariflo’ or ‘flutinet’ to describe flute and clarinet; ‘flutoon’ or ‘baflute’ to describe a mixture of flute and bassoon sound, as requested by Toscanini in the citation from Toff in Chapter 3.11. These melding effects can be particularly effective when playing in unison and in octaves.

When playing with an oboe Hill says that she is more likely to employ a more focused, more centred sound, whereas playing with a clarinet she is likely to use a wider, more open sound. Hill acknowledges that she is not sure whether she would be thinking in these terms or whether she would just instinctively play in this way¹⁵⁶. As in the Phase 1 interview, Hill again refers to getting inside the sound of the oboe or the clarinet, and of allowing these instruments to get inside her sound. According to Hill, you can do this with some players and not with others, and these abilities grow when you play with the same people on a regular basis. Hill describes what a great feeling it is as two sounds meld to become ‘a different instrument’.

¹⁵⁶ An added complication here might be if the other wind player is also simultaneously making adjustments to play with the flute. The way that this interaction between players functions in practice represents an interesting future research avenue.

Hill notes that when students start to move between the open and focused extremes of tone it can be disorientating and difficult to understand and apply all the different concepts, and that students often get in a muddle. One reason for this is that they are starting to listen in a different way; they are educating their ears as they start to ‘get it’, says Hill.

Another reason for students getting muddled is that certain colours work better on certain notes, and the nature of the flute means that there can be an inherent lack of consistency which the player needs to mitigate against. This requires the player to make what Bausor described as constant micro adjustments based on aural feedback, and is a skill developed through hours of deliberate practice to combine PAPAPI with other aspects of my *Synthesis of Multimodal Cognitive Processes*¹⁵⁷.

In the practice room, when a desired tonal quality is achieved the player needs to almost freeze, and play it again and again, to educate their ears and to start to remember what it feels like to produce. This is a process of developing muscle and aural memory that represents a heuristic, and eventually results in the ability to remember and recreate desired timbral qualities at will, enabling the subconscious and intuitive execution that both Bausor and Hill have referred to.

6.4 Gitte Marcusson: Case Study

Gitte Marcusson studied flute with Trevor Wye and Clare Southworth in Manchester and later in London with Patricia Lynden and Patricia Morris.

She has had a busy freelance career, playing with many major orchestras and teaching at Chethams School of Music for 16 years. Since 2012 she has been professor of flute at the Royal College of Music, London.

I had several one-to-one sessions within her private teaching studio in London, where we explored her approach to teaching tone, tone colour and what she perceives to be the associated issues.

¹⁵⁷ See Chapter 2.5.

6.4.1 Breathing: Inhaling and Exhaling to Play the Flute

Inhaling:

Marcusson recommends that students do not actively breathe in, as this creates tension; students often try too hard to suck air into the lungs. Instead, she advocates just opening the jaw, releasing any tension, and to imagine creating a space inside the chest that allows the air in; imagine a balloon inflating inside the chest.

Exhaling:

The objective is to mould and shape the airstream, thereby moulding and shaping the sound. This is the way to achieve nuanced phrasing and expression, including dynamics and tone colour. Marcusson advises to ‘play on air, not on muscle’ and suggests the following image to assist in obtaining this feeling:

Imagine that you are riding a bike and being carried along by a tailwind. The tailwind is propelling you effortlessly forwards. You are being carried along by the air, rather than riding into the wind, fighting against it.

Marcusson also advises to think about how you ‘spend your air’. For example, a big, open sound can be very impressive, but if you always play like this you will be using a lot of air, will sometimes run out of air, and will always sound the same, which is boring for the listener and makes it difficult to ‘say’ different things musically. To be expressive with tone and colour Marcusson gives her students instructions such as:

- mould the air;
- shape the air;
- craft the air;
- finesse the air;
- spin the air; and
- sculpt the air.

There are many ways that these instructions can be realised, such as using the lips to direct the air, increasing and decreasing the volume and speed of the air in relation to the lips, fitting increases in vibrato speed, depth and intensity to each note and phrase, matching the use of air to an imagined, desired tonal quality, using both mouth and chest resonance. These instructions have explicit connections to the use of the breathing mechanism, the resonance chambers, and

the lips, in how tone and colour is produced and applied musically, but do not explicitly instruct where to use more or less air, more or less vibrato, or more or less colour. They encourage the learner to aim to achieve a musical outcome rather than follow a physical instruction and require that the learner discovers how to achieve an objective for themselves; physical instructions are used sparingly, when required. This approach embraces the concept of personalised authoring of know-what, through entangled processes involving exploration, experimentation, discovery, testing, feedback, and refinement that form part of *The Entangled Web of Musical Learning*¹⁵⁸.

6.4.2 The Lips

The lips should be elastic, constantly changing¹⁵⁹ to mould and shape dynamics and colour, and to adjust intonation. For a hollower sound, make a round ‘oo’ shaped aperture, and for a firmer, more focussed sound make an oval aperture using a broad vowel shape like ‘ah’ or ‘ee’ (in my ELPaR I preferred ‘ee’). The round ‘oo’ has looser lips, and enables a tone with less overtones, which will sound hollower, whilst the oval ‘ee’ is firmer and more compact, with the top and bottom lip being closer to each other, which increases the presence of overtones in the sound.

It can be useful to imagine the density of the lips; density equals firmness, so the denser the lips feel the more overtones they will add to the tone and the more focussed the tone will be. Marcusson notes that there is likely to be less space between the top and bottom teeth with an oval aperture, and that reducing the space inside the mouth can also contribute to a more focussed sound. The lips can be used to change the width of the airstream, opening the aperture to make a broader, more open sound, or closing the aperture to make the airstream ‘slimmer’, which will make a narrower sound. A narrower sound can be particularly useful in the low register, where the sound can sometime boom and be too loud. This narrower, more focussed tone in the low octave is also better for playing octaves¹⁶⁰ and for articulation¹⁶¹.

If the flute is placed too high on the bottom lip this can impede flexibility of the lips, so care should be taken to achieve the correct placement, which will vary player to player according to their physiognomy.

¹⁵⁸ See Chapter 2.1.

¹⁵⁹ This idea is contrary to some of the authors cited in the literature review, such as Debost and Galway, who advocate for minimal lip movement.

¹⁶⁰ The relationship between a focussed tone and playing octaves emerged whilst working on Moyes’s 24 Little Melodic Studies with Variations. See Chapter 7.2 and ‘Moyse 24: A Toolkit’ for more detail.

¹⁶¹ The relationship between a focussed tone and articulation emerged whilst working on Moyes’s 24 Little Melodic Studies with Variations. See Chapter 7.2 and ‘Moyse 24: A Toolkit’ for more detail.

6.4.3 Resonance and Colour

Utilising mouth resonance, vowel shapes that place the tongue higher inside the mouth, such as ‘ee’ (*heat*) and ‘e’ (*egg*), will create a more focussed tone as they reduce the resonating cavity and channel the air more directly towards the lips. Conversely, vowel shapes that create a larger, more open mouth cavity, like ‘ah’ (*art*) and are useful for creating more hollow tone colours, especially in the bottom octave, but care and attention are required to ensure that the tone does not lack a centre or a core.

Singing and humming are both activities that Marcusson recommends to access chest resonance, and placing a hand on the chest whilst singing and humming can help learners to gain awareness of the chest vibrations taking place. Chest resonance is one tool that helps to add/emphasise lower harmonics within the tone, moving away from the hollow end of the colour spectrum by adding depth or ‘bass’ to the tone.

6.4.4 Vibrato

Marcusson sees vibrato as something that enhances colour and contributes to the idea of moulding and shaping the sound to be expressive. However, she believes that one of the main problems with vibrato for many players is that it can be too predictable. She says that there is no point in changing colour if the vibrato always stays the same, and that vibrato predictability is both very annoying to listen to and impedes musical communication, leading to playing that does not ‘say anything’. Vibrato needs to sound natural, whilst being moulded and shaped to each line or phrase, rather than to each note, and decisions need to be made about which note(s) of a phrase require peak vibrato intensity (which Hill describes as notes requiring an extra ‘hug’), how much is required, and where less or none is required. This means that the player is using vibrato to shape the phrases, and it is not just a mechanical affectation.

Vibrato should be produced solely by control of the airstream with no involvement of the lips. Every note with vibrato should contain a straight note within, represented by the straight line below.

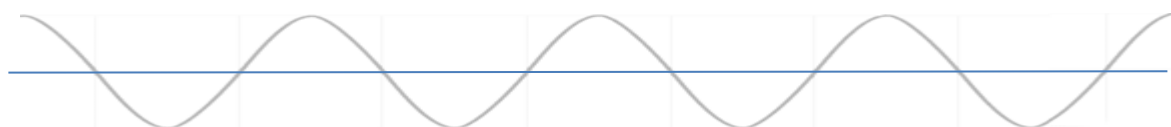


Figure 54: Straight ‘core’ within a note with vibrato

The straight note is the core of the note; straight, vibrato-less notes produced by a well-supported, consistent column of air should be practised on all notes and in different tone colours and dynamics, to ensure that they are stable (i.e., do not wobble), resonant, and have the harmonics-in-tune. Use of a tuning machine to check that there is no wobble in pitch is recommended. It is this straight note that should then be ‘vibrated’, which should manifest as a fluctuation in pitch that goes above and below, in equal measure, the straight, in-tune core of the note. This concept is related to Roorda’s belief that only an in-tune sound is capable of true vibrato, and that having an intrinsically-in-tune sound is a prerequisite of vibrato¹⁶².

Assuming a harmonics-in-tune tone, the speed and the depth of the vibrato can change, with multiple combinations of getting faster, slower, shallower, and deeper, to emphasise important notes within a phrase, to build up intensity within a phrase, to let a phrase tail away or to not emphasise notes that are less important within the overall phrase shape and the underlying harmonic structure.

Students should also be aware not to habitually start a note without vibrato and then start to add it as they get the air moving; this can be a choice but must not be a default way of playing. Starting a note with vibrato immediately at the beginning of the note is one way of giving a note energy and life, and it can sometimes be appropriate to start with an energised vibrato and then let it die away, as in playing ‘bell-tones’¹⁶³.

A final three points that are worth making learners aware of: (1) In general, faster notes do not require vibrato as the vibrato wave can disrupt the melodic line. (2) Vibrato needs to be thoughtful, and often less sounds more elegant and classier; this of course depends on the context, and might be subjective, but just because you can do it does not necessarily mean that you should. (3) Vibrato can take over the player’s voice if allowed, and there can be more vibrato than actual note; context and judgment need to be considered and applied .

Vibrato Exercise with a Tuning Meter

This is an exercise for gaining control of air pressure and speed and develops the ability to increase and decrease the air speed and pressure with precision. It also helps to develop an awareness of the air support system (what I have called the ‘corset muscles’). The objective of this exercise is to start on an in-tune note, and then adjust the blowing to gently move up and down in pitch 20% either side of the in-tune note, then 10% either side. This should be mastered

¹⁶² See Chapter 5.6.

¹⁶³ See Chapter 6.4.8.1.

in a slow, controlled way and is setting up the final step, which is to create a natural vibrato which has a slight pitch fluctuation that moves in equal measure above and below an in-tune note.

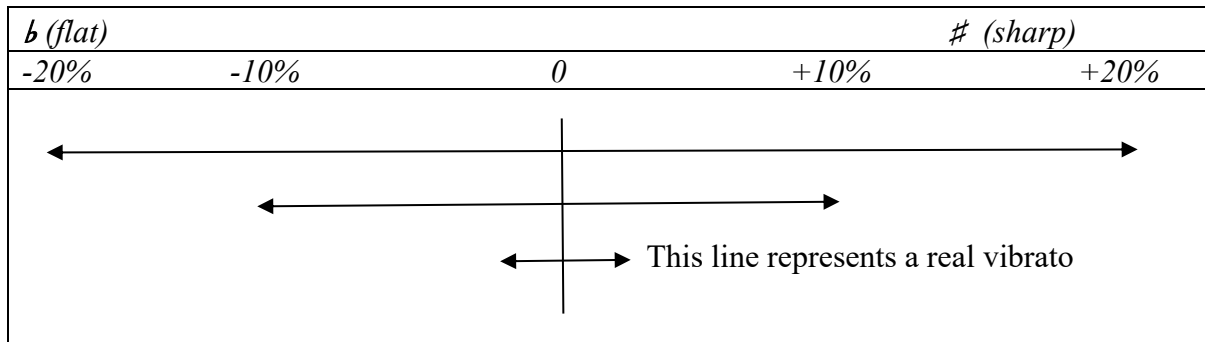


Figure 55: Vibrato Exercise with a Tuning Meter

(exercise by Gitte Marcusson)

6.4.5 Singing

Marcusson advocates singing all melodies before playing them. She believes that this aids an understanding of phrasing and that it helps to develop legato playing by enabling the player to feel the connection between the notes. She says not to worry about vocal quality, and that singing will improve the sense of musical line, natural expression, and vibrato; to recreate a singing quality on the flute is our aim. As already stated, singing and humming can also aid developing awareness of chest resonance.

Singing and the soft palette

Marcusson points out that if you sing a descending arpeggio you will notice that the soft palette is raised on the highest note, and that its position gradually lowers as you sing the descending pitches. In addition, as the pitch lowers, the jaw drops, the shape inside the mouth cavity changes and you are also able to engage more chest resonance.

6.4.6 ‘Liquid’ Legato playing

Every note has a beginning, a middle and an end, and each note needs to be connected to what went before and what is coming next. Marcusson uses the image of two magnets representing two notes; each magnet is drawn towards the other to make an inevitable connection. Another image is that of a pearl necklace; the pearls are the notes, and the string is the airstream; if there is a break in the string the pearls fall off, and if there is a break in air support the notes fall off.

It is important to focus on the space and on what happens between the notes so that the air maintains a connection between each note to ensure a ‘liquid’ legato.

6.4.7 Extremes: Dynamics, Vibrato, and Tone Colour

When a player has a high level of control, Marcusson recommends practising melodies at the extremes of the dynamic range with and without vibrato, i.e., *pp* with no vibrato, *pp* with vibrato, *ff* with no vibrato, *ff* with a big vibrato, and to use a tuning meter to ensure that everything is always in tune. The objective is to be able to play at all dynamics in any colour, from unfocussed and hollow to focussed and dark, and to add whatever type of vibrato you wish.

6.4.8 Phrasing: ‘Elephants’ and ‘Taxis’

Marcusson¹⁶⁴ is a fan of the ‘elephant and taxi’ approach to mini-phrasing that was a feature of William Bennett’s teaching, where the first syllable of each word has the most emphasis, followed by a tailing off or diminuendo.

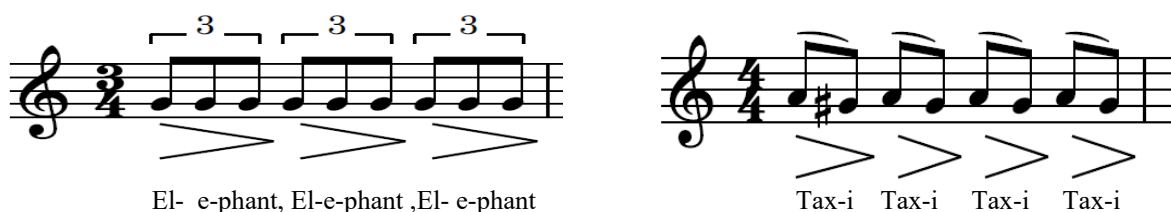


Figure 56: Elephants and Taxis

Marcusson links her approach to phrasing to a combined, holistic use of tone colour, dynamics (especially diminuendos), and vibrato intensity, believing that these three ingredients combine in sound to create nuance and finesse. Often it is only the first note of an ‘elephant’ or ‘taxi’ that requires vibrato as a way of giving the note life and energy.

6.4.8.1 Bell-tones

Bell-tones are notes that have an immediate beginning with an immediate vibrato that gives the tone life and energy, and then fade away. They are said to be like the sound of a bell or a glockenspiel, where an initial attack on a note is followed by a ringing, resonant decay. They can start phrases, and are sometimes spread over two or more notes, as in ‘elephants’ and

¹⁶⁴ The use of ‘elephant and taxi’ also emerged in my work with Hill when working on Moysse’s 24 Little Melodic Studies; see Chapter 7.2

‘taxis’, where the first note has a bell-like emphasis, fading away into the proceeding note(s). Flute players should aim to mimic this attack and decay, which requires both resonance in the tone and control of the diminuendo as the note decays. Another instrument that can be used to model this idea of attack and decay is the piano, where a note played with the sustain pedal pressed can have a clear beginning and then a long decay. Crucial with both the piano and the glockenspiel is that there is no risk of the pitch going flat as the note fades, whereas on the flute there is a big risk that must be controlled by raising the air stream as the note diminuendos.

6.4.8.2 Micro-nuances of timing and colour

Micro-nuances of timing and colour are things that are rarely written into musical notation, but they can be used by the performer to add to the sense of saying something with the music; they form part of personalised interpretation and expression. Micro adjustments to pulse and rhythm can work in combination with micro-nuances of dynamic, vibrato, and tone colour to create expressive affects. Marcusson believes that singers utilise micro-nuances of rhythm and colour more naturally than instrumentalists and that we can learn this skill by listening to good singers and mimicking their expression.

6.4.9 Note Bending

Note bending should be practised on a regular basis, and it can be especially useful for students who have a tight or rigid embouchure. In note bending exercises the focus is on developing jaw flexibility, moving the jaw backwards and forwards, and downwards and upwards; the jaw should be mobile in all directions and movements should be controllable at a micro level. In the initial practice stages learners should not worry about tone quality, but should aim to play very smooth, very controlled glissandi above and below the centre of a note achieving the biggest interval possible between the highest and lowest points of each glissando. As flexibility and control are gained, a focus on tone and nuances of colour can then become part of the learner’s deliberate practice goals. The purposes of practising note bending exercises are:

- To be flexible, supple, and elastic in the movement of the lips and jaw, avoiding any unnecessary tension. This facilitates:
 - Controlling the direction of the air. This is important for controlling intonation, and as a means of changing tone colour by manipulating the presence / distribution of harmonics within the tone.

- Marcusson's ideas on playing expressively by moulding/shaping/crafting/finessing/sculpting the air¹⁶⁵.
- Finding a resonant, harmonics-in-tune tone. By moving above and below the place where the note is most resonant, and experiencing where the harmonics are not in tune, note bending can help to find the 'sweet spot' within the possibilities of pitch variation on any given note where the harmonics align at their most resonant¹⁶⁶.

