



**New In Media Stat Virtus Method for distance
training in vocal - instrumental chamber music**

Guidelines for training





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Introduction

These guidelines cater to ensemble music discipline teachers, delving into techniques, methods, criteria, resources, good practices, and case studies for distance learning and blended training. Tailored for European students in I and II level degree courses encompassing instrument, singing, vocal chamber music, chamber music, and music education, they aim to offer a detailed overview of the current state of remote teaching and training.

Initially, let's establish a definition of chamber music in contemporary European music conservatories. Broadly agreed upon, it involves a group of more than one musician, one player per part, and notably, without a conductor. Our project embraces a diverse repertoire, spanning from early music to contemporary genres such as jazz and pop.

The seismic impact of the 2020 pandemic compelled a reimagining of innovative methods that blend traditional experiences with new technologies. The ensuing crisis spurred an unprecedented opportunity to embark on a new season in chamber music teaching. Our analysis examines various didactic approaches pre, during, and post-pandemic. Can we integrate these distinct phases? To enrich the discourse, we draw not only from the experiences of the In Media Stat Virtus project's seven partners but also from an extensive survey involving over 300 educational operators at the European level.



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The findings reveal a series of challenges and needs that surfaced during the pandemic, offering concrete prospects beyond the emergency period. This search for alternative solutions represents a digital paradigm shift with vast application potential in the entire musical sector. Moreover, it serves as a significant catalyst for the exchange of best practices, particularly in integrating technologies into chamber music teaching, professional training, and performance.

The *Guidelines*¹ content is a culmination of analysis, research, development, and experimentation, outlining a new methodology for remote chamber music teaching.

Lockdown Experience

Before the imposition of lockdown restrictions, the landscape of chamber music teaching predominantly featured in-person sessions, occasionally supplemented by basic technologies. While the past century witnessed the integration of technologies in recording and transmitting musical activities, the pandemic-induced transition spotlighted a critical gap – the lack of familiarity with technologies related to (social) networking and the self-processing/output of musical products within the academic teaching realm.

The sudden and comprehensive shift to a pandemic-era teaching model necessitated a fundamental reevaluation of established learning activities. This transition brought to light several challenges, including limited access to music academies, the impossibility of conducting in-person music lessons, theoretical approaches to Networked Music Performance (NMP) primarily remaining



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theoretical due to synchronisation issues, a complete overhaul of didactic methods, and a pronounced difficulty in conducting online auditions, tests, and assessments.

The First Response to the Emergency

In response to the crisis, the musical and academic community swiftly embraced technological solutions, including the adoption of online lessons, streaming concerts, and experimental synchronous activities. A noteworthy initiative during the initial phase of the In Media Stat Virtus (IMSV) project involved combining a video conference platform with audio software. This innovative approach enabled both teachers and students to share audio tutorials, fostering a visual interaction and an attempt to recreate a collaborative musical environment, despite being physically apart.

The overarching goal of this project is not only to shape a new generation of classical musicians proficient in leveraging the vast opportunities offered by new technologies but also to motivate and guide teachers in utilising these technologies in a functional manner. This dual objective extends beyond the confines of teaching, encompassing an amplification of all teaching activities and the sharing of procedures and best practices.

Why Are We Talking About Opportunities?

Drawing from local and international experiences on how educators dealt with this new and unprecedented reality, where face-to-face meetings were not possible or significantly limited, the



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challenge is to design and propose effective procedures that teachers of chamber music can apply to enhance and expand their teaching activities. The IMSV work group has meticulously integrated the diverse experiences gained during the months of lockdown. The intention is not merely to address an initial emergency need but to transform it into a stimulus for the enhancement of digital skills, not only in teaching and training but also in the realm of performance.

The pandemic-induced challenges, when viewed through the lens of opportunity, prompt us to consider how these technologies could bring tangible benefits to end-users: students and, indeed, the entire music education system.

Focus on Specific Topics

The challenges that surfaced during the initiation of distance learning were predominantly of a technical nature. Teaching chamber music, inherently a sensitive and demanding process, presented an extraordinary challenge when conducted remotely. The meticulous preparation required for the performance of a specific composition is certainly feasible, involving historical contextualization, analytical scrutiny (harmonic analysis, formal analysis), and the coordination of dynamic, agogic, and articulatory markings.

