

Digital Ensemble Skills in a Laptop Orchestra

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ABSTRACT

The emerging practices and growing number of laptop orchestras associated with university music programs raise questions about the capability of the laptop orchestra to develop students' ensemble skills, and how skills development differs from other conventional music ensembles. This paper proposes a set of digital ensemble skills attributes for collaborative music making in a laptop orchestra. These attributes address the technological aspects of ensemble skills development and the musicological significance of the laptop orchestra for students' music learning. Moreover, the paper identifies the pedagogical content of the laptop orchestra, highlighting its alignment with the university music curriculum.

1. INTRODUCTION

Ensemble skills are an area of interest in music education, especially at the university level where students are required to participate in musical ensembles as a curricular or co-curricular activity. They learn collaboratively to coordinate their actions and expressions with remarkable precision and achieve the common musical goal for a quality ensemble performance. The focus of ensemble skills development differs depending on the type of music ensemble. For example, a handbell ensemble requires accuracy in timing and alignment in dynamics, while a choral ensemble aims for perfect intonation among singers [1].

The laptop orchestra (or laptop ensemble) is a type of music ensemble that emerged in the 2000s following the rapid advancement in computer technology that enabled individuals to perform music collaboratively. As an interdisciplinary performing group involving music, technology, media, and digital arts, the performance practices and development of musical skills required for laptop ensembles may differ greatly from those of other conventional music ensembles. The concepts and frameworks of technology-mediated musical skills identify the characteristics of music teaching and learning in the digital era, including, but not limited to, digital musicianship, technological pedagogical content knowledge (TPACK), and technological metaphors informing the use of digital music technologies [2]. This paper fills a gap in the literature by examining the

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technological ensemble skills involved in the laptop orchestra.

2. MUSICIANSHIP

Musicianship is the ability to behave musically [3]. Elliott defines musicianship as “any practice of music making and listening” [4], which refers to the field of knowledge and expertise in various creative practices of music making, such as performing, listening, improvising, conducting, and musical understanding. Several frameworks related to the notion of musicianship exist, comprehensive musicianship being the most widely used in music education at school. Comprehensive musicianship is a set of musical attributes, abilities, knowledge, and skills for practical music making [5] that includes the understanding and practice of musical elements; the interdisciplinary study of music theory, history, and performance; acting various roles as performer, conductor, listener, and analyst; the study of the literature and performance of quality music of diverse genres, cultures, and historical periods; and ensemble skills [5, 6, 7, 8, 9].

Brown proposes the concept of a sound musicianship that adopts a humanistic perspective on music [10]. It goes beyond the conventional framework of musicianship to adapt to changes in musical practices caused by globalization and technology, taking into consideration the broader physical and cultural contexts within which people make and experience music and embracing the broader demands of musical activities relevant to people living in a technoculture. These demands include the understanding and skills development of sound-making techniques, the understanding of music perception and contextualized aural awareness, the development of appropriate motor skills for gesture expression, and awareness of the role of music in the community and one's interrelatedness with others through music.

3. ENSEMBLE SKILLS

Ensemble skills encompass a range of musical and non-musical competencies that contribute to the collaborative quality performance of ensemble players, which can only be fostered by ensemble participation, but not individually or through coursework. By participating in a music ensemble, students expand their creativity and flexibility toward new musical ideas, get access to a wide repertoire of different ensemble settings, develop their instrumental and analytical skills, gain confidence and motivation to develop their theoretical and practical

music understanding, and cultivate their ability to express and convey emotions through music [11].

The core set of ensemble skills includes both technical proficiency in instrumental playing and non-technical competencies for musical communication among players. It involves the ability to listen to other players during ensemble playing, to use physical gestures or eye contact to communicate with other players, to adjust the dynamic nuance in one's part as the music goes, to make the corresponding adjustments from the conductor's cues, and to understand the musicological significance of the ensemble music [12, 13]. To become a good ensemble player, a student must acquire this multitude of skills comprehensively. These ensemble skills listed by practitioners and researchers are based on the performance practices of conventional music ensembles, such as orchestra, symphonic band, handbell ensemble, and choir. However, the list does not take into account the performance practices of electronic music ensembles or laptop orchestras.

4. CONCEPTUAL FRAMEWORK FOR TECHNOLOGY-MEDIATED MUSIC MAKING AND LEARNING

Despite the lack of literature on ensemble skills in a laptop orchestra, previous scholars provide some references in technology-mediated conceptual frameworks. For example, digital musicianship argues that musical competency in the digital age is not only located in the musician's interactions with the musical instrument, but also *in* the digital tools used for music making and communication [14, 15]. This framework is consistent with [16], who emphasizes the decisive roles of digital devices and aural awareness in shaping and directing the development of musicianship, and with the features of digital musicianship suggested by [17], including aural awareness, musical ability, and technical skills.

Technological pedagogical content knowledge (TPACK) is a framework based on Shulman's construct of pedagogical content knowledge (PCK) to include technology knowledge [18, 19, 20]. It identifies the set of knowledge that teachers need to deliver effective teaching in the school context. This framework is generally used to guide the curriculum development of pre-service and in-service teachers [21, 22]. In music education, the TPACK framework is used for technology-assisted assessment of music creativity, performance, and understanding, and as a model for integrating technology into the music classroom [23].