Marcusson recommends working at pitch bending exercises using a tuning meter and to start from an in-tune (A=440) note, aiming to achieve a very smooth, very controlled glissando in pitch that moves in equal measure above and below the in-tune note.

6.4.10 Articulation

I have avoided discussing articulation in my thesis to this point, believing it to be beyond the scope of an investigation into tone and timbre, but Hill and Marcusson both believed that a discussion of tone and timbre was incomplete without addressing articulation¹⁶⁷. Marcusson felt very strongly that how we use the tongue to start a note is intrinsic to the quality of the tone that follows the articulation, and that we cannot talk about tone without talking a little bit about the tongue. Like others in this inquiry, she agreed that starting notes without articulation, using only the airstream, is an important skill that must be practised and developed, and that issues relating to poor use of the tongue for articulation purposes often cause problems in tone production in general. These problems include:

- Having the tongue poorly positioned inside the mouth, which can have a negative effect on resonance and intended tone colour;
- Having an explosion of sound at the beginning of a note or phrase as the tongue does too much;
- Not hearing repeated notes if they are not articulated sufficiently;
- Difficulty in maintaining a continuous air column and articulating in a 'vocal manner', caused by the tongue interrupting the airstream.

¹⁶⁵ See Chapter 6.4.2.

¹⁶⁶ As already described in Chapter 6.3.2.

¹⁶⁷ Hill's opinions emerged during our work on Moyse's 24 Little Melodic Studies; see Chapter 7.2.

For these reasons, she was in favour of including some consideration of how to use the tongue in our work on tone and colour, even if it was not explored in the same depth as other areas under investigation.

Marcusson adopts the French practice of articulation, which she sums up as:

- placing the tip of the tongue inside the aperture hole, or slightly on the top lip, as if gently spitting away a grain of rice, but not outwardly visible (i.e., not sticking out or disturbing the aperture hole);
- very light, with minimal tongue movement; and
- with the tongue definitely not on the gum or behind the teeth. The articulation must place the tongue between the lips.

According to Marcusson, tonguing behind the teeth disturbs the airstream, cutting off the air flow and making it difficult for the tone to ‘sing’.

Regarding timbre, Marcusson believes that having a range of tongue strokes, which she likens to brush strokes using paint brushes of different sizes, adds variety to the tone colours at a player’s disposal. She also talks of varying the speed of retraction of the tongue as a tool for varying timbre, and about the use of an energised vibrato that can be applied to articulated notes to give them ‘life’. These issues were explored in depth on our joint exploration of Moyses’s 24 Little Melodic Studies with Variations¹⁶⁸

6.5 Chapter Summary

This phase of my primary research was extremely fertile and productive. Exploring practically and experientially, instrument-in-hand, enabled a depth of inquiry into a wide range of themes and issues to take place within an iterative cycle over a prolonged time period. This allowed for insights to be unveiled slowly; for my own personal praxis to develop, gestate, and evolve, informed by a merging and synthesis of multiple expert practices within my own practice, which could then be purposed for the benefit of others. The practical results of this process were two user-facing, practice-oriented, learner-centred resources, ‘The Tone and Time Toolkit’; and ‘Moyse 24: A Toolkit’, as detailed in the following chapter.

¹⁶⁸ See Chapter 7.2, and my book ‘*Moyse 24: A Toolkit*’.

Chapter 7: Creating Research-Based, User-Facing, Practice-Oriented, Learner-Centred Pedagogy

This investigation was conceived with the intention of providing learners and teachers with new teaching and learning materials that are learner-centred and practical in nature, to be used both collaboratively within one-to-one flute lessons, and by students working autonomously in the privacy of their own practice space. This chapter explores the new knowledge and insights that I have unveiled and synthesised, born out of the practical and collaborative nature of my ELPaR, and the potential that my findings have to inform and impact on the practice of others through the learner-facing resources resulting from my inquiry; the two original, user-facing texts to emerge from this investigation are ‘The Tone and Timbre Toolkit’ and ‘Moyses 24: A Toolkit’.

This chapter combines description of the processes that unfurled throughout my ELPaR journey, methodological thinking that emerged as I moved beyond the learner-researcher phase of my investigation towards using the data gathered in the role of researcher-resource creator, critical analysis, rationale, and ideas designed to guide and instruct learning. I also present and reflect on the data to emerge from having a group of students and teachers trial some of the materials from my investigation. In a different type of inquiry I am aware that readers might expect some of the content of this chapter to appear earlier within a thesis, but in the case of this thesis none of the content of this chapter was possible earlier; it is the result of the ELPaR that had already taken place. Before continuing to read the remainder of this chapter, I suggest that readers look at ‘The Tone and Timbre Toolkit’ and ‘Moyses 24: A Toolkit’ to examine the ideas, approaches, exercises, and materials that they contain, and henceforth that they refer to each text when referenced in this chapter.

7.1 Creating ‘The Tone and Timbre Toolkit’

The Tone and Timbre Toolkit is a method-text that aims to:

1. disseminate my findings to the flute-playing community and to be of practical use;
2. issue an invitation to learners to explore and discover for themselves, engaging (although I do not explicitly say this) with *The Entangled Web of Musical Learning* and the *Synthesis of Multimodal Cognitive Processes*¹⁶⁹;
3. issue an invitation to teachers to facilitate learners in discovering what works for them, moving away from a master-apprentice teaching model of knowledge transfer towards a more personalised and meaningful mode of learner discovery and authoring of know-how;
4. empower learners to develop their own praxis in the building of personalised expertise.
5. acknowledge that every individual player has a unique physiognomy (facial features, such as the size and shape of the lips, bottom jaw, teeth, tongue etc.) that requires personalised know-how.

The Tone and Timbre Toolkit is conceived as the non-academic, user-friendly face of my research, and it aims to unveil and disseminate some of the knowledge and practices hidden in the ‘secret garden’ of the one-to-one expert performer-teacher studio. It is a praxis-based resource that combines conceptual exposition with practical exercises and repertoire, all aimed at empowering learners to discover know-what en route to embedding know-how-in-action.

Based on the professional practices of my group of experts, but filtered through the six lenses of my theoretical framework as they operated within *The Entangled Web of Musical Learning* to develop expert-learner-researcher PAPAPI through the collaborative and reflexive/reflective practices of my ELPaR, The Tone and Timbre Toolkit contains a practical set of ‘tools’ that aims to empower both learners and teachers. For learners it seeks to support personalised discovery-through-doing by offering tools and approaches to try out and observe what happens, without trying to predict an outcome; training students to become heuristic researchers of their own practice by inviting them to explore a range of previously undocumented ideas that are research-based and aim to empower problem solving and the mastering of new skills embedded through developing PAPAPI. As already discussed in Chapter 2.7, Bach states that ‘one enters heuristic research without hypotheses or suppositions. The purpose is discovery rather than proof’ (2002, p.93). Abrahamson additionally states that ‘we need not tell people explicitly

¹⁶⁹ See Chapter 2.5.

what they should perceive in order to act effectively under novel conditions – they can figure out for themselves imaginary dynamical perceptual structures that mediate effective action’ (2020, p.219); both Bach and Abrahamson’s assertions are embedded in my research outputs.

The teachers’ section of *The Tone and Timbre Toolkit* begins by gently but explicitly addressing the pitfalls of the ‘master-apprentice’ model of teaching, explaining some of the reasoning behind academic research, such as increased student motivation and agency, that tells us why learning is more powerful when students discover for themselves. It explains the benefits of learner exploration and discovery and why providing fixes and solutions for students is not always the best way to teach. It also acknowledges that change can be difficult, and that some students may not want to discover for themselves, preferring the security of being told the answers and given fixes and solutions to problems. I do not seek to prohibit teachers from solving their students’ problems, and I acknowledge that where a teacher can solve a problem easily it is probably effective to do so, but I do caution about the risk of creating students who are overly reliant on their teacher and who struggle to solve problems for themselves.

I try to be sensitive to teacher reservations about changing aspects of their practice, and to outline a new role that teachers might inhabit; a role where teacher’s diagnostic skills are followed up by teacher guidance, feedback, encouragement, reassurance, employing their eyes and ears and years of experience, but aiming to avoid learning that lacks student agency. At times readers of this thesis might have questioned what the role of the teacher is, but this has never been my intention. The learner-teacher collaboration that forms part of *The Entangled Web of Musical Learning* has always been a central pillar in my rendering of possible new approaches to instrumental pedagogy, and the potential of the ‘tools’ that my research offers learners will only be realised if they are embraced by teachers; they are intended to add to the existing repertoire of resources that teachers already possess, to complement existing practice rather than inhibit it. I am aware that in and of itself my toolkit cannot guarantee a move away from master-apprentice style learning towards a more collaborative way of learning, but the book makes it explicit that this is the intention.

My tools cover a range of factors that impact tone production, including: posture and balance; embouchure and the lips; breathing and support of the airstream; resonance and projection; harmonics; dynamics and vibrato, and they aim to offer opportunities for a ‘transformative pedagogy’, as described by Carey and Grant¹⁷⁰ (2014, 2016). Each tool has been tested and refined in the collaborative spaces of multiple ‘secret gardens’ as well as within my own

¹⁷⁰ See Chapter 1.3.5.

ELPaR, where I have experienced positive changes in my own playing employing each tool. Furthermore, all tools have been endorsed by multiple experts, and have also received positive feedback when tested by a sample group of students and teachers¹⁷¹.

In The Tone and Timbre Toolkit each tool is explained. Exercises, musical excerpts, and repertoire are offered that can be used as a vehicle for experimenting with each tool individually, and for trying out the tools in different combinations. The combinations suggested in this book are those that I have found to be particularly effective in my ELPaR or those that emerged within the expert one-to-one teaching studio. Each individual player will have different needs and interests and some tools will be useful whilst others will no doubt be rejected. The repertoire used is by no means exhaustive, and the tools can be applied to explore and improve tone and timbre in a variety of different styles for a variety of different purposes.

Most of the repertoire used in this book has a link to one or more piano/instrumental accompaniment video on YouTube. These accompaniments provide the student with a harmonic and timbral context within which to consider their use of tone and timbre, and another instrument against which to measure intonation, which should always be of paramount importance. The inclusion of video accompaniments stems from expert performer-teacher observations that other books that use musical excerpts as a means of developing tone often lack the harmonic and timbral context in which the melody is set¹⁷², and therefore lack vital clues that can inform and inspire students as to the style and character of the music and appropriate use of tone and colour. In addition, some of the repertoire is presented with accompaniments in several different keys, giving the student the opportunity to explore how they may wish to change colour and timbre, or how idiosyncrasies of the instrument might lend themselves to changes in timbre and colour, when a melody moves from one key to another. Finally, I also included a selection of recordings by non-flute players; examples of the repertoire performed on instruments including the piano, violin, cello, oboe, as well as vocal performances. The rationale here was to encourage learners to listen and be inspired by examples of the tone and timbre of other instruments, together with different examples of vocal timbre, thereby attempting to avoid a narrow, flute-centric view of tone, timbre, and expression.

¹⁷¹ See Chapter 7.1.6 for data from trialling the book with a sample group of students and teachers.

¹⁷² As noted by Hill and Pope in Chapter 5.3.

7.1.1 Working Collaboratively: Researcher/Expert Practitioner Interaction and Dialogue

Establishing collaborative working relationships between myself as the researcher, and expert practitioners, was a crucial step in creating new, user-facing, practice-oriented, research-based pedagogical materials. These relationships were initiated by accessing expert practice via the familiar route of the instrumental lesson, but it was important that this relationship not be a standard teacher-student relationship. As stated in Chapter 1.1, my practice as an accomplished flute player-teacher-researcher gave me both credibility when approaching expert performer-teachers, and the language/experience necessary to engage in meaningful exploration of their practice, both in discussion and instrument-in-hand. This contributed to building the trust, cooperation, and rapport necessary to enable a genuine working relationship, and participants were very generous with their time and with their sharing of ideas; the majority of time given to interviews and workshops/lessons given free of charge.

The Tone and Timbre Toolkit is both born out of collaborative working practices and intended to promote collaborative working. It was constructed in the space created by my research methods; a space where expert knowledge and practice imbricated with my own participant-researcher practice and critical reflexion/reflection. Despite having collected a great deal of data at each stage of the investigation, the collaborative nature of ongoing iterative dialogue, lesson sessions, coaching, and feedback from within multiple ‘secret gardens’ was crucial to developing and synthesising effective ideas and resources. This ongoing process helped to focus a gradual honing and refinement of ideas, and the presentation of those ideas, into an organised and user-friendly format. It also contributed to ensuring rigour in my investigation by having multiple experts constantly question my developing practice, my lived experiences, and my assumptions and conclusions; they provided vital checks and balances against my own preferences, biases, and subjective perceptions.

7.1.2 Structuring The Tone and Timbre Toolkit

The Tone and Timbre Toolkit is presented in three sections. Section 1 is ‘the theory part’, where flute tone-and-timbre-related issues are presented and each ‘tool’ is explained, in non-academic, user-friendly language. Most of the tools have an emoji-style icon designed to act as a short-cut prompt to perception and/or action in practice and performance, and some have accompanying introductory exercises or explanatory video links.

Section 2 is ‘the practical section’. It starts with a series of exercises that explore a number of approaches unveiled in the ‘secret garden’, and employs a selection of ‘tools’ to initiate the process of developing PAPAPI skills relating to a variety of tone and timbre related issues. There are then over twenty pieces of repertoire, each intentionally chosen from non-flute repertoire (piano, voice, violin, oboe, etc.). The rationale behind this is twofold: (1) to avoid using pieces with which learners might already be familiar as flute players, so that each piece can be approached in an open, fresh way; (2) to encourage learners to listen to examples of other instrumental and vocal timbres, thereby attempting to learn from the expressive practices of other musicians and avoid a narrow, flute-centric view of tone, timbre, and expression.

The repertoire has been chosen for its suitability as a vehicle for using the tools, and also to present a range of styles and composers from different cultural backgrounds and traditions, whilst acknowledging that having worked with a group of expert performer-teachers from the classical music world, and as a classical musician myself, the majority of the repertoire is likewise classical. I acknowledge the classical bias of my research, which based in an exploration of my own practice was perhaps inevitable, but also highlight opportunities for further research that might investigate a full range of non-Classical and non-Western musical traditions. The final piece of repertoire offered in *The Tone and Timbre Toolkit* is a composition by Ravi Shankar, based on Indian classical music, and as learners reach the end of the book they are prompted to look beyond *The Tone and Timbre Toolkit* to explore other works that are based in or inspired by non-Western, non-Classical music, that will facilitate a continued exploration of tone and timbre in their flute playing.

Following the advice of expert performer-teachers, the repertoire is structured working from the low octave to the middle and then the top octave of the flute’s register. A common flaw in many learners’ tone is that it gets unintentionally narrower and weaker as it moves up the register; it starts wide and fat in the bottom octave where the fingerings represent the fundamental note, but as the tone moves into the middle octave, where notes are effectively harmonics overblown using the same fingerings as the low octave, the tone loses the fullness of harmonic content. Hill refers to this as the ‘Pyramid Effect’¹⁷³ and the rationale behind starting work in the bottom octave is, in part, to establish the technique required to produce a strong fundamental tone on each note, and the ability to take the quality of the strong fundamental into the middle octave, retaining some of the harmonic content of the lower octave fundamental to give richness and depth to the middle and top octaves.

¹⁷³ See Chapter 6.3.3.

The first draft¹⁷⁴ of The Tone and Timbre Toolkit, as sent to the sample group to try out, went through many iterations before trialling, and development of the book continued following feedback. The first draft of the book began with a lot of expositional text, but informed by the feedback process this text was edited and condensed, with some of it relocated to the final part of the book and labelled Section 3, the ‘teacher section’. It was felt by some that too much text preceding the practical, explorative elements of the book was off-putting, or might form a barrier for some learners. In labelling the more detailed written text as the teachers’ section the information is available to keen, or more advanced students, including those in tertiary education or already working in the profession, whilst not discouraging learners from starting to explore. This means that the final edition gets to the hands-on practical elements involving learning-through-doing much sooner.

7.1.3 The ‘Tools’

The tools that my research has unveiled, together with guidance for using them as the learner engages with *The Entangled Web of Musical Learning* to develop PAPAPI skills, are the most important outputs of my investigation for flute players. For a detailed understanding of each tool, and to see them applied in practical, learning-through-doing, exercises and repertoire, I refer the reader to the final edition of The Tone and Timbre Toolkit. It contains twenty tools in addition to some posture exercises, some to be practised with the flute, and some without.

For ease of use, I have divided the tools into five main areas:

1. Breathing;
2. Supporting the Airstream;
3. Embouchure and the Lips;
4. Resonance; and
5. Posture.

Some tools can be considered as fundamental to good playing technique, whilst others are offered as a means to refine the control of tone and colour. As already discussed, I present the tools with images, sometimes ‘emoji-like’¹⁷⁵, and videos that are designed to help visualise, experience, and develop physical awareness, and/or develop and prompt the enactment of

¹⁷⁴ See Appendix 6 for the first draft of The Tone and Timbre Toolkit.

¹⁷⁵ Acknowledging the cello pedagogue Amit Peled and his use of imagery (see Chapter 2.7).

heuristic shortcuts that can be employed to develop skills physically and deploy them quickly and effortlessly in performance.

7.1.4 Technology: Opportunities and Dangers

The Tone and Timbre Toolkit utilises technology, especially embedded video clips and apps for journaling, as tools for learners to utilise in the creation of personalised know-what to know-how, within the process of engaging with *The Entangled Web of Musical Learning*. Where access to the ‘secret garden’ is limited, one of the opportunities afforded to instrumental pedagogy by technology is the possibility to model, in audio and video format, ideas, concepts, and approaches to those who might not otherwise experience them. Where written text can be opaque, subjective, and easily misinterpreted, especially where commonly used metaphorical descriptions of colour or timbre are concerned, the use of audio/visual exemplar material has the potential to play a big part in bringing additional clarity to ideas and concepts as well as widen access.