Following this preparatory phase, individual practice becomes imperative. Academically, students are expected to navigate this phase independently, and digitization of sheet music emerges as a valuable tool. It facilitates the creation of a program archive tailored to a specific chamber group.



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The subsequent phase involves collective music-making, a process heavily reliant on meeting certain basic technical standards. These standards include a reliable internet connection, quality headphones, a suitably soundproofed space, a high-quality microphone, and an understanding of correct microphone placement. The quality of collaborative music-making hinges on these basic conditions and the proficiency in managing the relevant technology.

Undoubtedly, challenges arose during this phase as well. Problems such as inadequate technical equipment in classrooms, professors' limited technological expertise, students' suboptimal internet connections, unsuitable playing spaces, and a scarcity of instruments were encountered. An essential element in the performance of chamber music is not just the sound but also the visual communication among musicians. Therefore, ensuring a sufficiently good video transmission between musicians became imperative, necessitating quality cameras.

Overview of Teaching During the Pandemic

The consequences and challenges that teachers encountered during the Covid-19 pandemic, particularly in subjects heavily reliant on in-person attendance, are noteworthy. Some educators successfully adapted to online teaching, striving to maintain professional performance. However, this transition led to a significant increase in workload, prolonged use of virtual platforms, reduced rest time, and personal wear and tear from adapting classes to home environments.

Various studies conducted on music teachers in secondary education, particularly in publicly owned centres, during the pandemic revealed low digital competence in both knowledge and use of digital



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tools. Considering the academic training of the subjects, this coincides with the findings of the aforementioned studies.

The direct contact between the student and the teacher in face-to-face teaching is deemed a crucial element of musical education. This underscores the reluctance to embrace changes that modify traditional aspects of teaching in music conservatories, as there are strong advocates for in-person attendance.

In situations such as those experienced during the pandemic, where attendance was challenging, it would be beneficial for teacher training programs to view the transition to virtual teaching and learning not just as a response to an emergency but as an opportunity for change and further exploration of online practices.

Teachers at music schools and professional and superior conservatories grappled with family conciliation difficulties and motivation challenges stemming from remote teaching. This shift led to significant changes in the meticulous and necessary teaching of chamber music.

One of the primary consequences of the pandemic and consequent confinement on teaching due to Covid-19 was the rapid transformation of face-to-face classes into distance learning. This necessitated a swift adaptation of teaching-learning resources and methodologies. In learning chamber music, the direct contact between the teacher and the students holds great importance. It plays a crucial role in learning, improving, and developing instrumental technique, making the transition to remote learning even more challenging.



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However, undertaking activities without difficulties for teachers was one of the hurdles presented during confinement, similar to the challenges of smart working. The primary difficulty encountered by teachers was a lack of time. Suddenly having to rethink their methodologies, face technical problems, all while operating from the same space as their families, created a considerable challenge. For these reasons, family reconciliation became a difficulty that paralleled the lack of time.

This challenge of combining work with family life was notably significant for educators with children. The effort that teachers had to exert to adapt to the new teaching format using new computer programs during confinement must not be understated. Notably, a high percentage of teachers learned to handle these programs, indicating a predisposition and interest in adapting to the new and forced situation imposed by the pandemic.

In the case of music schools and conservatories, it would be advisable to institute training plans focused on the use of new technologies in the classroom. This would enable teachers to seamlessly integrate these technologies into their professional performance. Simultaneously, students, aspiring future educators, would naturally assume this teaching-learning process of a musical instrument through ICT.

Considering the lack of time, challenges with family reconciliation, the need to share material, and a reduced workspace, coupled with the varying technological skills among teachers and the adaptation to new teaching formats and evaluation methods, it is not surprising that the stress levels of our teachers ranged from medium to high.



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Direct visual contact between a student and teacher is crucial for learning a musical instrument. The teacher must correct various technical aspects of instrumental execution, including postures, body part positioning, instrument positioning, grips, arm and finger movements, breathing techniques, and relaxation. As such, it becomes necessary to innovate and develop training plans, methodologies, and specific resources that complement traditional teaching methods. These resources should assist teachers in developing and enhancing the learning of a musical instrument in a non-classroom setting. This evolution capitalises on the significant advancements in new technologies, fostering a high-quality online educational activity.