Brown's technological framework develops three perspectives on the use of digital music technologies: a tool, a medium, and a (musical) instrument [2]. As a tool, music software is typically viewed as an extension of human capacity to increase work efficiency. As a medium, music software is a transmission vector that converts experiences into new forms [24]. As a musical instrument, it provides both tangible and intangible

interfaces and controls for more innovative musical expression.

5. LAPTOP ORCHESTRA AS MUSIC CLASSROOM

In addition to the novel musical experiences it offers to performers and audiences, the laptop orchestra is often used as a music classroom for university-level students to explore the possibility for new sounds and synergy for innovative interdisciplinary performance. It provides a learning environment for students to apply their instrumental knowledge, develop their social skills, and experiment with new techniques.

Research findings on the educational aspects of the laptop orchestra reveal the development of musical and non-musical skills among participants, and how skills development differs from that of a conventional acoustic music ensemble [25]. The technological aspects of competency development emphasize that the laptop orchestra can foster students' ability to develop both musical and technological skills. More specifically, skills development includes listening to and performing music, developing musical and creative thinking, and engaging in their learning process [26]. Other benefits of participating in the laptop orchestra include promoting self-motivation, curiosity, and independent learning [27].

6. DIGITAL ENSEMBLE SKILLS

The literature review of the notion of musicianship draws attention to the strong correlation with its use in conventional music ensembles for collaborative music making. In addition, it demonstrates how the involvement of digital technology transforms conventional musicianship into a technological one. A comparison between the two types of musicianship training in music ensembles reveals different self-assessed achievements in the development of musical and non-musical competencies [25], including awareness of how sound behaves, the ability to use hardware and software for musical communication, and the ability to develop, modify, and become familiar with a digital musical instrument. This result suggests that the set of ensemble skills required in a laptop orchestra may not be the same as that of a conventional music ensemble.

The following set of attributes is proposed for the development of digital ensemble skills specific to the technological aspects of collaborative music making in a laptop orchestra. These attributes address not only the involvement of technology, but also the performance practices and interdisciplinary nature of the laptop orchestra as a specific type of music ensemble.

6.1 Prototyping Digital Instruments for Mass

The ability to design one's own digital musical instrument, including both hardware and software, is a key attribute of digital musicianship. Although digital instrumental design is usually a matter of personal style according to one's individual practice, in the context of

an ensemble setting, its implementation varies depending on its purpose and consideration for effective musical communication among the ensemble members. For example, the Stanford Laptop Orchestra (SLOrk) develops 20 multi-channel speaker arrays, each with six car speakers and amplifiers surrounded by a hemispherical wooden enclosure for an acoustical “point source” projecting sound to ensemble members and the audience [28].

6.2 Interdisciplinary Performance Practice

The laptop orchestra is an interdisciplinary practice that involves music, computer science, multimedia, and other disciplines. The formation of the laptop orchestra often consists of members from various disciplines who apply their discipline knowledge to a collaborative laptop orchestra performance [29]. Therefore, interdisciplinary knowledge and the understanding of the performance practices of the laptop orchestra are necessary to achieve the synergistic effect.

Compared with other historically informed ensemble practices, such as orchestra, symphonic band, and choir, as an emerging type of music ensemble, the performance practices of the laptop orchestra are rather new and sometimes unfamiliar to the participants. Depending on the characteristics of the members and their artistic goals, the performance practices of different laptop orchestras vary greatly. Understanding the interdisciplinarity of the laptop orchestra can help members to become familiar with the performance practices involved and thus achieve the musical and artistic objectives of the pieces and the laptop orchestra.

6.3 Sound Awareness

Listening to each other is one of the key and unique attributes of conventional ensemble skills, in which ensemble players are required to listen to other parts to adjust the dynamic nuance, syncopate the music progression, and reach the correct pitch and harmony. The same applies to the ensemble practices of the laptop orchestra, yet their parameters are not limited to the aforementioned musical elements. Additional parameters may include signals for analog synthesis, commands to trigger particular musical or sonic events, and non-standard pitches and rhythms that are not common in conventional music ensembles. It requires not only the musical awareness, but also the sonic and acoustic awareness of ensemble players.

6.4 Multiple Ensemble Roles

Although distinctive roles exist in conventional music ensembles to separate the functions of conductor, composer, and player, multiple roles are commonplace in a laptop orchestra. Very often, the artistic director or the laptop players compose for their own group, design instruments for other players, and experiment with new sounds with their own pieces. Other players may also act

as debuggers and critics to exchange musical and computer programming knowledge to improve the laptop pieces.

7. IMPLICATIONS

Although most current laptop orchestras are affiliated with university music departments as a co- or extra-curricular activity [30], they pursue the same pedagogical goal as other music ensembles at the university to develop students’ musical skills, including ensemble skills, instrumental skills, motor skills, and cognitive abilities [31]. Due to the interdisciplinary nature and unique performance practices of the laptop orchestra, an understanding of its technological ensemble skills may provide insights into curriculum alignment and subsequent planning in the music or computer science curriculum.

8. CONCLUSION

Although the number and emerging practices of laptop orchestras are growing, the pedagogical content and its alignment with the university music curriculum are rarely addressed. This paper proposes a set of digital ensemble skills attributes for collaborative music making in a laptop orchestra. These attributes not only identify the technological aspects of skills development for students, but also address the musicological significance of the laptop orchestra that fosters creativity and flexibility toward new musical ideas. Future research on this topic should include the development of a framework of digital ensemble skills for the laptop orchestra and/or broader coverage to include electronic and mixed music ensembles.

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