Platforms such as YouTube already contain many videos designed to inform students and teachers about aspects of instrumental pedagogy, including in the domain of tone production in flute playing, but I offer here a few words of caution. Firstly, YouTube and similar platforms are open to everyone to upload videos, and during my investigation I have encountered many ill-informed videos containing poor advice. Secondly, performer-teachers who have produced online resources present a personal account of what works for them professionally, but as with similar printed method texts, the approaches and information presented are usually anecdotal or intuitive rather than research or pedagogy-based¹⁷⁶. These internet-based resources are easily accessible, but sit isolated and unchecked, and combine to create a minefield of information, misinformation, and confusion for students trying to develop autonomy within their practice. Moreover, despite the wealth of online material, my research experiences indicated that online material is not held in the same high regard as publications like those of Moyse and Wye¹⁷⁷ by expert performer-teachers; indeed, none of the performer-teachers with whom I collaborated, who admittedly make up a very small sample and may or may not be typical of the expert performer-teacher community at large, ever spoke about or directed me to online resources; they still predominantly used traditional method texts, in conjunction with study books, repertoire, and exercises of their own devising in their teaching. It is true that the Covid-19 pandemic hastened the adoption of some forms of technology, particularly those related to

¹⁷⁶ See Chapter 3.

¹⁷⁷ Moyse and Wye are the two best-selling authors of flute-related didactic texts.

online teaching, and some of my expert practitioners have described teaching live online, including via live analysis of pre-recorded student work, but this practice still forms part of the ‘secret garden’ and is not open for all to access.

To aid students in developing a reflexive/reflective practice and to take greater ownership of their learning I strongly recommend that they do two things that in my ELPaR I found invaluable. Firstly, they should record their one-to-one lessons, listen back, and make notes. I found that this process significantly encourages learner reflection and autonomy; secondly, students should keep detailed records of their practice sessions. In my research I used an app called ‘journey.cloud’ to keep a video diary of my practice and thinking. Keeping a diary, or journaling, allowed me to record, reflect on, and revisit my thoughts and playing at particular moments in time, and is a process that most students would benefit from. I am sure that many similar apps exist, but choosing a platform that is easily accessible on a mobile device, and enables the capture of written text as well as audio and video moments from within daily practice might be a key tool in empowering students to reflect on how they are progressing, and to identify and plan activities that address areas for improvement, informing Schön’s ‘reflection-in-action’ (1983) and Coulson and Harvey’s¹⁷⁸ (2014) iterative process of *Learning to Reflect*¹⁷⁹. Sharing such a diary or journal with an instrumental teacher might also be of great use in enhancing student/teacher dialogue, promoting the conditions whereby students co-author their own learning and teachers address misconceptions and provide feedback that facilitates student exploration and discovery.

Within a wider consideration of one-to-one tuition, technology might offer opportunities to share practice, break down barriers and silos of practice, and diminish some of the isolation inherent in the ‘secret garden’¹⁸⁰. As long ago as 2006, Gaunt stated that ‘teachers need to share practice, and to input into their own knowledge base from as wide a range of sources as possible, rather than being locked into their own practice as a player’ (2006, p.313). Technology in 2023 undoubtedly offers greater possibilities to achieve this objective than it did in 2006, and will no doubt continue to evolve and offer new possibilities in future.

¹⁷⁸ or my adaptation of Coulson and Harvey – See Chapter 2.2.

¹⁷⁹ See Chapter 2.2.

¹⁸⁰ Technology is not the only option here. Well established practices including group teaching models and masterclasses also offer opportunities to share practice, break down barriers, and combat isolation; technology can contribute.

7.1.5 Dissemination

The publication of ‘The Tone and Timbre Toolkit’ (and ‘Moyses 24: A Toolkit’¹⁸¹) is the primary means by which I am disseminating the results of my investigation to the flute playing ‘community of practice’ (Lave & Wenger, 1991). These two books are intended to be the first in a series of user-facing publications that hope to become a significant force for change in flute pedagogy and instrumental learning more widely, sharing new knowledge and best practice within this community of practice.

Both books are conceived as method texts, which are familiar formats for users, and intended to be used in a similar way to many of the performer-authored method texts which I explored in the Literature Review; they add to the lineage of method texts already in existence, but with one big difference – they are research-based. The method text format was chosen intentionally as it is familiar to both learners and teachers and offers a way to *gently* disseminate new ways of thinking and working within a familiar context. Whilst both of my books were conceived to sit on a music stand and invite students to learn-through-doing, as are many other method texts, my books’ approaches to discovery through the exploration of my learning ‘tools’ begins the process of instigating a new approach to one-to-one instrumental learning; designed to empower personalised authoring of know-what to know-how, and focus on developing ever-increasing levels of learner agency, individuality, imagination, and autonomy through guided self-discovery.

Other traditional modes of dissemination include plans to write articles for the many national flute associations, such as The British Flute Society and The National Flute Association USA, whose membership will be easily reachable through their websites and quarterly magazine publications.

In addition, there are many opportunities to use online and social media platforms for dissemination purposes. According to Thoma et al.

social media (SoMe) is rapidly evolving into a critical tool for the dissemination of new scholarly material and resources for practitioners. It is becoming important for authors, research groups, and journals to do more than simply publish research; they are increasingly tasked with assisting in the dissemination and knowledge translation of their work. (2018, p.301)

¹⁸¹ See Chapter 7.2, and Appendix 5.

There is no doubt that many social media platforms are regularly used to disseminate and access music performances, and to take TikTok as an example, ‘videos of users sharing specific knowledge have increased because of initiatives such as #learnontiktok’ (Fiallos, Fiallos & Figueroa, 2021, abstract). ‘LearnOnTikTok’ was launched in May 2020 to facilitate learning during Covid 19 lockdowns, and ‘videos are authored by professionals from different disciplines, students, and other users, who have shared their knowledge to this social network’s audiences’ (Fiallos et al., 2021, introduction). I freely admit at the time of writing to being a social media novice, but I see here opportunities for engaging learners, maintaining regular communication and motivation, disseminating new knowledge and engaging practitioners in active exploration and discovery that will form part of my post-doctoral plan.

An American study titled ‘Social Media Use in 2021’ states that ‘A majority of Americans say they use YouTube and Facebook, while use of Instagram, Snapchat and TikTok is especially common among adults under 30’ (Auxier & Anderson, 2021). As well as analysing use of social media platforms by age and frequency of use, Auxier and Anderson also explore usage/platforms by other demographics such as race, gender, and level of education (see below), which might inform a future online dissemination strategy to the widest range of users possible. Regarding age, my books have a large target demographic, aiming to be of use to pre-tertiary, tertiary and adult learners, as well as their teachers, and one limitation of Auxier and Anderson’s study is that it does not account for persons under the age of 18. See the table below for a summary of their findings.

Use of online platforms, apps varies – sometimes widely – by demographic group

% of U.S. adults in each demographic group who say they ever use ...

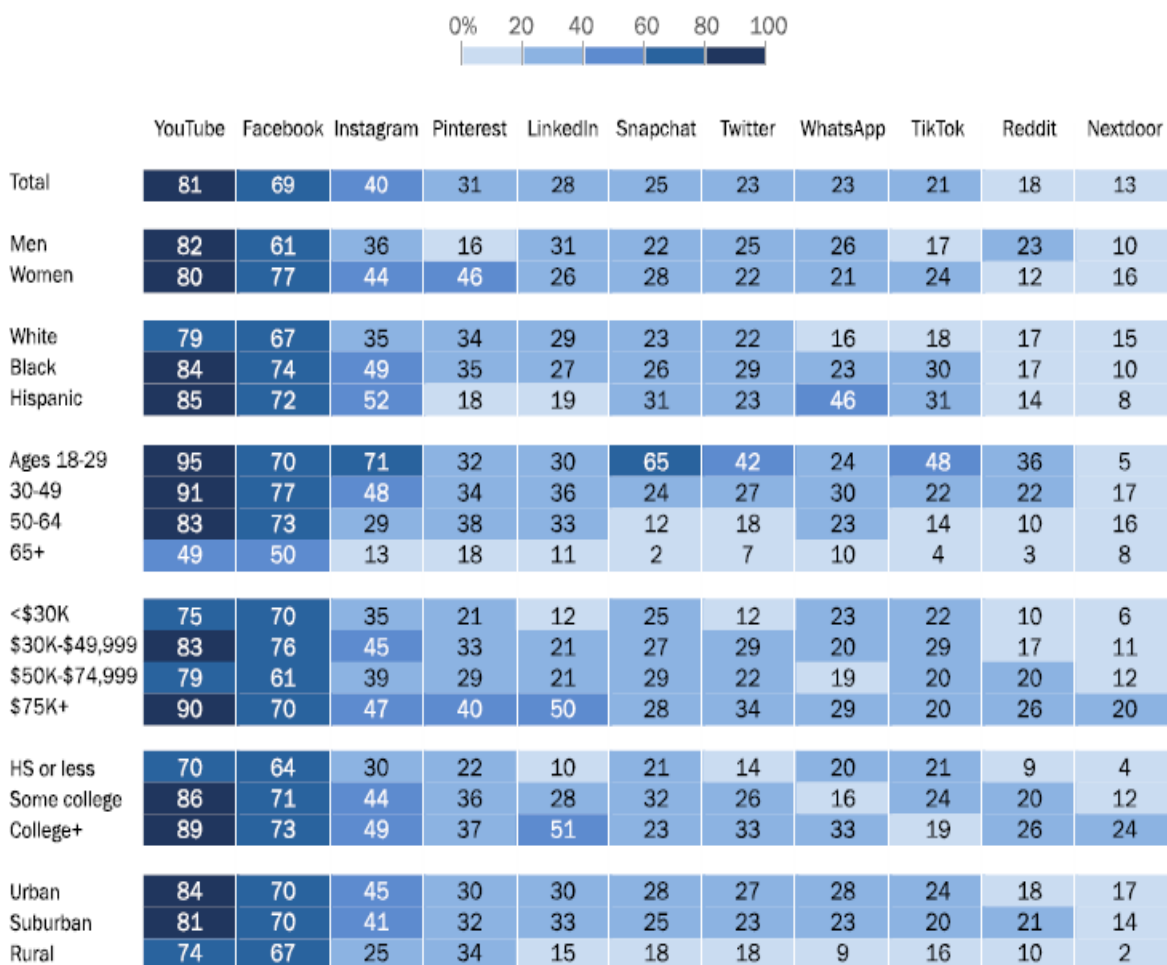


Figure 57: Demographic Overview of Social Media Use

(Auxier & Anderson, 2021, p.7)

Another social media platform being used in education is *X* (formerly *Twitter*). In the domain of medical education:

Tweetorials are a form of threaded tweets that have emerged as a tool for medical education and knowledge dissemination. Making use of features not available in traditional formats, tweetorials offer novel opportunities for educators of all levels to engage with a potential audience of millions. (Breu, 2020, abstract)

The examples provided by *TikTok* and *X* provide food for thought. A detailed analysis of their potential, as well as possible drawbacks, is beyond the scope of this investigation, but I intend to start by creating a website/blog, and a YouTube channel for which I will record myself

playing exercises and repertoire from my books, and offer mini-lessons/tutorials, and to investigate further the possibilities offered by other popular social media platforms to reach a wider community of learners.

From an academic standpoint, several upcoming journal articles are also envisaged as post-doctoral activity, and I hope to find opportunities to present at conferences and academic institutions.

7.1.6 Feedback from Students and Teachers

Once an initial first draft of *The Tone and Timbre Toolkit* was ready, I invited all the flute teachers at Trinity Laban Conservatoire and all the expert performer-teachers who had been involved in the Phase 1 and 2 stages of the investigation¹⁸² to participate in a trial of the book. I hoped to have a reasonably large sample of students spanning different ages, genders, backgrounds, nationalities, and ability levels take part; an effort was made to create a sample group that spanned a pre-tertiary to adult age range, and that had an equal gender split. At Trinity Laban none of the teachers except Pope accepted the offer, and Marcusson (Royal College of Music, London) and Roorda (Royal Conservatoire of The Hague) both said that they would invite all their students to participate, but none took up the offer. Marcusson informed me that feedback from her students at RCM was that they were too busy with the requirements of their studies, combined with having to work in part-time jobs, to be able to commit to being involved. Marcusson did, however, have one pre-tertiary student participate. In the end the sample group comprised:

- Three pre-tertiary students:
 - One pre-tertiary student studying privately with a professor from the Royal College of Music, London;
 - One pre-tertiary student studying privately with a professor from Trinity Laban Conservatoire, London; and
 - One pre-tertiary student studying at the junior department of the Royal Academy of Music, London;
- One undergraduate student from the University of Cambridge, UK;
- One master's student from Trinity Laban Conservatoire, London;

¹⁸² At this stage one teacher had retired, one was on maternity leave, one was only teaching piccolo, and one had sadly passed away.

- Two adult learners, one a flute teacher and the other an adult who had returned to playing having played at school and was preparing for an ABRSM¹⁸³ performing diploma.

Whilst not as big a sample as I had hoped, the students involved did span an age range from pre-tertiary to adult learner, including one representative from both undergraduate and post-graduate levels of study. Of the three pre-tertiary level students, two expressed a hope to go on to study music at undergraduate level and were planning to audition for conservatoires in the future. Achieving an equal representation of genders proved difficult, with a ratio of 5 females to 2 males, reflecting anecdotal evidence that ‘more girls than boys’ learn the flute.

As the trial got underway I received the first teacher feedback, from Roorda. He commented positively on the appropriateness of my repertoire choices, and he liked the tools and their discussion, stating that he believed the book was strongest when I made it clear where I stand as the author. He felt that I should foreground more of my own opinions, born out of my (ELPaR) experiences trying out the tools and ideas, and he encouraged me to trust my own instincts above the practices of my expert participants.

No further feedback came for six months. The initial testing period lasted from September 2022 to March 2023, at which point feedback from students, via Likert questionnaires, was sought. In the process of preparing the Likert questionnaires I undertook an initial unstructured interview with Pope and one of her master’s students who had trialled the book. I hoped that this informal, unstructured interview might inform some of the questions that I asked of the whole sample group, and provide some insights into questions and issues that I might not have considered, and data that would be useful to collect from the Likert feedback.

Initial feedback from this interview is summed up as follows:

- It was not clear who the intended audience for the book was. In its trial form it was considered most appropriate as a book to inform teachers about new ideas they might adopt, helping teachers to move beyond what works for them by providing a set of alternative options (the ‘tools’) that they could adopt if ideas from their own practice do not work for certain students. After teachers, the book was also considered most appropriate for university level students and more academically minded advanced students. I reflected on the need to use the Likert Questionnaires to discover which age groups had found the book most useful, paying particular attention to any perceived barriers expressed by younger users.

¹⁸³ A UK-based examination that is offered worldwide.

- The book was considered too technical and too wordy for most pre-tertiary students. It was said that there was too much text for younger students to deal with, and too much academic language used. I had been mindful in the writing stage of *The Tone and Timbre Toolkit* of the need to simplify my language in comparison with my thesis, and of the differences in intended audience between the two documents. This feedback suggested that more needed to be done in this respect. I reflected on the need to use the Likert Questionnaires to discover if the pre-tertiary students expressed any issues regarding the amount and complexity of text in the book, and whether, based on user feedback, the book in its current form did seem more suited to older/more advanced learners.

- One possible suggestion was to move the wordy section of the book from the beginning to the end, making it a ‘teachers section’ that students were not required to engage with, and having a ‘workbook’ section that included all of the practical exercises, musical material and video/YouTube material much earlier in the book. I had already considered the possibility of rearranging the content in this way, and it seemed a good idea that I hoped further feedback would help to confirm.

- There was too much repetition of ideas that might encourage readers to skip over what they felt they had already read. An example given of this potential problem was how I had given an overview of the tools, and then gone on into more depth but saying much of the same thing. One suggestion was that the overview be presented near the end of the book as a summary or reminder of the ideas. In the end I decided to condense all expositional text into one place, in Section 1 ‘the theory part’, for ease of access and reference.

- Doubt was expressed about the idea of inviting students to explore the tools for themselves. It was said that younger students were likely to get confused working in such a way, and that I might consider inviting the teacher rather than the student to try out and explore the tools, and that it could be for the teacher to adopt those tools that they felt appropriate for each individual student in their lessons. It was said that not all students wish to explore for themselves; that many students faced with a problem simply want an answer or a solution that they can put into practice. This led me to reflect that after three and a half years of being immersed in my own explorative journey, I was perhaps presenting my work in a way coloured by my own biases. On the other hand, current academic thinking is very clear about the power of learner-discovery and learner-authored knowledge, both from a depth of learning standpoint and from the benefits to learner agency and motivation that it can offer. Despite evidence from current research, Guillaumier states that ‘the typical Conservatoire student generally just wants to ‘do’ and is reluctant to make time to ‘reflect’ (2016, p.355); this observation highlights why the approach that I am advocating is necessary. I reflected that age might be a key factor here,

and considered the possibility that only older, more mature, or more advanced students might be expected to work exploratively.

- A possible solution to some of the issues raised was to create a student book and a teacher book, or to create two student books; a more basic book focussing on tone, and a more advanced book focussing on colour or timbre.

- When talking about the kind of feedback that would be useful to get from students in the Likert questionnaires, it was not considered necessary to ask for feedback on the tools themselves. It was felt that the tools were all worthwhile, and that I would not be altering or rejecting them based on feedback from a handful of respondents trialling the book. More general questions such as ‘Name one thing that you liked about the book’ and ‘Name one thing that you did not like about the book’ were considered more appropriate for pre-tertiary students.

- One useful aspect of my toolkit was identified as its aim to encourage students to maintain a consistency of colour throughout an exercise or a piece, but it was noted that this was purely an exercise and that most of the repertoire I had utilised requires changes of colour for musical purposes. It was suggested that it might be worthwhile to separate the musical material in the book into a section that focusses on maintaining one colour at a time, as a technical exercise designed to build awareness and control, and then provide another section with material where the objective is to mould and sculpt sound with musical intention, changing colour for expressive purposes. The end objective is that students should develop a physical and aural awareness of the sonic impacts of their actions and build towards acting in a natural and spontaneous way, manipulating colours to express themselves and their musical ideas and imagination, but I was cautioned that my book should not prescribe how or when this should happen.

- There were misgivings about my use of the word ‘diaphragm’ and a request not to say things about the diaphragm that are factually untrue. I had already been careful in this respect, often placing the word ‘diaphragm’ in inverted commas, and advocating for my concept of the ‘corset tool’ to represent the muscles around the diaphragm that control the air when playing, but I agreed to go back and check, and to avoid misrepresenting what the diaphragm does and how it works.