Some European institutions sought to organise chamber music sessions through platforms like Zoom. However, it is generally agreed that this did not entirely substitute for in-person experiences. During the Covid-19 period, various institutions had diverse experiences within the realm of chamber music. While some students struggled with social loneliness, others displayed initiative by inventing or discovering creative formats to communicate with each other. Platforms such as Zoom, YouTube, or WhatsApp facilitated musical collaboration. Surprisingly, the sonic results were often intriguing. The final concerts conducted via Zoom or YouTube drew substantial attendance, offering an interesting albeit not entirely comparable substitute for an in-person concert experience. It's worth noting that, due to frequent self-recording by students, many showcased remarkable progress. This practice has become a staple in the repertoire of students for individual practice.

In the latter part of the pandemic period, some Italian institutions started to launch projects like GARR (co-funded by the EU with the RAPPLab Strategic Project KA 203, led by HfMT Koeln/Germany



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and Conservatory Santa Cecilia, partners in that project). Institutions across Europe adopted various approaches:

- **Accompaniment (piano + solo instrument):**
 - Online sessions faced challenges related to latency and reduced sound quality.
 - Workarounds involved creating playalongs by répétiteurs, enabling students to continue playing solo pieces with piano accompaniment.
 - While this facilitated solo practice, it did not entirely replace the artistic exchange and joint music-making that in-person accompaniment allows.
- **Ensemble/Orchestra/Choir/Conducting/Composition:**
 - Teaching sessions that emphasised interpretive comparisons, score study, and creating arrangements proved effective.
 - Playing in various chamber and orchestral formations and choir rehearsals faced challenges.
 - Improvisation formats, where audio tracks were exchanged online, worked well.
 - Composition lessons proceeded without major issues.

This expanded overview of teaching during the pandemic underscores the nuanced experiences of educators, students, and institutions alike. It emphasises the resilience, adaptability, and creativity displayed in the face of unprecedented challenges, while also acknowledging the limitations and obstacles encountered in the pursuit of maintaining musical education.



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Part 1 - Introduction to Innovative Methodologies for Distance Learning in Chamber Music Education

In the dynamic landscape of music education, the pursuit of effective distance learning methodologies remains a constant endeavour across various pedagogical levels. The continuous evolution of educational technology has ushered in platforms that facilitate online delivery of music courses, spanning both undergraduate and graduate studies in conservatories of music (EQF 6 and 7). This exploration delves into innovative techniques developed within the framework of the In Media Stat Virtus project (IMSV), specifically focusing on network-based solutions tailored for chamber music education.

1.1 Network-Based Distance Learning for Chamber Music

The realm of distance learning stands as an enduring subject of research and development within music pedagogy. The transformative impact of educational technology has not only opened avenues for virtual learning but has also sparked inventive approaches to the teaching of chamber music at both undergraduate and advanced levels. Within the distinguished methodologies cultivated at IMSV, a spotlight shines on network-based solutions, strategically designed to enrich the training experiences of aspiring vocal coaches, piano accompanists, and continuo players.

Acknowledging the diverse needs of pre-professional (undergraduate) and professional (graduate and post-diploma) training, IMSV has honed two distinctive methods: Partial Playback and



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Networked Music Performance (NMP). As we embark on an exploration of these methodologies, it becomes evident that vocal coaches and continuo players engaging with these innovative techniques must be equipped with a modest set of tools and materials. This minimal ensemble allows them to record and seamlessly transmit sound signals through internet networking, fostering a rich and immersive learning environment for students.

The symbiotic relationship between technology and music education unfolds as we dissect the nuanced facets of these two prominent IMSV-developed methods. In the ensuing sections, we will navigate through the intricacies of Partial Playback and Networked Music Performance, elucidating their applications, impact, and the transformative journey they offer to both mentors and learners in the realm of chamber music. This exposition aims to provide a comprehensive understanding of the methodologies that underscore the commitment to excellence in distance learning within the music conservatory setting.

1.2 Partial Playback

1.2.1 Recording of Tutorials Under the Guidance of the Professor

In the initial phase of this innovative approach, instructors embark on the creation of a comprehensive tutorial. Through meticulous guidance from the professor, a video recording captures the essence of each musical part, drawing from the wealth of experience within their own musical pool.