Informed by this discussion I designed my Likert questionnaire, using Google Forms, and emailed it to the student participants, copying in their teachers. The purpose of this questionnaire was to identify ways to improve The Tone and Timbre Toolkit; to identify what had been useful, areas where more information or practice opportunities might be useful, and anything that had been confusing or received negative feedback, seeking to understand any

problems or barriers to engagement and learning and identify solutions and improvements. I was also curious to get a sense of how the book, and its overall approach to exploration and discovery, had been received by trial participants in different age groups.

7.1.6.1 Likert Data

During the trial period it was the adult learners who reported having used The Tone and Timbre Toolkit the most ('a reasonable amount'), followed by all pre-tertiary students reporting having used it 'some' of the time, and the master's student the least. Unfortunately, despite several emails and reminders, I did not receive a response from the undergraduate student. The main data from the Likert questionnaires is summed up as follows:

- 34% (one pre-tertiary learner and one master's student) reported having used the book independently, without teacher input, whilst 66% (2 pre-tertiary and two adult learners) reported having used it both independently and working with their teacher.
- 83% 'agreed/strongly agreed' that the written parts of the book were clear and easy to follow and reported no difficulties engaging with the text-heavy parts of the book. Interestingly, it was the master's student who reported difficulty with reading through the text.
- 100% 'strongly agreed' that the pictures and videos were helpful, and 33% reported that the inclusion of more pictures and videos would be useful.
- 100% 'strongly agreed' that they liked the repertoire contained in the book, with the pre-tertiary students more likely to want more repertoire included in the book, whilst the adult/master's students did not feel that more repertoire was necessary.
- 66% felt that including piano accompaniments would be useful, and the same number 'agreed/strongly agreed' that the use of YouTube accompaniments made practice more fun.
- 83% 'agreed/strongly agreed' that The Tone and Timbre Toolkit had encouraged them to think more about timbre and tone colour and that the use of YouTube accompaniments in different keys had helped them to explore tone colour in their playing.
- 100% 'agreed/strongly agreed' that The Tone and Timbre Toolkit had given them new ideas to try out physically when playing, had encouraged them to listen to tone and colour more carefully, and had had a positive impact on their tone production and on their ability to vary tone colour in their sound, with 83% 'agreeing/strongly agreeing' that The Tone and Timbre Toolkit had encouraged them to be more imaginative with their use of colour.

- 100% ‘agreed/strongly agreed’ that The Tone and Timbre Toolkit had had a positive impact on their ability to vary vibrato speed and depth, with 66% ‘agreeing/strongly agreeing’ that it had had a positive impact on their ability to vary dynamic levels.
- 100% reported that the book was a useful addition to their studies, and an intention to continue to use it.
- There was some disagreement about the age ranges for which the book is most appropriately targeted. 100% ‘agreed/strongly agreed’ that it was suitable for university age students and that they would recommend it to young professions and graduates looking to teach the flute, with 66% ‘agreeing/strongly agreeing’ that it is suitable for teenage learners but unsuitable for younger learners.

7.1.6.2 Rating the ‘tools’

I invited trial participants to rate each tool, to identify any connections between individual tools and learner demographic. I was not anticipating abandoning any of the tools if feedback was poor, as my own ELPaR and expert performer-teacher feedback had already strongly endorsed everything contained in the book, but I was conscious that negative responses might indicate areas that were misunderstood or poorly explained/communicated. The ‘tool’ ratings¹⁸⁴ are provided in the table below.

	I have not yet tried out this tool sufficiently to form an opinion	Not very useful	Occasionally useful	Sometimes useful	Very useful
The Corset	50%		17%		34%
Nose Breathing		33%		17%	50%
The Posture Exercises	17%		17%	17%	50%
Singing whilst Playing				17%	83%
Cranking the Car Vibrato				50%	50%
ffff, vvvv, ssss, zzzz	17%		33%	17%	33%
Elongated Sideburns		17%		66%	17%
Snake Egg Mouth		33%		33%	33%

¹⁸⁴ The percentages have been rounded, and so some add up to 99/101%.

Space Between the Teeth			17%	33%	50%
Flutter Tonguing	50%			17%	33%
Harmonics					100%
Vowel shapes					100%
Note Bending		17%			83%
Flared Nostrils	17%	17%	66%		
Bottom Lip Whistle	50%		33%		17%
The Rabbit	33%			17%	50%
Headjoint upside down	50%				50%
Floating Collarbone	33%		33%	17%	17%
Short, sharp, sniffs	17%	17%	33%	17%	17%

Table 6: 'Tool' rating by student trial participants

Whilst there were some participants who had not tried out all the tools, the overall conclusion for the tool ratings was that all tools were found to be 'useful/very useful' by some users, including where others had found the same tool to be 'not very useful'. There were no discernible patterns relating to demographic, perhaps unsurprising given the small sample size.

7.1.6.3 Additional Positive Feedback

Additional positive general comments from participants in each age group included:

Pre-tertiary learner comments:

- 'It has helped with my embouchure. It made me feel more relaxed in my face muscles and made flexibility easier'.
- 'I really liked the exercises for lip flexibility and found it very useful'
- 'It made me more aware of what sound I made. It also made my practice more interesting when playing around with different tone colours. I also have a bigger understanding of others' use of tone colour, which made it more fun to listen to others play'.

- ‘The book has been a great source for beginning my practice sessions and as a student looking to go into the profession, I will be definitely using it for the foreseeable future!’

Master’s degree learner comments:

- ‘I particularly liked that you included recordings of pieces that were not flute. I think more recordings like this encouraging players to listen to other instruments is very helpful for providing colour inspiration. I think that these different timbres provide a much clearer idea of what different shades of colours you can aspire to than word descriptions’.

Adult learner comments:

- ‘It is a book that I go back to time and time again when I get stuck (or more often frustrated) and it always helps me push through the challenge due the amount of different ideas are in there’.
- ‘It really helped me with my bottom lip relaxation, and support as all the different exercises helped me to find out what I was doing wrong and how to correct it’.
- ‘I would say the amount of text to pictures, depends on the group you are wanting to target. For me as an older pupil I loved the text and found it useful, for other players you may want more pictures’.
- ‘loved the book, really helped me, the headjoint upside down was a revelation! I loved the book as an adult player, and really found the text useful.’
- ‘Some of the above, whilst they might not be directly useful to me in my practice, may be useful to my pupils e.g., Collarbones floating helps me a little but it is really useful and important to be able to suggest this tool to a pupil and for me to be aware of this as an option.

As well as the positive comments, two specific suggestions for improving the final edit of the book that I took into account were:

Pre-tertiary learner comment:

- ‘If the plan is to publish this book in a physical copy, then the YouTube links could be a bit tricky for some to use. Maybe refer to the actual name of the account and the video name instead of a link. It could help simplify for someone. Also, it may just be me, but having to get a secondary source with a lot of the exercises does break my concentration. I prefer not to have my phone while practising rendering the links a bit

counterproductive. But then again, I like the option, and I think it is an effective way of showcasing all the different exercises. I think it's something to think over, and maybe some written notes could be added that showcase the same as the video. This does not include the accompaniments. They are great!'

I had already planned on using QR codes to give more immediate access to each video link, and with the use of video links having received a 100% positive rating I discarded this one comment about secondary sources. I did, however, look for opportunities to reinforce information contained in video links with improved text/pictorial explanations.

Master's degree learner comment:

- 'In the dynamics section, I think that it would be useful to explain how to make the aperture smaller for quiet playing. Otherwise, there is a strong risk that many players will tighten the lip corners to achieve this when you want the main work to be at the central lip muscles. In your embouchure section, you only have exercises for people who have a tight smiley embouchure but none for people who have the opposite problem and are too relaxed - perhaps you could find something to add in here? When discussing the consonant sounds for finding air resistance, it needs to be made clear that these are used purely as an awareness exercise and the amount of resistance experienced is not what you should be aiming for whilst playing. Finally, I think it would be best if all the repertoire and the accompanying links were at the end of the book together rather than scattered throughout the book, particularly because not all the accompaniment links are with the pieces (i.e. some are a couple of pages later, than the piece, which is quite odd)'

I considered the suggestions from the master's student to all be valid and acted on the first three suggestions immediately. With the final suggestion, the repertoire and accompaniment links were reorganised to facilitate ease of use.

In conclusion, the user feedback, whilst admittedly from a smaller sample of users than hoped, confirmed an overall positive reception of the ideas and concepts contained within the book. There were no problems relating to being invited to explore and discover for themselves, and all users had found ideas which were of use to them at that particular moment of their studies whilst discarding or not engaging with what was not of use. Furthermore, my own experiences had shown me that where a tool might not be of immediate use, it may well be of future use in a journey that involves lifelong learning.

7.2 ‘Moyses 24: A Toolkit’: Expert Performer-Teacher Ways of Working/What Moyses Did Not Write

One of the things I always expected to discover in this investigation was new ways of working with existing method texts. As noted in the Literature Review, the works of Marcel Moyses and Trevor Wye are the most sold books worldwide that relate to flute pedagogy, having been translated into many languages. All the expert performer-teachers with whom I collaborated in this investigation use the books of Moyses, and his four most mentioned texts were: *24 Little Melodic Studies with Variations* (1932); *25 Melodious Studies with Variations* (1932); *De La Sonorité* (1934); and *Tone Development Through Interpretation* (1962).

I set out to investigate some of the materials contained in these books, working with Hill and Marcusson within their ‘secret gardens’ to discover possible ways of using the materials neither stated by Moyses nor documented elsewhere, to unveil new ideas and ways of working that, filtered through my ELPaR, I could translate and disseminate to a wider audience.

I focussed in particular on Moyses’s *24 Little Melodic Studies* (‘Moyes 24’), to unveil expert practices for using these studies and to explore in my ELPaR how the tools and approaches set out in *The Tone and Timbre Toolkit* might be effectively employed in each study. On the surface ‘Moyes 24’ seems rather simple, but in reality these studies contain a wealth of challenges and learning opportunities when used appropriately; somewhat problematically, however, they contain no written instructions¹⁸⁵ at all from Moyses. According to Wye:

The 24 Little Melodious [*sic*] Studies...are among the most important studies ever written for the flute, though they are regarded by most students as being elementary, ‘kids’ stuff. It always came as a shock to anyone who studied with Moyses that these apparently simple melodies with their innocent variations opened doors into the mysteries of musical structure: phrase building, tone, colour, articulation, ornaments of different kinds and all manner of basic techniques necessary for the vocabulary of the accomplished artist. “I didn’t write these books for children,” he (Moyes) once said. “I wrote them to help the many [Conservatoire] students who came to me who could not understand how to build a simple melody.” (1993, p.45)

¹⁸⁵ Some of the studies do contain musically noted instructions relating to dynamics, articulation, and tempi, but they are inconsistent. This could perhaps have been a deliberate tactic on Moyses’s part to oblige students to think for themselves about phrasing, shaping, dynamics, and harmonic structure, but I speculate.

Having already explored how expert performer-teachers conceive of tone and colour, and their practices relating to the manipulation and teaching of tone and colour, this final phase of my inquiry, working flute-in-hand within the one-to-one teaching studio, served to widen the focus of my investigation. It moved away from exploring how tone and timbre can be developed, and situated the application of tone and timbre within a wider musical context. For example, it highlighted how timbre, including dynamics and vibrato as well as the harmonic content of the sound, can relate to issues such as phrasing and articulation. Phrasing and articulation were issues not previously encountered in my one-to-one sessions and their inclusion at this stage of my inquiry facilitated a more holistic approach to the application of tone and timbre.

I believe myself to be the first academic to research the whole book, flute-in-hand, working collaboratively with expert practitioners within the one-to-one teaching studio, with the aim of making hidden knowledge and practices available to others, and my findings include many previously undocumented ideas, insights, and approaches. Most previously documented knowledge relating to these studies was anecdotal or lacking in the depth of detail that I have unveiled¹⁸⁶.

In addition, Moyses's notes exist for a series of masterclasses utilising 'Moyse 24' and 'Moyse 25'. In these notes he wrote:

The rules that govern the interpretation of musical phrases do not differ much from those which govern prosody, but they are more difficult to discern. The study of the interpretation of the 24 and 25 Little Melodious Studies, written with that in mind, will help the student develop expression in music as clearly as the study of the rules of grammar would enable him to write literature. These studies, particularly the 24, are set forth in order to establish the general laws of interpretation – the sound, its color, its different ways of being expressed – character, rhythm, etc. These etudes are to be played by different students (from beginner to the best player). (MMS-Newsletter-V14-2004-05.Pdf, n.d.)

From these notes it is clear that Moyses intended the study of tone and colour to be central to the use of these studies, and that they were written to be of use to players of varying levels. In

¹⁸⁶ Notwithstanding, other documented commentaries that may interest flute players include:

- Trevor Wye (<http://www.trevorwye.com>), who provides a short commentary on each study;
- Nehir Aydoğmuş, (Aydoğmuş, 2022), whose 2022 Master's Thesis investigates the first ten studies, but was, at the time of writing, only available in Turkish.
<https://dspace.trakya.edu.tr/xmlui/bitstream/handle/trakya/8399/0191146.pdf?sequence=1&isAllowed=y>

my investigation I worked through all of ‘Moyses 24’ with both Hill and Marcusson, accessing their ideas and teaching approaches by situating myself as ‘expert-learner-practitioner-researcher’ and offering my own practice as an instrumentalist as a model to be taught and critiqued. Following my ‘secret garden’ sessions, I used the studies and the data gathered in acts of deliberate practice designed to inform my understanding of how the studies work, through critical reflexion/reflexection within my own ELPaR. By working flute-in-hand on the same material with two expert practitioners, merging and synthesising the approaches of both, and following this up by inviting other experts to contribute their ideas to my written findings, this work provides genuine new insights into the hidden practices of how Moyses’s materials are used at elite levels within the expert one-to-one teaching studio.

Both Hill and Marcusson studied with Wye, who himself studied directly with Moyses, and Hill was a regular attendee, first as a student and later as a teacher, at a summer school in Kent where for two years Moyses also taught, and she has direct recollections of Moyses’s classes. Moyses taught on these courses using his own study books, and she paraphrases him as having said ‘I can’t write out all of the possible variations of each melody that are useful; the book would be too big and too expensive’. Marcusson states that teachers need to use their imagination to extend ways of working with Moyses’s materials to focus on areas not immediately obvious. Both Hill and Marcusson state that each melody and variation in ‘Moyses 24’ can be used and altered as the student or teacher wishes, to work on achieving whatever objective the learner has. In working with me to unveil how this might work in practice they demonstrated an attention to detail that strongly reflected my concept of PAPAPI set out in my theoretical framework.

The remainder of this sub-chapter offers a summary of the imaginative ways, unveiled in the ‘secret garden’ and through my ELPaR, in which Moyses’s material might be used. Please refer to my book ‘Moyses 24: A Toolkit’ to see all the ideas applied contextually to each individual study. The book aims to provide teachers and students with a range of ideas that might empower tone related learning and apply these ideas to the development of technique and musicianship, and it is conceived to be used alongside Moyses’s original publication. It includes suggestions for using some of the ‘tools’ developed in The Tone and Timbre Toolkit, and begins the process of creating a series of imbricating, research-based books and resources designed to complement each other in informing and elevating various aspects of teaching and learning related to high level flute playing.

A list of the learning objectives to which the studies in ‘Moyses 24’ can be applied includes:

- **Tone Colour:** Tone colour can be imagined on a spectrum, from an unfocussed, open, hollow timbre at one end, to a narrow, dark, focussed timbre at the other. The Tone and Timbre Toolkit provides many tools with which learners can explore, to develop the ability to move at will between points on the spectrum.

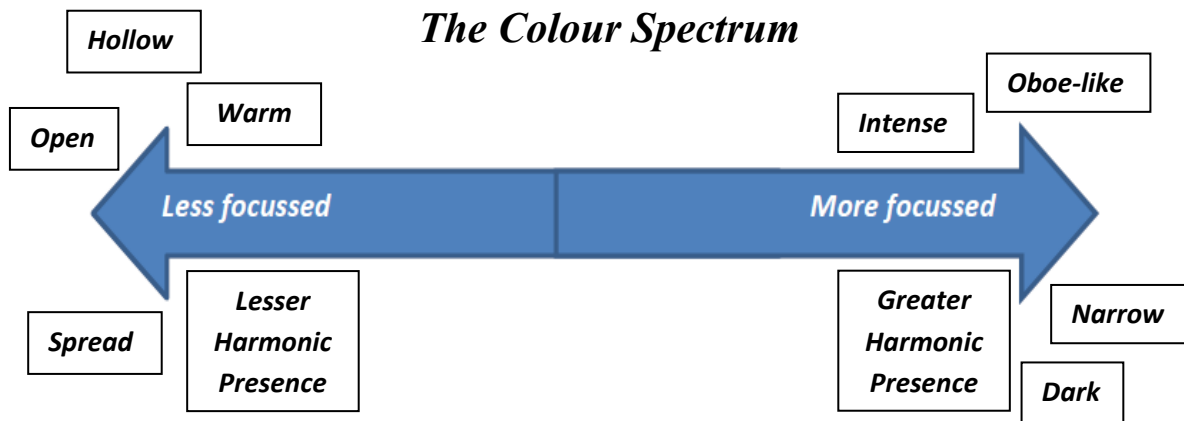


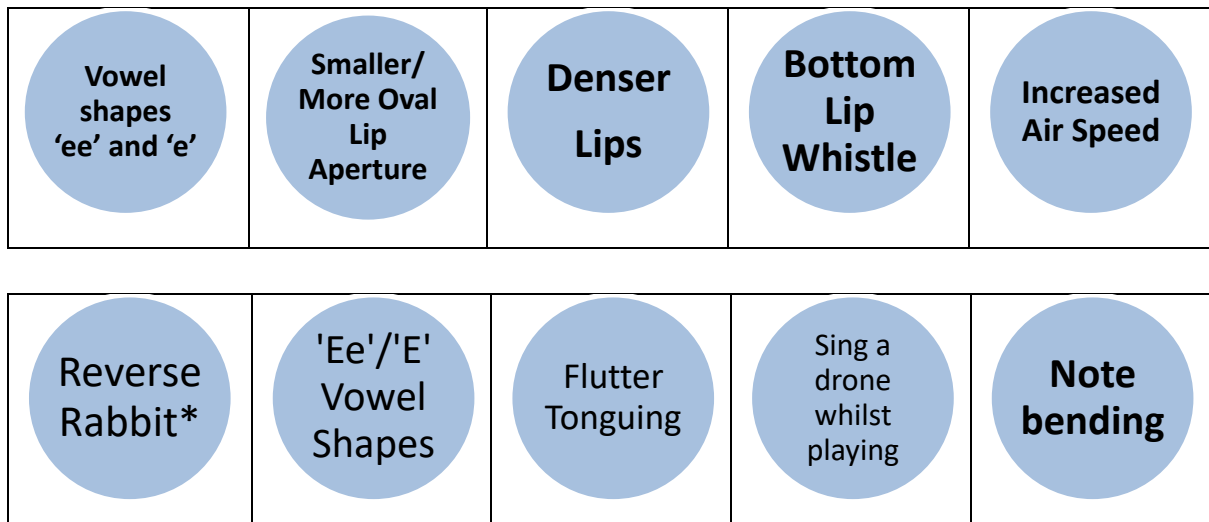
Figure 58: The Colour Spectrum

The table below is an overview of some of the tools from The Tone and Timbre Toolkit which encourage movement in both directions along The Colour Spectrum, and that can be employed in 'Moyses 24'.

Tools that can encourage a hollower, less focussed tone colour.

Vowel shapes 'aw', 'ah', 'o', 'oo'	Larger/ Rouder/ Softer Lip Aperture	Widen space between teeth	Snake, Egg, Mouth	Elongated Sideburns
Nose Breathing	Flared Nostrils	The Rabbit	Headjoint Upside down	Floating Collarbone

Tools that can encourage a darker, more focussed tone colour.



**use The Rabbit to control the top lip downwards, against the top teeth, to direct the air lower, and possibly give more focus to the sound, which will increase the harmonic content of the sound.*

Figure 59: Tools that encourage more focussed/less focussed timbre

Regardless of colour, a focus on developing a resonant, harmonics-in-tune tone is a key aim of this study book. Before starting each study, learners are recommended that time should be taken to explore and find the best tone for each starting note. *'Never start with a cheap sound'*, cautions Hill. Using many of the tools from The Tone and Timbre Toolkit, such as note bending, harmonics (from C5 upwards), singing and playing, flutter tonguing, etc. can assist this process.

The different moods and characters of each study provide opportunities to employ a variety of tone colours from along 'The Colour Spectrum', and working to communicate the harmonic structure of each study likewise provides opportunities for changes in colour for expressive purposes.

Using a focussed timbre

My ELPaR found that it was :

1. easier to use a more focussed, harmonics-rich timbre in the articulated studies in 'Moyse 24', and articulated passages in general.
2. easier to use a more focussed, harmonics-rich timbre on the lower note in octave work, so that the upper note is present but hidden within the harmonics of the lower note and might simply emerge or be released by the player.

- **Phrasing:** In some of the studies, especially those to be played legato, Moyses sometimes includes phrase markings, and they usually follow the rise and fall of pitch within the melodic line. These markings can be used as an invitation not only to crescendo/diminuendo, but also to engage in changing intensity of colour and vibrato as the melodic line rises and falls. Where phrasing markings are not included, Hill advises that learners should seek to emphasise the harmonic structure. In my ELPaR I experimented with using changes in dynamics, vibrato, and colour to shape phrases and emphasise the harmonic structure. If learners do not do this, they are simply playing two-dimension technical studies, and missing the point of the studies, which is to learn how to build a melody, as stated by Moyses.
- **‘Love Every Note’:** In focussing on both tone quality and phrasing, Hill advises students that it is necessary to ‘love every note’, but decide where to give an ‘extra *hug*’ to the most important notes within a phrase. To love every note the player must listen equally intently to every note, having taken time to find the best tone quality on which to start, and maintaining this quality throughout. My ELPaR experiments found that a ‘hug’ might come in the form of any musical device employed for expressive effect, such as increased dynamic level, vibrato intensity, more focus in the sound, or the use of rubato.
- **‘Elephants’ and ‘Taxis’:** As part of working on phrasing and dynamics, ‘elephant’ and ‘taxi’ were two words commonly used by both Hill and Marcusson. I believe that these words originated in the teaching of William Bennett, and Seed (2016) writes about this in his account of Bennett’s teaching as a kind of stress and release. ‘Taxi’ represents a pair of notes where the first syllable is stressed and the second syllable is released, and ‘elephant’ represents a group of three notes where there must be a diminuendo (release) that occurs either throughout all three notes, or on the third note. Both Hill and Marcusson employ ‘elephant’ and ‘taxi’ a great deal in their teaching. According to Hill, the cardinal sin of ‘elephant’ is to allow the third note (‘phant’) to be louder than the note preceding it. See below for annotated examples of ‘elephant’ and ‘taxi’ taken from the first four studies in ‘Moyse 24’.

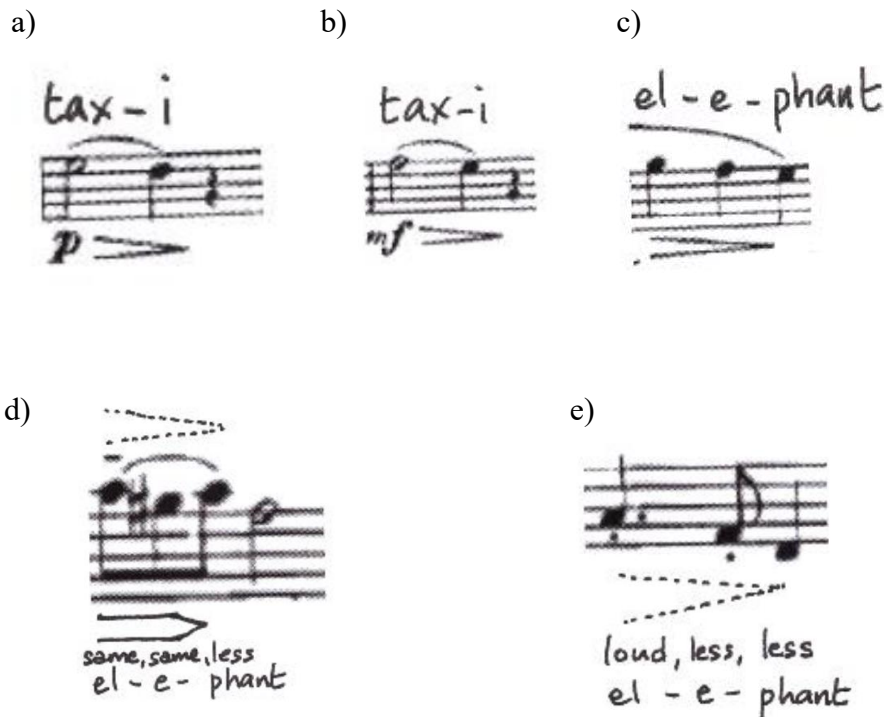


Figure 60: Examples of 'Elephants and Taxis' from 'Moise 24'

As seen in the examples above, Moise sometimes notates a diminuendo but not always. Nevertheless, the learner is advised to always play these figures with a diminuendo. I found that the most effective way to emphasise the stress/release/diminuendo element is to use one of/a combination of: tone colour (releasing from a more focussed to a lesser focussed timbre); and/or vibrato, releasing from a more intense, deeper or faster vibrato to a less intense, shallower or slower vibrato, or tailing away to no vibrato; and/or a diminuendo, requiring a flexible jaw/bottom lip that can raise the airstream as a note tails away to avoid going flat. If pitch problems are caused by lack of flexibility, I found that tools such as 'note bending', 'disgusting chewing' and 'the upside down headjoint' can be employed to reduce tension in the lateral parts of the lips and increase control.

Whilst I found the 'elephants and taxi' system of phrasing useful, and of particular use in focussing on controlling small scale diminuendos and phrasing within larger phrases, I did sometimes find a contradiction between this approach and phrases requiring a crescendo; making constant, small scale diminuendos within a phrase that is growing in volume is counter-intuitive. I would therefore recommend that learners use the approach as a training tool, and when appropriate in a musical phrase, but that they are also conscious of when not to apply it.

- Dynamics:** Controlling dynamics involves controlling pitch and airstream whilst maintaining a harmonics-in-tune, resonant sound. There is often a danger of unintentional changes of colour, including loss of resonance, resulting from lack of PAPAPI when applying dynamics. Playing quietly involves using less air and a higher direction of air stream, lifted by a flexible bottom lip/jaw, whilst playing louder involves a greater volume of air needing to be directed downwards to avoid going sharp whilst maintaining resonance; opening the space inside the mouth using tools such as ‘snake egg mouth’, ‘widening the space between the teeth’, ‘elongated sideburns’, and vowel shapes that encourage the jaw to drop, like ‘ah’, ‘aw, and ‘o’ can help. Extremes of dynamic should be avoided where quality of tone is not achievable; players should play at dynamic levels that work well for them, usually *mp* – *mf*, and slowly, over time, work towards extending this range and developing the extremes, whilst maintaining colour, quality, and control.
- Note endings:** Note and phrase endings require control, nuance, and finesse. Where notes or phrases taper away care should be taken to maintain colour and pitch whilst moulding or sculpting the note ending. Where notes are followed by a rest, Hill recommends imagining that the note ends as if sung with the sound ‘um’, and always maintaining the full note length, right up to where the rest begins. It can be useful to imagine that another instrument will pick up your phrase and continue, and you have to ‘pass the baton’ seamlessly. This is a useful skill when making music with others, always playing to the beginning of the rest to ensure no gaps in a melodic line.
- Vibrato:** The ability to vary vibrato speeds, depths, and intensity, and to match this as appropriate to both the dynamic and pitch of a note, in combination with its use to highlight the importance of particular notes (to give them a ‘hug’) within a musical phrase or structure, is a very important part of playing expressively. The Tone and Timbre Toolkit looks at various tools for exploring and developing the technical side of these skills, such as the ‘Cranking the car’¹⁸⁷ tool for developing a bigger, wider, more expansive vibrato, and ‘Moyses 24/25’ offer a more nuanced opportunity to apply this learning.

¹⁸⁷ See The Tone and Timbre Toolkit, pages 19 – 21.

- **Intonation:** Learners should be aware of the following:
 - A harmonics-in-tune tone should be maintained throughout each study, regardless of colour, dynamic, or vibrato intensity. It is recommended to spend some time searching for the most resonant tone achievable on the first note of each study before continuing to play the first phrase and beyond. In my ELPaR I found that tools including ‘note bending’, ‘singing and playing’, and ‘harmonics’ can assist the learner to achieve this.
 - Flexibility gained through note bending exercises will aid in adjusting pitch, and colour can also sometimes be employed as a means of correcting intonation. This flexibility can help learners to develop an awareness of how ‘equal temperament’¹⁸⁸, compares to ‘just intonation’¹⁸⁹. According to Kanno, ‘the tension between pitch and intonation can be creatively exploited in performance’, and she notes ‘four types of expressive tuning: harmonic, melodic, corrective and colouristic’, and a ‘tension between pitch and intonation...in relation to the concept of musical timbre’ (Kanno, 2003, abstract). Kopiez adds to the picture, stating that ‘intonation is influenced by numerous variables, such as the instrument’s imperfections, musical context, playing conditions (solo or accompanied), timbral spectrum, register, dynamics, player idiosyncrasies, beat frequencies, tone durations, and the size of intervals’ (2003, p.385). The observations made by Kanno and Kopiez highlight the importance of researching timbre from the performer rather than the listener/phenomenological viewpoint. In my ELPaR I found that it often sounds better if I pitch major 3rds a little lower, minor 3rds a little higher, and I might also raise 5ths a little. Furthermore, I found that a hollower colour, containing less pronounced partials, often sounds (or feels) slightly higher in pitch, whilst a more focussed, oboe-like timbre often sounds or feels slightly lower. My ELPaR observations help to explain some of the issues raised in Chapter 5.13 regarding intonation and blending flute sound with other instruments.

¹⁸⁸ where all twelve semitones within an octave are equally spaced or distanced from one another.

¹⁸⁹ where the performer might override the equal distancing of semitones in order to be in tune with others, or for expressive effect.

Obviously, this makes working with a tuning meter difficult, and likewise when playing with fixed pitch instruments such as the piano. When playing with other instruments, intonation should be judged through careful listening to match what you hear around you. All of this requires heightened PAPAPI skills. This is a complex scientific area in which issues relating to ‘equal temperament’, ‘just temperament’ and ‘just intonation’ are at play. Further exploration of this issue is beyond the scope of this inquiry, but from a pedagogical point of view learners need to be aware of the issues, and understand that pitch is not always fixed and good judgment informed by acute listening needs to be exercised.

- **‘Liquid legato’:** A well-supported air stream is crucial in obtaining a true connection between slurred notes. Marcusson refers to this as a ‘liquid legato’, and employs the image of notes connecting like magnets pulling towards each other¹⁹⁰. To achieve this, a well-supported airstream is key, and controlled use of the ‘corset muscles’ is paramount.
- **Articulated Notes:** As already mentioned in Chapter 6, working collaboratively on ‘Moyses 24’ was the catalyst for the inclusion of issues relating to articulation being included in my investigation. Having identified that (mis)use of the tongue often has a negative impact on tone and timbre, and that lack of control of the ‘corset’ muscles/air support mechanism often results in learners using the tongue to ‘catapult’ the air to start notes, reasons were presented in Chapter 6 for the inclusion of tonguing within my investigation. I also note here that Hill and Marcusson have very different approaches to articulation. Whilst Marcusson recommends only using the French method of forward tonguing between the lips, Hill is more open to students developing a range of different placements of the tongue within the mouth, whilst recommending against a tongue placement that is too far back in the mouth. In my ELPaR I explored both approaches, and these issues, together with insights into solutions, are presented in ‘Moyse 24: A Toolkit’. My ELPaR also uncovered a relationship between timbre and articulating with the tongue; it is easier to articulate with precision and clarity using a more focussed, harmonics-rich timbre, and deliberate practice strategies are required to develop good articulation when using a less focussed timbre.

¹⁹⁰ See Chapter 6.4.6.

Chapter 8: Conclusion

Launched from the springboard of my literature review, which itself, as a substantial and unique survey of the existing knowledge contained in the extant flute tone and timbre related pedagogical literature, represents a significant contribution to new knowledge, this investigation went on to explore and unveil the hidden practices of the one-to-one teaching studios of several flute-playing expert performer-teachers. The exploration was set within a new and original author-generated theoretical framework embedded within a reoriented (ELPaR) PaR methodology.

The ELPaR (Expert Learner Practice as Research) process represents, in itself, a significant contribution to new knowledge. It is a pioneering research methodology for the generation of new knowledge and insights, that situates the researcher as learner within the expert-practitioner domain, and the act of learning as research. Working within the professional domain, ELPaR facilitates academics in building trust, forming partnerships, and serving as a bridge between professional practice and expertise, and a wider community of practice. ELPaR differs from other research methodologies that aim to generate new knowledge by working practically with professional experts, with the researcher becoming an active participant-learner, instrument-in-hand, within the one-to-one teaching studio, rather than a passive observer of others.

The objective of ELPaR is not to carry out observational studies of the activities that take place within the one-to-one teaching studio, or to carry out empirical studies that question teachers and students about their attitudes and/or experiences, which has been the main approach of previous research in this domain. ELPaR, as conceived and undertaken in my investigation, constitutes the first instance in which active learner-researcher participation has been employed within the expert one-to-one teaching studio to unveil previously undocumented ways of conceiving ideas and working practically, and to feed a process of critical reflexion/reflection designed to inform the learning of others. ELPaR harnesses collaborative forms of instrument-in-hand academic researcher/professional practitioner knowledge creation through active researcher enactment of professional practices and individual/joint critical reflection. It creates possibilities to synthesise and blend ideas and practices that originate in multiple one-to-one teaching studios, filtered through the researcher's lived experiences and processes of critical reflexion/reflection, to create new, research-based, user-facing, practice-oriented, learner-centred pedagogical materials. That my ELPaR methodology has successfully engaged expert

practitioners in collaborative acts of knowledge creation, facilitating their contribution to music education research where they had previously shown little interest, and that it can be replicated, adapted, and applied across other pedagogical domains to create further new knowledge is, I believe, a major contribution to future research.

Concrete examples of previously undocumented ways of thinking, conceiving, and working that I unveiled during my time collaborating within the ‘secret garden’ include: The Pyramid Effect; The Corset; ffff, vvvv, ssss, zzzz; Headjoint Upside Down; Bottom Lip Whistle; Cranking the Car Vibrato; Snake Egg Mouth; and Elongated Sideburns. Many of these ideas became ‘tools’ in The Tone and Timbre Toolkit that offer new ways for learners to think, experiment, explore, experience, and discover for themselves. Some are mental images designed to prompt a physical action, some are intended to illustrate and improve understanding of the way that the body works and provide proprioceptive/kinaesthetic/sensorimotor feedback, some are intended to train automated physical abilities and responsive adaptability, and others are intended to identify and explain common problematic tendencies or issues; all are intended to improve artistic practices within the domain of flute playing and learning. What they all also have in common is that they are original, previously undocumented ideas or ways of thinking unveiled by my research within a number of ‘secret gardens’. Having unveiled and filtered expert practices through my ELPaR, I then translated them into novel, learner-friendly materials with the aim of universalising the ideas to create transparent and shared pedagogy out of the isolated and private nature of the ‘secret garden’, testing the application and efficacy of those ideas and materials both on myself and with a sample group of learners before now disseminating them.

In addition to these new ways of thinking and conceiving, this investigation has also transfigured current understanding of ideas and practices already in the public domain, by exploring them in greater detail than had been previously achieved, or by finding new, previously undocumented ways to understand or apply them. For example, the concept of a ‘harmonics-in-tune’ sound has been totally reimagined and recontextualised¹⁹¹. My investigation into the concept of a harmonics-in-tune sound in flute playing presents for the first time the idea that the player can manipulate the distribution of the harmonic partials in the tone in search of what I have called the ‘sweet spot’, where all the harmonics vibrate together at their most resonant, thereby maximising tone production and projection. My explanation of how the harmonic distribution within flute tone affects the timbre along a continuum, from

¹⁹¹ See Chapter 6.3.2.

unfocussed/hollow at one end of the spectrum to very focussed at the opposite end, and my having created ‘tools’ that might train physical and perceptual mechanisms for affecting these changes, is also new. Furthermore, the concept has been made more meaningful for performers by linking it for the first time to related issues such as dynamics and vibrato, thereby creating a more holistic understanding of the entangled web within which these issues operate.