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The collaborative effort with an audio technician ensures that the recordings possess a sound quality of utmost excellence. These recordings are then expertly superimposed on a multitrack file, skilfully excluding the section designated for student practice. To enhance the learning experience, the option to adjust the speed is made available, facilitating a more effective initial study phase for students. In instances where instrumental introductions or extended pauses pose challenges, a low-volume sound guide is ingeniously integrated.

Expanding on these foundations, various innovative solutions continue to be explored, tailored to meet the diverse needs encountered during student practice sessions.

1.2.2 Deliver Tutorials to Students and Explain How to Use Them

Transitioning into the second stage, students receive these meticulously crafted tutorials. This immersive experience allows them to delve into practising with heightened awareness, fostering a deeper understanding of the musical piece in a truly chamber-style context.

Opting for video recordings, rather than solely relying on audio, proves to be a strategic choice. Students, in their performances, not only observe breaths, fingerings, and bowings but also gain a clearer understanding of rests, entries, and the intricate movements of the body. This visual aid acts as a guiding force, enhancing the students' overall performance.

In the preparatory phase, tutorials serve a multifaceted purpose. Students progress through four distinct phases:



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1. **Listening and studying the version of the tutorial with its single part:** assimilating the nuances while practising concurrently.
2. **Listening to and studying the complete version of the tutorial with all parts:** grasping the piece in its entirety, practising alongside.
3. **Performing one's own part individually using the tutorial excluding it:** achieving autonomy in their performance.
4. **Realising their recording and elaborating the final product:** guided by the professor throughout the academic year, they embark on producing their recordings, replacing the initially prepared tutorial track.

Collaborating with audio technicians ensures that these student-produced tracks undergo the same level of quality processing as the initial tutorials. The resulting audio-video products become tangible representations of the training process, integrating the musical skills acquired over the course. In an era where audio-video support holds paramount importance, particularly for young musicians navigating auditions and placements, this experience equips students with invaluable skills.

1.2.3 Equipment and Costs

One of the distinctive features of this experimentation is its commitment to facilitating online training processes without burdening professors and students with additional equipment costs. The following items constitute the minimal toolkit for both professors and students:



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- audio headphones or earphones;
- smartphone or another device to practise on the delivered multitrack file;
- smartphone and other devices (tablet, PC, etc.) to simultaneously listen, view the basic track, and record a video.

Moreover, the material created is envisioned to be freely accessible. An interactive repository, such as PR4 or IMSLP¹ for score only, or a dedicated YouTube channel, becomes the platform for sharing. Professors and professionals from various conservatories, both in Italy and abroad, are encouraged to freely implement and contribute to this growing repository.

This emphasis on accessibility, coupled with the creative use of available tools, paves the way for a more inclusive and enriched approach to chamber music education in the digital age.

1.3 Miskolc Music Academy: Navigating the Digital Landscape

Embarking on a journey at the Miskolc Music Academy unveils a stark reality—today's university students are deeply entrenched in the realm of digital technology, a trend set to continue with the upcoming generation born into a world seamlessly managing digital devices. In Hungary, forward-thinking music schools have instituted experimental classes where students, including 5-6-year-olds in preparatory classes, engage with laptops. These young minds compose and record simpler

¹ <https://imslp.org/>



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melodic dictations tailored to their age group, allowing teachers to simultaneously assess and correct the work of 8-10 individuals.

Recognizing the evident fusion of technology and education, the Miskolc Music Academy seeks to integrate digital opportunities into university-level instruction. While digital tools have historically served as supplementary aids for tasks such as choral part preparation and repetition, the pandemic-induced lockdown compelled a profound reliance on these technologies. The imperative was clear: keep education alive, necessitating a bold exploration of diverse methods.

This transition, however, laid bare a digital divide—unequal access to appropriate technical equipment, encompassing both hardware and software, and varying levels of proficiency in handling them. Addressing this gap becomes paramount for the future, prompting a call to acquire necessary tools and impart essential skills systematically, perhaps within the confines of the academic timetable. The institution has already set a precedent with sheet music composing programs.