These newly documented ideas and ways of working are the result of collaborative and reflexive/reflexive ELPaR activities, engaging with the six lenses of my theoretical framework, that coalesced through my work to become *The Entangled Web of Musical Learning*. *The Entangled Web of Musical Learning* is a new and original model, based on my lived experiences of ELPaR, for understanding and engaging with the learning stages and ‘ingredients’ involved in developing and embedding new skills as an instrumentalist. *The Entangled Web of Musical Learning* is built around four skill-building, generative know-what lenses, and two automation-embedding, intuition-empowering, know-how lenses, within an overarching process of critical reflexion/reflection, and is conceptualised to empower learner autonomy and agency via a personalised, practice-oriented, learner-centred learning journey.

Effective engagement with *The Entangled Web of Musical Learning* is also informed by my *Synthesis of Multimodal Musical Cognitive Processes and PAPAPI skills*, a novel schema that I posit to illustrate the simultaneously imbricating multimodal cognitive acts taking place, in-the-moment, when practising and performing, through combined mind, body, and situated cognition. Both my *synthesis* and my *entangled web* offer major new insights into how musical learning might be better understood and implemented. It is my hope that both frameworks prompt future academic discussion and lead to a greater understanding of the processes involved in instrumental/vocal pedagogy and a further refining of how this knowledge might be utilised to inform improved learning outcomes.

Within a specific focus on flute-related pedagogy, my research has unveiled a range of hidden ideas and practices that many learners, due to lack of access to the ‘secret garden’, may never otherwise experience. Furthermore, I have purposed the insights gained to be of practical use for both students and teachers of the flute within the wider flute-playing community. Presenting my findings as tools and inviting learners and teachers to utilise these tools to empower a journey of exploration, experimentation, and discovery is in line with current academic thinking about the power of learner-centred knowledge and skill creation, but curiously still absent from current flute-related pedagogical literature. The resulting Tone and Timbre Toolkit is a novel method text unlike any other for the flute in that it makes no absolute claims,

managing to be specific without being dogmatic, and offering ideas that learners can embrace or discard as they wish, empowering them to ‘Absorb what is useful, Discard what is not, Add what is uniquely your (their) own’ (Bruce Lee, Twitter, 2020).

In addition to *The Tone and Timbre Toolkit*, a second book, ‘*Moyse 24: A Toolkit*’, has also resulted from this inquiry. The various flute pedagogy-related publications of Marcel Moyse hold an almost legendary status within the flute playing community, and Moyse’s ‘24 Little Melodic Studies with Variations’ is a core text for the study of tone and colour-related issues within many expert performer-teacher’s one-to-one teaching studios. I chose to investigate how this text is used within the expert one-to-one teaching studio because Moyse gave no instructions on how to use each study, and in the absence of any instruction beyond the musical notation it is not clear to learners or teachers that are not direct descendants of Moyse’s school of teaching how or why these seemingly simple twenty-four studies could be of such importance.

For the many students who are not fortunate enough to study with an expert performer-teacher, or younger students who are aspiring to do so in the future, the effective use of this book can contribute to laying the foundations for an expressive use of tone and colour. In Chapter 1.2, I addressed some of the issues relating to social justice in music education and identified that access to the ‘secret garden’ is limited, privileged, competitive and expensive, with conservatoire training often perceived as elite and out of reach of many. Both of my books aim to widen access to expert performer-teacher knowledge and practice, for the benefit of both students and their teachers. My companion guide to each study in ‘*Moyse 24*’ is designed to empower learners to understand how and why experts value them so much and how their use can be maximised. ‘*Moyse 24: A Toolkit*’ not only unveils specific approaches to using each study from within the ‘secret garden’, but also draws on tools from *The Tone and Timbre Toolkit*, integrating the same approach to experimentation, exploration, and discovery, but applying it to Moyse’s materials. In this way the pedagogical principles established in *The Tone and Timbre Toolkit* are mapped onto an already existing core text, beginning the process of illuminating how my research findings might be applied beyond my own publications. At the same time, it lays the foundations for future work, authored by me and others, guided by similar pedagogical principles and emanating from a similar researcher/expert practitioner collaborative approach.

To conclude, I refer back to my original research questions. Firstly, I asked how flute players might be empowered to experiment and learn-through-doing in order to develop and embed

personalised, tone and timbre-related, artistic and technical skills that are embodied, enactive, automated, and intuitive. The most resounding endorsement of success in achieving this aim came from the feedback from the students who trialled *The Tone and Timbre Toolkit*. See Chapter 7 for their positive comments relating how they were enabled, empowered, motivated, and given agency in their learning by my research, often working autonomously without teacher input. In addition, I have been informed by various expert performer-teachers that they have adopted some of my tools in their teaching. For example, Morris told me that she had used some of my tools in her piccolo classes at the Royal Academy of Music, and Halnan told me that in addition to having three students trial the book, she had also been using specific tools with younger students for whom the book as a whole was too advanced, but who nevertheless were benefitting from her choosing specific tools and ideas from the book that she felt were appropriate.

Secondly, I asked how academics might actively collaborate with expert practitioners within the hidden domain of the one-to-one teaching studio to unveil new insights that might inform the creation of new, learner-centred, practice-oriented pedagogy. It is my reorienting of Nelson's rendering of PaR, to create ELPaR, that answers this question best. ELPaR is a methodology that not only opens the door to collaborative knowledge creation within the one-to-one teaching studio, but that through its active application has the power to create transformative experiences for the learner-researcher in addition to new and original pedagogical approaches and materials for the benefit of others.

The Tone and Timbre Toolkit and 'Moyses 24: A Toolkit' provide pedagogical approaches and materials designed to transform any learning environment that might uncritically prioritise the dissemination of teacher knowledge and experience over learner-centred exploration and discovery. These books embrace a research-based rationale for a way of working, based on my concept of *The Entangled Web of Musical Learning* and developing PAPAPI, in which 'perception, action, motivation, memory and thinking are all tightly woven together' (Claxton, 2021, p.113). By encouraging learners to develop know-what as a generative, ability-building mode of knowledge and skill discovery en route to embedding automated and intuitive know-how heuristics, my research, if embraced, can empower a new way of thinking and working for flute students and teachers, as well as inform developments in music pedagogy more widely.

As my investigation draws to a close, I must acknowledge some of its limitations as well as its successes. I am very aware that my research is particularly UK-based; from the literature

review, which foregrounds the texts most commonly utilised in UK educational settings, to the expert performer-teacher participants, all of whom are UK-based or have been taught by British teachers as part of their training, to the inevitable centrality that my position as participant-researcher investigating my own practice occupies in my inquiry. It is highly probable that a different researcher, utilising the same ELPaR methodology (which obviously would have not been possible prior to my envisaging and designing it) but working with different expert participants, would unveil different new insights, but I consider that to be a strength of my research; that my new and original way of working has the potential to go on unveiling new knowledge and insights if adopted by others is an exciting prospect.

I am also conscious of one big, outstanding issue; the use of subjective, opaque language and metaphor to describe timbre, and how misleading and open to misunderstanding, misinterpretation, and disagreement this language often is. Whilst I found some commonalities in how expert performer-teachers talk about tone and timbre, I did not feel that there was sufficient consistency that might enable me to offer a shared linguistic framework.

Having rejected the idea of utilising the metaphorical language of others, my position is that it is best when learners author their own personally meaningful metaphors and imagery prompted by authentic personal experience. From this standpoint, it would be inappropriate for me to dictate a new, standardised vocabulary of descriptive terminology, but what I have tried to do through my research is provide a framework for concepts to be more widely understandable. As evidenced in Chapters 5 and 6, I discovered a wide range of personalised and idiosyncratic expert performer-teacher metaphorical language and imagery to be alive and well in the one-to-one teaching studio, but through my ELPaR I sought to translate expert-practitioner metaphors into exercises and approaches that are accessible and can be meaningful to a wide range of students and teachers. It is through my research and the production of my toolkit that I have made this newly unveiled knowledge meaningful and useful for others.

Finally, it provided me with much satisfaction to stand back and see that my investigation had resulted in the unveiling of so many new insights, informing new ways of working and conceiving ideas, and that I had been empowered to create novel pedagogical materials, both theoretical and practical, that might be of use to both the community of practice represented by flute players, teachers, and students, and also to a wider community of academic researchers and music education practitioners. Believing the end of this investigation to be a starting point rather than a conclusion, I began to contemplate avenues for future research and to identify where my research interests might take me.

I am particularly keen to continue collaborating with expert performer-teachers to create more practice-oriented, learner-centred pedagogical materials. As a flute player, educator, and academic, I believe that my doctoral studies have set me on a path where I might be extremely productive in this area. I am also very interested in continuing to investigate ways that learners might maximise the impact of their one-to-one instrumental/vocal lessons. In a higher education environment where many music undergraduates do not receive a weekly one-to-one instrumental lesson, the imperative to empower student autonomy and agency so that they might maximise what they gain from the lessons that are on offer cannot be overstated. Information taken from the websites of four UK universities¹⁹² demonstrates that some music undergraduates might receive as little as twelve hours instrumental tuition per year, meaning that ‘instrumental students in higher music education are doing most of their instrumental learning away from their teachers, in practice sessions’ (Jørgensen, 2000, p.67). My future research efforts will undoubtedly focus on developing ways to further support this isolated practice.

Recent studies have investigated how increasing student self-regulation and autonomy can be of benefit (Evans & Bonneville-Roussy, 2016, Bonneville-Roussy, Hruska & Trower, 2020), and my ELPaR experiences have led me to a strong belief in the power of critical reflexion/reflection as an engine for student agency and autonomy. Simple acts such as recording lessons, listening back and making notes, and time-stamping key moments to make them easy to re-visit and listen to again, helped me to think and reflect in a more objective way than when I was actively involved in lessons. These simple acts enabled me to return, instrument-in-hand, to learning episodes that were important; to think, explore, and discover in greater depth, informing my ongoing ELPaR as I worked towards embedding my desired outcomes.

ELPaR, *The Entangled Web of Musical Learning*, and my *Synthesis of Multimodal Musical Cognitive Processes and PAPAPI skills*, are all novel theoretical models created by my research activities. Notwithstanding, they were not conceived as theoretical models, but rather as models

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- ¹⁹² **University of York (BA Music):** 15 hours annually during Year 1 and 2, rising to 18-20 hours annually in Year 3 for students specialising in performance.
 - **University of Huddersfield (BA Hons Music Performance):** up to 20 hours a year.
 - **University of Cardiff (BMus):** 12 hours annually during Year 1 and 2, rising to 24 hours annually in Year 3 for students opting for the ‘recital module’.
 - **Royal Holloway, University of London:** 13.5 hours – 22 hours, depending on Year and modules studied.

to actively engage with and apply to support the processes involved in instrumental learning, effective practice, and skill development

These models had a transformational effect on my practice as a performer, teacher, and academic, and significantly influenced the way that my investigation unfolded. They facilitated a way to see and understand the different elements and stages of effective instrumental learning, scaffolding understanding of my own experiences as I navigated different ways of working and understanding within multiple ‘secret gardens’, and within my own private practice studio.

I am aware that *The Entangled Web of Musical Learning* might not resonate with everyone, and future work to investigate its efficacy is of great interest to me. To investigate how it might be experienced by others, and working to develop and refine it, is, I believe, important work that might benefit many. How such a framework might contribute to designing new music education programmes and activities, that build critical reflexion/reflection skills and support effective artistic and technical skill and knowledge development, in the pursuit of empowering learner autonomy and agency as students seek to generate know-what to know-how, must surely be high on the agenda for any institution offering music education courses. It is my hope that all my ideas, findings, and research methods prompt future academic discussion and research activities, leading to greater understanding of the processes involved in instrumental/vocal pedagogy, increased learner agency, autonomy, and motivation, and that other academics are encouraged to engage actively and practically with expert practitioners in multiple domains, with the intention of furthering pedagogical knowledge and practice, and improving learner outcomes for all.

Chapter 9: Bibliography

- Abrahamson, D. (2020). Strawberry feel forever: Understanding metaphor as sensorimotor dynamics. *The Senses and Society*, 15(2), 216–238. <https://doi.org/10.1080/17458927.2020.1764742>
- Ackermann, B. J., Kenny, D. T., & Fortune, J. (2011). Incidence of injury and attitudes to injury management in skilled flute players. *Work*, 40(3), 255–259. <https://doi.org/10.3233/WOR-2011-1227>
- Adams, T. E., & Jones, S. H. (2008). Autoethnography Is Queer. In N. Denzin, Y. Lincoln, & L. Smith, *Handbook of Critical and Indigenous Methodologies* (pp. 373–390). SAGE Publications, Inc. <https://doi.org/10.4135/9781483385686.n18>
- Alain, C., & McDonald, K. L. (2007). Age-Related Differences in Neuromagnetic Brain Activity Underlying Concurrent Sound Perception. *The Journal of Neuroscience*, 27(6), 1308–1314. <https://doi.org/10.1523/JNEUROSCI.5433-06.2007>
- Auxier, B., & Anderson, M. (2021). *Social Media Use in 2021*. Pew Research Centre.
- Avison, D. E., Lau, F., Myers, M. D., & Nielsen, P. A. (1999). Action research. *Communications of the ACM*, 42(1), 94–97. <https://doi.org/10.1145/291469.291479>
- Aydoğmuş, N. (2022). Marcel Moyses'in 24 Petites Etudes Melodiques Avec Variations adlı metodunun ilk 10 etüdünün çalışma teknikleri bakımından incelenmesi [masterThesis, Trakya Üniversitesi Sosyal Bilimler Enstitüsü]. <http://dspace.trakya.edu.tr/xmlui/handle/trakya/8399>
- Bach, L. (2002). Chapter 7: Heuristic Scholar: Heuristic Inquiry and the Heuristic Scholar. *Counterpoints*, 183, 91–102.
- Balance Exercises on One leg stand. (n.d.). Retrieved 10 October 2021, from <http://www.physiowarzish.in/balance-exercises-one-leg-stand.html>
- Barczyk, K., Sipko, T., Demczuk-Włodarczyk, E., & Boczar, A. (2012). Anteroposterior Spinal Curvatures and Magnitude of Asymmetry in the Trunk in Musicians Playing the Violin Compared With Nonmusicians. *Journal of Manipulative and Physiological Therapeutics*, 35, 319–326. <https://doi.org/10.1016/j.jmpt.2012.04.013>

- Barrett, E., & Bolt, B. (Eds.). (2010). *Practice as research: Approaches to creative arts enquiry* (Paperback ed). Tauris.
- Barrett, L. (2018). The Evolution of Cognition: A 4E Perspective. In A. Newen, L. De Bruin, & S. Gallagher (Eds.), *The Oxford Handbook of 4E Cognition* (pp. 718–734). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780198735410.013.38>
- Barten, S. S. (1992). The Language of Musical Instruction. *Journal of Aesthetic Education*, 26(2), 53–61. <https://doi.org/10.2307/3332923>
- Barten, S. S. (1998). Speaking of Music: The Use of Motor-Affective Metaphors in Music Instruction. *Journal of Aesthetic Education*, 32(2), 89–97. <https://doi.org/10.2307/3333561>
- Bassey, M. (1999). *Case Study Research in Educational Settings*. Open University Press.
- Bastani Nezhad, A. (2012). Root tone: A holistic approach to tone pedagogy of western classical flute. *Australian Journal of Music Education*, 2, 33.
- Bastani Nezhad, A. (2013). Primal Sound and its Application in Tone Pedagogy of Western Classical Flute. *Malaysian Journal of Music*, 2(1), 10–29.
- Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. 18.
- Baxtresser, J. (1996). *Orchestral Excerpts For Flute*. Summit Records, Inc.
- Beer, R. D. (2000). Dynamical approaches to cognitive science. *Trends in Cognitive Sciences*, 4(3), 91–99. [https://doi.org/10.1016/S1364-6613\(99\)01440-0](https://doi.org/10.1016/S1364-6613(99)01440-0)
- Benade, A. H., & French, J. W. (1965). Analysis of the Flute Head Joint. *The Journal of the Acoustical Society of America*, 37(4), 679–691. <https://doi.org/10.1121/1.1909393>
- Bennett, D., & Stanberg, A. (2006). Musicians as teachers: Developing a positive view through collaborative learning partnerships. *International Journal of Music Education*, 24(3), 219–230. <https://doi.org/10.1177/0255761406069646>
- Bennett, W. (undated). [Http://www.williamsbennettflute.com](http://www.williamsbennettflute.com).
<http://www.williamsbennettflute.com/articles.html>
- BERA. (2019). *BERA Ethical Guidelines For Educational Research* (4th ed.). <https://www.bera.ac.uk/publication/ethical-guidelines-for-educational-research-2018-online#privacy>

- Bernold, P. (2016). *Philippe Bernold: Le souffle, le son - Exercices, extraits d'œuvres du répertoire destinés à maîtriser la colonne d'air de la flûte et acquérir un beau son*. G BILLAUDOT.
- Blackwell, J. (2022). "Mistakes are just information": A case study of a highly successful violin pedagogue. *International Journal of Music Education*, 40(1), 78–89.
<https://doi.org/10.1177/02557614211025770>
- Blakeman, E. (2005). *Taffanel: Genius of the Flute*. Oxford University Press.
- Bonneville-Roussy, A., Hruska, E., & Trower, H. (2020). Teaching Music to Support Students: How Autonomy-Supportive Music Teachers Increase Students' Well-Being. *Journal of Research in Music Education*, 68(1), 97–119. <https://doi.org/10.1177/0022429419897611>
- Bouriakov, D. (2013) Note Bending for flutists—Part 1. *Artis Music*.
<https://www.youtube.com/watch?v=5u3VYim6OcY>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Bresler, L. (2006). Ethnography, phenomenology and action research in music education. *Visions of Research in Music Education*, 8, 30–30.
- Breu, A. C. (2020). From Tweetstorm to Tweetorials: Threaded Tweets as a Tool for Medical Education and Knowledge Dissemination. *Seminars in Nephrology*, 40(3), 273–278.
<https://doi.org/10.1016/j.semnephrol.2020.04.005>
- Buchmann, M. (1987). Teaching Knowledge: The lights that teachers live by. *Oxford Review of Education*, 13(2), 151–164. <https://doi.org/10.1080/0305498870130203>
- Bull, A. (2019). *Class, Control, and Classical Music*. In *Class, Control, and Classical Music*. Oxford University Press.
<https://www.oxfordscholarship.com/view/10.1093/oso/9780190844356.001.0001/oso-9780190844356>
- Burwell, K. (2013). Apprenticeship in music: A contextual study for instrumental teaching and learning. *International Journal of Music Education*, 31(3), 276–291.
<https://doi.org/10.1177/0255761411434501>
- Burwell, K. (2018). Coaching and feedback in the exercise periods of advanced studio voice lessons. *Orfeu*, 3(1). <https://doi.org/10.5965/2525530403012018011>

- Burwell, K., Carey, G., & Bennett, D. (2019). Isolation in studio music teaching: The secret garden. *Arts and Humanities in Higher Education*, 18(4), 372–394.
<https://doi.org/10.1177/1474022217736581>
- Candau, Y., Françoise, J., Fdili Alaoui, S., & Schiphorst, T. (2017). Cultivating kinaesthetic awareness through interaction: Perspectives from somatic practices and embodied cognition (p. 8). <https://doi.org/10.1145/3077981.3078042>
- Carey, G., & Grant, C. (2014). Teachers of instruments, or teachers as instruments? From transfer to transformative approaches to one-to-one pedagogy. *Proceedings of the 20th International Seminar of the ISME Commission on the Education of the Professional Musician*, 42–54.
- Carey, G., & Grant, C. (2016). Enacting transformative pedagogy in the music studio: A case study of responsive, relational teaching. *Proceedings of the 21st International Seminar of the ISME Commission on the Education of the Professional Musician*.
https://www.academia.edu/25141042/Enacting_transformative_pedagogy_in_the_music_studio_A_case_study_of_responsive_relational_teaching
- Carey, G., Grant, C., McWilliam, E., & Taylor, P. (2013). One-to-one pedagogy: Developing a protocol for illuminating the nature of teaching in the conservatoire. *International Journal of Music Education*, 31(2), 148–159. <https://doi.org/10.1177/0255761413483077>
- Carey, G., Harrison, S., & Dwyer, R. (2017). Encouraging reflective practice in conservatoire students: A pathway to autonomous learning? *Music Education Research*, 19(1), 99–110.
<https://doi.org/10.1080/14613808.2016.1238060>
- Cazeaux, C. (2017). *Art, Research, Philosophy* (1st ed.). Routledge.
<https://doi.org/10.4324/9781315764610>
- Clark, A. (2013). Whatever next? Predictive brains, situated agents, and the future of cognitive science. *Behavioral and Brain Sciences*, 36(3), 181–204.
<https://doi.org/10.1017/S0140525X12000477>
- Claxton, G. (2021). *The Future of Teaching: And the Myths That Hold It Back*. Routledge.
<https://doi.org/10.4324/9781003080749>
- Coltman, J. W. (1973). Mouth resonance effects in the flute. *The Journal of the Acoustical Society of America*, 54(2), 417–420. <https://doi.org/10.1121/1.1913593>

- Cossette, I., Monaco, P., Aliverti, A., & Macklem, P. T. (2008). Chest wall dynamics and muscle recruitment during professional flute playing. *Respiratory Physiology & Neurobiology*, 160(2), 187–195. <https://doi.org/10.1016/j.resp.2007.09.009>
- Cossette, I., Sliwinski, P., & Macklem, P. T. (2000). Respiratory parameters during professional flute playing. *Respiration Physiology*, 121(1), 33–44. [https://doi.org/10.1016/S0034-5687\(00\)00111-0](https://doi.org/10.1016/S0034-5687(00)00111-0)
- Coulson, D., & Harvey, M. (2013). Scaffolding student reflection for experience-based learning: A framework. *Teaching in Higher Education*, 18(4), 401–413. <https://doi.org/10.1080/13562517.2012.752726>
- Covington, K. (2005). The Mind's Ear: I Hear Music and No One Is Performing. *College Music Symposium*, 45, 25–41.
- Cox, J. (2014). Encouraging and Training Conservatoire Students at Undergraduate and Taught-Postgraduate Level Towards Fluency in the Thought-Processes and Methods of Artistic Research. In S. D. Harrison (Ed.), *Research and Research Education in Music Performance and Pedagogy* (pp. 45–64). Springer Netherlands. https://doi.org/10.1007/978-94-007-7435-3_4
- Csikszentmihalyi, M. (2014). *Applications of Flow in Human Development and Education: The Collected Works of Mihaly Csikszentmihalyi*. Springer Netherlands. <https://doi.org/10.1007/978-94-017-9094-9>
- Csikszentmihalyi, M., Latter, P., & Weinkauff Duranso, C. (2017). Running Flow. *Human Kinetics*. CT rotation. (n.d.). The Chiropractic Health Centre. Retrieved 10 October 2021, from <https://www.chiropractor.co.za/wp-content/uploads/2016/07/CT-rotation.jpg>
- Debost, M. (2002). *The Simple Flute: From A-Z*. Oxford University Press, USA.
- Dib, N. E., & Sturme, P. (2007). The Effects of Verbal Instruction, Modeling, Rehearsal, and Feedback on Correct Posture During Flute Playing. *Behavior Modification*, 31(4), 382–388. <https://doi.org/10.1177/0145445506296798>
- Dick, R. (1986). *Tone Development Through Extended Techniques* (Rev. edition). Lauren Keiser Music Publishing.

- Dimon, T. (n.d.). Part Three: Exercises—The Body in Action. Retrieved 10 October 2021, from <https://www.alexandertechniqueprinciples.com/chapter03-exercises>
- Dogantan-Dack, M. (Ed.). (2015). *Artistic Practice as Research in Music: Theory, Criticism, Practice* (1 edition). Routledge.
- Dolan, E. L. (2013). *The orchestral revolution: Haydn and the technologies of timbre* (Jerwood Library Main collection 786.3 DOL). Cambridge University Press.
- Douglass, B. G., & Moustakas, C. (1985). Heuristic Inquiry: The Internal Search to Know. *Journal of Humanistic Psychology*, 25(3), 39–55. <https://doi.org/10.1177/0022167885253004>
- Duffie, B. (1989). James Galway Interview with Bruce Duffie.
<http://www.bruceduffie.com/galway.html>
- Duffy, C., & Broad, S. (2016). Practising Research, Playing with Knowledge. In *Artistic Practice as Research in Music: Theory, Criticism, Practice* (pp. 53–71). Routledge.
- Ebitz, D. (1988). Connoisseurship as Practice. *Artibus et Historiae*, 9(18), 207–212.
<https://doi.org/10.2307/1483344>
- Ely, M. C., & Van Deuren, A. E. (2009). *Wind Talk for Woodwinds: A Practical Guide to Understanding and Teaching Woodwind Instruments*. Oxford University Press.
<https://eds.b.ebscohost.com/eds/ebookviewer/ebook/bmxlYmtfXzM1OTk4OV9fQU41?sid=b2adb7e-966a-4121-9d10-171f7c736acf@sessionmgr101&vid=1&format=EB>
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100(3), 363.
- Esslin-Peard, M., Shorrocks, T., & Welch, G. F. (2016). Through the looking glass: The role of reflection in the musical maturation of classical and popular musicians at university.
https://www.academia.edu/35971571/Through_the_looking_glass_The_role_of_reflection_in_the_musical_maturation_of_classical_and_popular_musicians_at_university
- Evans, P., & Bonneville-Roussy, A. (2016). Self-determined motivation for practice in university music students. *Psychology of Music*, 44(5), 1095–1110.
<https://doi.org/10.1177/0305735615610926>

- Fiallos, A., Fiallos, C., & Figueroa, S. (2021). Tiktok and Education: Discovering Knowledge through Learning Videos. 2021 Eighth International Conference on eDemocracy & eGovernment (ICEDEG), 172–176. <https://doi.org/10.1109/ICEDEG52154.2021.9530988>
- Fitzgibbon, H. M. (Henry M. (1914). *The story of the flute*. London : Walter Scott Publishing Co. ; New York, C. Scribner's Sons. <http://archive.org/details/storyofflute1914fitz>
- Fletcher, N. H. (1975). Acoustical correlates of flute performance technique. *The Journal of the Acoustical Society of America*, 57(1), 233–237. <https://doi.org/10.1121/1.380430>
- Floyd, A. S. (1990). *Gilbert Legacy: Methods Exercises and Techniques for the Flutist*. Winzer Press.
- Gabrielsson, A., & Lindström Wik, S. (2003). Strong Experiences Related to Music: A descriptive System. <https://journals.sagepub.com/doi/abs/10.1177/102986490300700201>
- Galamian, I. (2013). *Principles of Violin Playing and Teaching*. Courier Corporation.
- Gallagher, S. (2015). How embodied cognition is being disembodied: *The Philosophers' Magazine*, 68, 96–102. <https://doi.org/10.5840/tpm20156819>
- Galway, J. (1998). *Flute (New edition edition)*. Kahn & Averill.
- Garner, B. (2003). *The Flute Embouchure*. *TBA Journal*, 5(1).
<https://bandworld.org/pdfs/FluteEmbGarner.pdf>
- Gartner, J. (1981). The vibrato, with particular consideration given to the situation of the flutist: Historical development, new physiological discoveries, and presentation ... of instruction. G. Bosse.
- Gaunt, H. (2006). *Student and teacher perceptions of one-to-one instrumental and vocal tuition in a conservatoire [PhD Thesis]*. Institute of Education, University of London.
- Gaunt, H. (2011). Understanding the one-to-one relationship in instrumental/vocal tuition in Higher Education: Comparing student and teacher perceptions. *British Journal of Music Education*, 28(2), 159–179. <https://doi.org/10.1017/S0265051711000052>
- Gaunt, H. (2016). Introduction to special issue on the reflective conservatoire. *Arts and Humanities in Higher Education*, 15, 269–275. <https://doi.org/10.1177/1474022216655512>
- Gaunt, H. (2017). 'Apprenticeship and Empowerment': The Role of One-to-One Lessons. In *Musicians in the Making: Pathways to Creative Performance*. Oxford University Press.

- Gaunt, H., & Westerlund, H. (2013). *Collaborative Learning in Higher Music Education* (1 edition). Ashgate.
- Gearheart, S. K. (2011). *Exploring the french flute school in North America: An examination of the pedagogical materials of Georges Barrère, Marcel Moyse, and René Le Roy*.
- Georgii-Hemming, E., Johansson, K., & Moberg, N. (2020). Reflection in higher music education: What, why, wherefore? *Music Education Research*, 22(3), 245–256.
<https://doi.org/10.1080/14613808.2020.1766006>
- Golf Fitness Training Programs at FitGolf Performance Centers. (2021). *Golf Fitness Training Programs at FitGolf Performance Centers*. <https://fitgolf.com/files/2013/06/3-200.png>
- Graf, P.-L. (1991). *Check-Up: 20 Basic Studies for Flautists*. Schott Music.
- Guillaumier, C. (2016). Reflection as creative process: Perspectives, challenges and practice. *Arts and Humanities in Higher Education*, 15, 353–363. <https://doi.org/10.1177/1474022216647381>
- Hakala, R. (2023). *Changing my sound: Developing the Tone Quality on the Flute with Embouchure Change*. <https://gupea.ub.gu.se/handle/2077/76850>
- Hallam, S., & Himonides, E. (2022). *The Power of Music: An Exploration of the Evidence*. Open Book Publishers.
- Hambrick, D. Z., Oswald, F. L., Altmann, E. M., Meinz, E. J., Gobet, F., & Campitelli, G. (2014). Deliberate practice: Is that all it takes to become an expert? *Intelligence*, 45, 34–45.
<https://doi.org/10.1016/j.intell.2013.04.001>
- Han, Y., & Lee, K. (2016). Detecting fingering of overblown flute sound using sparse feature learning. *EURASIP Journal on Audio, Speech, and Music Processing*, 2016(1), 2.
<https://doi.org/10.1186/s13636-015-0079-0>
- Harnum, J. (2014). *The Practice of Practice: How to Boost Your Music Skills*. Sol Ut Press.
- Healey, M., Flint, A., & Harrington, K. (2016). Engagement through partnership: Students as partners in learning and teaching in higher education. *International Journal for Academic Development*, 21(1), 84–86. <https://doi.org/10.1080/1360144X.2016.1124966>
- Healey, M. P., Vuori, T., & Hodgkinson, G. P. (2015). When Teams Agree While Disagreeing: Reflexion and Reflection in Shared Cognition. *Academy of Management Review*, 40(3), 399–422. <https://doi.org/10.5465/amr.2013.0154>

- Hofer, B. (2001). Personal Epistemology Research: Implications for Learning and Teaching. *Educ Psychol Rev*, 13, 353–383. <https://doi.org/10.1023/A:1011965830686>
- Hofer, B. (2008). Personal Epistemology and Culture. In M. S. Khine (Ed.), *Knowing, Knowledge and Beliefs: Epistemological Studies across Diverse Cultures* (pp. 3–22). Springer Netherlands. https://doi.org/10.1007/978-1-4020-6596-5_1
- Hofer, B., & Bendixen, L. (2012). Personal epistemology: Theory, research, and future directions. *APA Educational Psychology Handbook*, 1, 227–256. <https://doi.org/10.1037/13273-009>
- Hoffman, D. L., & Novak, T. P. (2009). Flow Online: Lessons Learned and Future Prospects. *Journal of Interactive Marketing*, 23(1), 23–34. <https://doi.org/10.1016/j.intmar.2008.10.003>
- Holm, C. P. (1997). Correctives to breathing hindrances in flute performance, with emphasis on the Alexander technique—ProQuest [The Southern Baptist Theological Seminary]. <https://www.proquest.com/openview/6fa9246dc924925c9ed29a5d0524fbfe/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Holmes, P. A. (2012). An exploration of musical communication through expressive use of timbre: The performer’s perspective. *Psychology of Music*, 40(3), 301–323. <https://doi.org/10.1177/0305735610388898>
- Holmgren, C. (2022). Empowering piano students of Western classical music: Challenging teaching and learning of musical interpretation in higher education. *Music Education Research*, 24(5), 574–587. <https://doi.org/10.1080/14613808.2022.2101632>
- Howard, V. A. (1982). *Artistry: The Work of Artists*. Hackett Publishing.
- <https://www.rcs.ac.uk/search/reflective/>. (2023, August 11). Royal Conservatoire of Scotland. <https://www.rcs.ac.uk/search/reflective/>
- Huber, A., Ingrisch, D., Kaufmann, T., Kretz, J., Schröder, G., & Zembylas, T. (2021). *Knowing in Performing: Artistic Research in Music and the Performing Arts* (Issue volume 132). transcript Verlag. <https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=nlebk&AN=2962371&authtype=shib&site=eds-live&scope=site>
- Huhtinen-Hildén, L., & Pitt, J. (2018). Taking a learner-centred approach to music education. [electronic resource]: *Pedagogical pathways* (Online ONLINE). Routledge.

- Hyry-Beihammer, E. K. (2010). Master-apprentice relation in music teaching. From a secret garden to a transparent modelling.
https://core.ac.uk/display/30917798?utm_source=pdf&utm_medium=banner&utm_campaign=pdf-decoration-v1
- Index Of Skiing: How To Ski Graphics. (n.d.). Retrieved 10 October 2021, from
https://www.seekpng.com/ipng/u2t4u2t4a9e6q8a9_index-of-skiing-how-to-ski-graphics-png/
- Jørgensen, H. (2000). Student learning in higher instrumental education: Who is responsible? *British Journal of Music Education*, 17(1), 67–77. <https://doi.org/10.1017/S0265051700000164>
- Junior, O. G. D. S. (2017). The Flute Inside-Out: Tracking Internal Movements in Flute Playing.
<https://www.semanticscholar.org/paper/The-Flute-Inside-Out%3A-Tracking-Internal-Movements-Junior/7f13f256b96769f9eb09ed48f8a2a7e41cb0a618>
- Juntunen, M.-L. (2014). Teacher educators' visions of pedagogical training within instrumental higher music education. A case in Finland. *British Journal of Music Education*, 31(2), 157–177.
<https://doi.org/10.1017/S0265051714000102>
- Kahneman, D. (2011). *Thinking, fast and slow* (Jerwood Library Main collection 150 KAH). Penguin.
- Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: A failure to disagree. *American Psychologist*, 64(6), 515–526. <https://doi.org/10.1037/a0016755>
- Kamler, B., & Thomson, P. (2014). *Pedagogies for supervision* (2nd ed.). Routledge.
<https://doi.org/10.4324/9781315813639>
- Kanno, M. (2001). Timbre as discourse: Contemporary performance practice on the violin.
<https://search.ebscohost.com/login.aspx?direct=true&db=edsble&AN=edsble.341111&authype=shib&site=eds-live&scope=site&authtype=ip,shib&custid=ns071427>
- Kanno, M. (2003). Thoughts on how to play in tune: Pitch and intonation. *Contemporary Music Review*, 22(1–2), 35–52. <https://doi.org/10.1080/0749446032000134733>
- Kara, Z. E., & Bulut, S. (2015a). Approaches and Teaching Methods in Breathing and Vibrato Technique in Flute Education. *Procedia - Social and Behavioral Sciences*, 186, 126–130.
<https://doi.org/10.1016/j.sbspro.2015.04.109>

- Kara, Z. E., & Bulut, S. (2015b). Approaches and Teaching Methods in Breathing and Vibrato Technique in Flute Education. *Procedia - Social and Behavioral Sciences*, 186, 126–130. <https://doi.org/10.1016/j.sbspro.2015.04.109>
- Kirchhoff, M. (2018). INTRODUCTION: Predictive brains and embodied, enactive cognition: an introduction to the special issue. *Synthese*, 195(6), 2355–2366.
- Klein, G. (1998). *Sources of Power: How People Make Decisions* (20th ed.). The MIT Press. <https://doi.org/10.2307/j.ctt1v2xt08>
- Kopiez, R. (2003). Intonation of Harmonic Intervals: Adaptability of Expert Musicians to Equal Temperament and Just Intonation. *Music Perception*, 20(4), 383–410. <https://doi.org/10.1525/mp.2003.20.4.383>
- Krampe, R.-T., & Ericsson, A. K. (1995). Deliberate practice and elite musical performance. <https://publishup.uni-potsdam.de/opus4-ubp/frontdoor/index/index/docId/26758>
- Lave, J., & Wenger, E. (1991, September 27). *Situated Learning: Legitimate Peripheral Participation*. Higher Education from Cambridge University Press; Cambridge University Press. <https://doi.org/10.1017/CBO9780511815355>
- Lee, S.-H., Carey, S., Dubey, R., & Matz, R. (2012). Intervention Program in College Instrumental Musicians, with Kinematics Analysis of Cello and Flute Playing: A Combined Program of Yogic Breathing and Muscle Strengthening-Flexibility Exercises. *Medical Problems of Performing Artists*, 27(2), 85–94. <https://doi.org/10.21091/mppa.2012.2016>
- Leech-Wilkinson, D. (2020). *Challenging Performance: Classical Music Performance Norms and How to Escape Them*.
- Leech-Wilkinson, D., & Prior, H. M. (2014). Heuristics for expressive performance. *Expressiveness in Music Performance: Empirical Approaches across Styles and Cultures*, 34–57.
- Lehmann, A. C., Sloboda, J. A., & Woody, R. H. (2007). *Psychology for musicians: Understanding and acquiring the skills*. Oxford University Press.
- Lennon, M., & Reed, G. (2012a). Instrumental and vocal teacher education: Competences, roles and curricula. *Music Education Research*, 14(3), 285–308. <https://doi.org/10.1080/14613808.2012.685462>

- Lennon, M., & Reed, G. (2012b). Instrumental and vocal teacher education: Competences, roles and curricula. *Music Education Research*, 14(3), 285–308.
<https://doi.org/10.1080/14613808.2012.685462>
- Lewis, L. (2015). English flute school performance aesthetics (1706-1972): A national style? [Ph.D., Goldsmiths College (University of London)]. <https://doi.org/10.25602/GOLD.00012581>
- Lieberman, M. D., Gilbert, D. T., Gaunt, R., & Trope, Y. (2002). Reflection and Reflexion: A Social Cognitive Neuroscience Approach to Attributional Inference.
- Lill, K. (2012). Comparative Theories of Visual Art and Music: May I Play You a Picture? *McNair Scholars Journal*, 16(1, Article 7). <http://scholarworks.gvsu.edu/mcnair/vol16/iss1/7>
- López-Íñiguez, G., & Bennett, D. (2020). A lifespan perspective on multi-professional musicians: Does music education prepare classical musicians for their careers? *Music Education Research*, 22(1), 1–14. <https://doi.org/10.1080/14613808.2019.1703925>
- Lortie, D. C. (1975). *Schoolteacher: A sociological study*. University of Chicago Press.
- Malinin, L. H. (2019). How Radical Is Embodied Creativity? Implications of 4E Approaches for Creativity Research and Teaching. *Frontiers in Psychology*, 10.
<https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02372>
- Malpass, D. W. (2013). A Historical Examination: The Role of Orchestral Repertoire in Flute Pedagogy. 103.
- Mandolini, R. (2020). Musical Heuristics: The Role of Fictions in the Process of Musical Creation and its Pedagogy THE CREATIVE COMPLEXITY. 1.
- Marrs, L. A. (2003). Integrating extended techniques into flute pedagogy: A resource guide for flutists, teachers and composers. 1.
- McAdams, S., Depalle, P., & Clarke, E. (2004). Analyzing musical sound. In *Empirical Musicology: Aims, methods, prospects*. Oxford University Press.
<https://doi.org/10.1093/acprof:oso/9780195167498.001.0001>
- Miles, M. B., Saldaña, J., & Huberman, A. M. (2014). *Qualitative data analysis: A methods sourcebook* [3rd ed.] (General Books GEN 300.723 MIL; 3rd ed.). Sage Publications.

- Miller, J., & Baker, D. (2007). Career orientation and pedagogical training: Conservatoire undergraduates' insights. *British Journal of Music Education*, 24(1), 5–19.
<https://doi.org/10.1017/S0265051706007194>
- MMS-Newsletter-v14-2004-05.pdf. (n.d.). Retrieved 8 June 2023, from <https://moysesociety.org/wp-content/uploads/2017/01/MMS-Newsletter-v14-2004-05.pdf>
- Morris, G. (1992). *Flute Technique* by Gareth Morris. Oxford University Press.
- Moyse, M. (1934). *On Sonority Art and Technique for Flute*. Alphonse Leduc.
- Moyse, M. (1973). *The Flute and Its Problems: Tone Development Through Interpretation for the Flute*. Muramatsu.
- Nakamura, J., & Csikszentmihalyi, M. (2014). The Concept of Flow. In M. Csikszentmihalyi, *Flow and the Foundations of Positive Psychology* (pp. 239–263). Springer Netherlands.
https://doi.org/10.1007/978-94-017-9088-8_16
- Nelson, R. (Ed.). (2013). *Practice as Research in the Arts: Principles, Protocols, Pedagogies, Resistances* (2013 edition). Palgrave Macmillan.
- Nelson, R. (2020). Artistic Research in Performance Through Collaboration (pp. 252–260). Palgrave Macmillan.
<https://eds.b.ebscohost.com/eds/ebookviewer/ebook/bmxlYmtfXzI1MjM5NDlfX0FO0?sid=89cd8331-a6d3-44b2-befb-0f58152d4d02@pdc-v-sessmgr02&vid=2&format=EK&rid=1>
- Nerland, M. (2007). One-to-one teaching as cultural practice: Two case studies from an academy of music. *Music Education Research*, 9(3), 399–416.
<https://doi.org/10.1080/14613800701587761>
- Noë, A. (2006). *Action in Perception* (Illustrated edition). MIT Press.
- Nyfenger, T. (1986). *Music And The Flute*. Thomas Nyfenger.
- Offermans, W. (1992). *For the contemporary flutist: Twelve studies for the flute with explanations in the supplement*. Zimmermann.
- Önal, M. A. (2022). A Research on the Use of the Alexander Technique in Flute Education Given in the Music Department and Music Teaching Departments of Faculties of Fine Arts in Turkey. *International Education Studies*, 15(4), 67. <https://doi.org/10.5539/ies.v15n4p67>

- Pace, I. (2019). Crispin | Search Results | Desiring Progress.
<https://ianpace.wordpress.com/?s=Crispin>
- Pearce, M., & Rohrmeier, M. (2012). Music Cognition and the Cognitive Sciences. *Topics in Cognitive Science*, 4(4), 468–484. <https://doi.org/10.1111/j.1756-8765.2012.01226.x>
- Pearson, E. M. (2000). What every Flute Teacher needs to know about the body: A handbook applying the principles of Body Mapping to Flute Pedagogy /. /paper/What-every-Flute-Teacher-needs-to-know-about-the-%3A-Pearson/6620b89cb56d31c108b6848dd6a2f0335fc19032
- Peled, A. (2018). The Cello Emoji Video Guide Amit Peled Cellist.
<https://www.youtube.com/watch?v=-4JR4jCIQdA>
- Perkins, R. (2013). Learning cultures and the conservatoire: An ethnographically-informed case study. *Music Education Research*, 15(2), 196–213. <https://doi.org/10.1080/14613808.2012.759551>
- Persson, R. S. (1994). Concert Musicians as Teachers: On Good Intentions Falling Short. *European Journal of High Ability*, 5(1), 79–91. <https://doi.org/10.1080/0937445940050108>
- Petsilas, P., Leigh, J., Brown, N., & Blackburn, C. (2019). Embodied reflection – exploring creative routes to teaching reflective practice within dance training. *Journal of Dance & Somatic Practices*, 11(2), 177–195. https://doi.org/10.1386/jdsp_00004_1
- Piston, W. (1955). *Orchestration*. W. W. Norton & Company.
- Pitts, S., & Davidson, J. (2000). Developing Effective Practise Strategies: Case studies of three young instrumentalists. *Music Education Research*, 2(1), 45–56.
<https://doi.org/10.1080/14613800050004422>
- Powell, A. (2002). *The Flute*. New Haven ; London : Yale University Press.
<http://archive.org/details/flute0000powe>
- Raposo, J. A. (2007). *Defining the British Flute School: A Study of British Flute Performance Practice 1890-1940*. [The University of British Columbia].
https://www.researchgate.net/publication/277848759_Defining_the_British_Flute_School_a_study_of_British_flute_performance_practice_1890-1940
- Reid, A., Costa, N. P. D., & Carrigan, J. (Eds.). (2020). *Creative Research in Music: Informed Practice, Innovation and Transcendence*. Routledge. <https://doi.org/10.4324/9780429278426>

- Renshaw, P. (2013). Collaborative learning: A catalyst for organizational development in higher music education. In *Collaborative learning in higher music education*, 237-246. Ashgate.
- Rockstro, R. S. (1928). *A treatise on the construction, the history and the practice of the flute* (2nd Edition). Rudall, Carte and Co.
- Roller, M. R. (2016, June 16). Ethical Considerations in Case-Centered Qualitative Research. *Research Design Review*. <https://researchdesignreview.com/2016/06/16/ethical-considerations-in-case-centered-qualitative-research/>
- Rumiantsev, T. W., Admiraal, W. F., & Rijst, R. M. van der. (2020). Conservatoire leaders' observations and perceptions on curriculum reform. *British Journal of Music Education*, 37(1), 29–41. <https://doi.org/10.1017/S0265051719000214>
- Ryle, G. (1945). Knowing How and Knowing That: The Presidential Address. *Proceedings of the Aristotelian Society*, 46, 1–16. JSTOR.
- Sataloff, R. T., & Trollinger, V. L. (2019). Respiratory Behaviors and Vocal Tract Issues in Wind Instrumentalists, Part 1. *Journal of Singing*, 76(2), 171–180.
- Sawyer, K. (2015). Group Flow and Group Genius. *NAMTA Journal*, 40(3), 29–52.
- Scharff, C, 2015. (n.d.). Retrieved 31 March 2020, from <https://cpb-eu-w2.wpmucdn.com/blogs.city.ac.uk/dist/f/849/files/2015/02/Equality-and-Diversity-in-Classical-Music-Report-2az518m.pdf>
- Schiavio, A., Nijs, L., van der Schyff, D., & Juntunen, M.-L. (2020). Editorial: Towards a Meaningful Instrumental Music Education. Methods, Perspectives, and Challenges. *Frontiers in Psychology*, 11. <https://www.frontiersin.org/article/10.3389/fpsyg.2020.625994>
- Schiavio, A., & van der Schyff, D. (2018). 4E Music Pedagogy and the Principles of Self-Organization. *Behavioral Sciences*, 8(8), 72. <https://doi.org/10.3390/bs8080072>
- Schlumpf, U. (2013). [Young musicians: Do they need prevention?]. *Praxis*, 102(4), 225–229. <https://doi.org/10.1024/1661-8157/a001191>
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.
- Schön, D. A. (1994). *The Reflective Practitioner: How Professionals Think in Action*. Taylor & Francis Group. <http://ebookcentral.proquest.com/lib/trinitylaban/detail.action?docID=4816972>

- Seashore, C. E. (2012). *Psychology of Music*. Dover Publications.
- <https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1149813&authtype=shib&site=eds-live&scope=site&authtype=ip,shib&custid=ns071427>
- Seed, R. (2016). *Mastering the Flute with William Bennett*. https://www.amazon.co.uk/Mastering-Flute-William-Bennett-Roderick/dp/025303163X/ref=sr_1_1?keywords=roderick+seed&qid=1571042887&sr=8-1
- Shaw, L. (2021). From student to professional: Recent conservatoire graduates' experiences of instrumental teaching. *British Journal of Music Education*, 38(1), 13–30.
<https://doi.org/10.1017/S0265051720000212>
- Shaw, L. (2022). *Facilitating the Transition from Student to Professional through Instrumental Teacher Education: A Case Study with Main Reference to the Royal Birmingham Conservatoire* [Doctoral, Birmingham City University]. <https://www.open-access.bcu.ac.uk/13415/>
- Smillie, G. J. (2021). *Pre-tertiary transitions in the performing arts: A qualitative study of the tensions and hierarchies in widening access to a conservatoire's cultural systems* [Text, Royal Conservatoire of Scotland and the University of St Andrews].
<https://ethos.bl.uk/ProcessOrderDetailsDirect.do?documentId=1&thesisTitle=Pre-tertiary+transitions+in+the+performing+arts+%3A+a+qualitative+study+of+the+tensions+and+hierarchies+in+widening+access+to+a+conservatoire%27s+cultural+systems&eprintId=833807>
- Soar, T. (1999). *Semi-supine in the Alexander Technique*—Alexander Technique Online.
<https://www.alexander-technique-online.com/defining-the-alexander-technique/the-lying-down-procedure/>
- Southworth, C. (2008). *The Expression of Colour*. Just Flutes. <https://www.justflutes.com/expression-of-colour-southworth-clare-product1142235.html>
- Sterelny, K. (2010). Minds: Extended or scaffolded? *Phenomenology and the Cognitive Sciences*, 9(4), 465–481. <https://doi.org/10.1007/s11097-010-9174-y>
- Sullivan, G. (2010). *Art Practice as Research: Inquiry in Visual Arts*. SAGE.

- Sutton, J. (2010). Exograms and Interdisciplinarity: History, the Extended Mind, and the Civilizing Process. In R. Menary (Ed.), *The Extended Mind* (pp. 189–225). The MIT Press.
<https://doi.org/10.7551/mitpress/9780262014038.003.0009>
- Swann, C., Piggott, D., Schweickle, M., & Vella, S. A. (2018). A Review of Scientific Progress in Flow in Sport and Exercise: Normal Science, Crisis, and a Progressive Shift. *Journal of Applied Sport Psychology*, 30(3), 249–271. <https://doi.org/10.1080/10413200.2018.1443525>
- Taffanel, P., & Gaubert, P. (1957). *17 Grands Exercices Journaliers De Mécanisme*. Alphonse Leduc.
- Taffanel, P., & Gaubert, P. (1958). *Méthode Complète de Flûte* (Jerwood Library Main collection 781.101 TAF). Leduc.
- The 4 Regions of the Scalp | Keeps. (n.d.). Retrieved 7 June 2023, from
<https://www.keeps.com/learn/diagnosis/parts-of-the-scalp>
- Thoma, B., Murray, H., Huang, S. Y. M., Milne, W. K., Martin, L. J., Bond, C. M., Mohindra, R., Chin, A., Yeh, C. H., Sanderson, W. B., & Chan, T. M. (2018). The impact of social media promotion with infographics and podcasts on research dissemination and readership. *Canadian Journal of Emergency Medicine*, 20(2), 300–306.
<https://doi.org/10.1017/cem.2017.394>
- Thompson, E., & Varela, F. J. (2001). Radical embodiment: Neural dynamics and consciousness. *Trends in Cognitive Sciences*, 5(10), 418–425. [https://doi.org/10.1016/S1364-6613\(00\)01750-2](https://doi.org/10.1016/S1364-6613(00)01750-2)
- Timbre. (n.d.). Oxford Reference. <https://doi.org/10.1093/oi/authority.20110803104638103>
- Toff, N. (1996). *The Flute Book: A Complete Guide for Students and Performers* (3 edition). OUP USA.
- Torres, E. H. (2012). *Flute Articulation Pedagogy: The Effect of Language-Specific Consonant Pronunciation on a Flutist's Articulation within the French and English Languages* [The Ohio State University].
https://etd.ohiolink.edu/pg_10?0::NO:10:P10_ACCESSION_NUM:osu1338398069
- Triantafyllaki, A. (2005). A Call for More Instrumental Music Teaching Research. *Music Education Research*, 7(3), 383–387.

- Valle, C. (2019, April 13). The Influence of Athlete Posture on Sports Performance. SimpliFaster.
<https://simplifaster.com/articles/athlete-posture-sports-performance/>
- van der Schyff, D., Schiavio, A., & Elliott, D. J. (2022). *Musical Bodies, Musical Minds: Enactive Cognitive Science and the Meaning of Human Musicality*. The MIT Press.
<https://doi.org/10.7551/mitpress/12117.001.0001>
- Walker, C. J. (2010). Experiencing flow: Is doing it together better than doing it alone? *The Journal of Positive Psychology*, 5(1), 3–11. <https://doi.org/10.1080/17439760903271116>
- Wallmark, Z., & Kendall, R. (2018). Describing sound: The cognitive linguistics of timbre.
<https://doi.org/10.1093/oxfordhb/9780190637224.013.14>
- Watson, R. A. (2011). *THE FLUTE PEDAGOGY OF TOSHIO TAKAHASHI*. University of Georgia, USA.
- Widholm, G., Linortner, R., Kausel, W., & Bertsch, M. (2001). Silver, gold and platinum—And the sound of the flute. 5.
- Wilcocks, G. R. (2006). Improving tone production on the flute with regards to embouchure, lip flexibility, vibrato and tone colour, as seen from a classical music perspective.
- Williamon, A. (2004). Strategies for individual practice. In A. Williamon (Ed.), *Musical Excellence: Strategies and Techniques to Enhance Performance* (p. 0). Oxford University Press.
<https://doi.org/10.1093/acprof:oso/9780198525356.003.0005>
- Williamon, A., Ginsborg, J., Perkins, R., & Waddell, G. (2021). *Performing Music Research: Methods in Music Education, Psychology, and Performance Science*. Oxford University Press. <https://doi.org/10.1093/oso/9780198714545.001.0001>
- Winn, R. (2008). *Melodies for Developing Tone and Interpretation: Essential Exercises*. Schott Musik International GmbH & Co KG.
- Wöllner, C., & Williamon, A. (2007). An exploratory study of the role of performance feedback and musical imagery in piano playing. *Research Studies in Music Education*, 29(1), 39–54.
<https://doi.org/10.1177/1321103X07087567>
- Wye, T. (1988). *Proper Flute Playing: A Companion to the Practice Books*. Novello & Co Ltd.
- Wye, T. (1993). *Marcel Moyse. An Extraordinary Man. A Musical Biography*. (1st ed edition). Winzer Press.

- Wye, T. (2015). *Wye Trevor Practice Books For The Flute Bks 1-6 New Edition BK/CD (Spi Pap/Co edition)*. Novello Publications.
- Yorita, R., & Clements, J. (2015). Using spectral analysis to evaluate flute tone quality. *Proceedings of Meetings on Acoustics*, 23(1), 035001. <https://doi.org/10.1121/2.0000054>
- Zendel, B. R., & Alain, C. (2009). Concurrent Sound Segregation Is Enhanced in Musicians. *Journal of Cognitive Neuroscience*, 21(8), 1488–1498. <https://doi.org/10.1162/jocn.2009.21140>