Yet, beyond the technical infrastructure, a more intricate challenge persists. The digital space, while enabling continued education, struggles to replicate the vibrancy of "live classes," personalised guidance, and the unique ambiance of individualised advice. The essence of personal presence, the magic of a live concert—these remain elusive in the digital realm. Hence, the institution's mission extends beyond technological provisions to safeguarding the irreplaceable human touch, striving relentlessly toward the possibility of reclaiming the authentic experiences associated with in-person education.



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1.4 Online Elements within the Discipline of Music Theory during the Pandemic

This section takes into account one of the institutions involved in the IMSV project, namely the National Gheorghe Dima Music Academy in Cluj-Napoca, Romania. The Theory-Solfeggio-Dictation discipline taught in this school holds a crucial position in fostering a seamless connection between musical text and sound configuration. This discipline, characterised by its high level of complexity, emphasises listening and writing skills, including inner musical hearing. It caters to both instrumental students and those specialising in Singing, Conducting, Composition, Musicology, or students preparing for a teaching career.

The overarching goal of the Theory-Solfeggio-Dictation discipline is twofold: the acquisition of musical grammar, encompassing terminology, notions, and relationships, and the development of reading abilities both horizontally and vertically. Additionally, it aims to instil a culture of ear training, foster the evolution of musical thinking, and deepen knowledge of diverse musical styles.

This discipline unfolds across two interconnected branches: the theoretical course and the practical seminar. The theoretical course introduces students to the elements of general music theory, covering the history of tonal and rhythmic systems. In contrast, the practical seminar focuses on honing writing and musical reading skills.



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With the abrupt onset of the pandemic and subsequent school closures, the Academy swiftly recognized the imperative of sustaining its teaching activities. To this end, several measures were implemented.

- **Integration of Moodle platform** - The Academy adopted the Moodle platform into its educational processes. Familiar to the teaching staff due to its prior use in distance education, the platform facilitated the creation of user accounts for all students, organised by year of study. Each teacher gained access to specific subjects, enabling the upload of teaching materials, audio examples, scores, presentations, explanations, and assignments. This consolidation streamlined the teaching process, offering insights into students' activities.
 - **Procurement of audio-video platforms** - Accounts for audio-video platforms such as Skype and Zoom were purchased. Zoom emerged as the preferred platform for its capacity to accommodate a large number of users, reasonable video quality, and progressively improving audio quality. Notably, Zoom could reproduce undistorted, unmodulated sound even amid increased background noise.
 - **Acquisition of audio-video equipment** - Urgent acquisitions of computers, audio or video cards, high-performance video cameras, and microphones bolstered the teachers' inventory. These resources were crucial for conducting effective online lessons.
 - **Subscription to international databases** - The Academy invested in subscriptions to international databases. This initiative aimed to enhance access to vital bibliographic sources, facilitating the research endeavours of both students and teaching staff.
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In adapting to the virtual landscape, the theoretical segment of the discipline successfully transitioned to the Zoom platform. This transition occurred seamlessly, maintaining a natural continuity between the online and on-site versions.

However, challenges arose in executing the applied aspects, particularly in the practical components of dictation and solfeggio. The subsequent discussion delves into these challenges and the strategies employed to navigate them successfully.

1.5 Challenges in the Practical Components

1.5.1 Ear Training and Dictation

The dictation component initially encountered challenges, prompting a phased approach to its implementation. Initially relying on pre-recorded dictations, students received audio samples and recorded dictations, attempting to transcribe what they heard. While this approach offered flexibility to students in terms of re-recording until satisfied, it introduced uncertainties about the accuracy of submissions.

Recognizing the limitations, a transition to live dictation on the Zoom platform followed. This live format aimed to bridge the gap, providing a more accurate representation of students' capabilities. However, intermediate-level students faced hurdles, requiring continuous assistance from the teaching staff. The platform's inherent limitations hindered real-time correction, affecting the progress of students at this level.



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The procurement of essential audio equipment, including condenser microphones, mixers, and sound cards, was a vital step in ensuring the faithful transmission of musical sound during live dictations on Zoom. This investment, coupled with a robust internet connection, considerably improved the quality of the dictation process for advanced students.

1.5.2 Solfeggio

Solfeggio, a practice exclusively derived from international and national repertoire materials, underwent a series of adaptations to meet the demands of remote learning. Initially, one-voice solfeggio assignments were submitted in recorded form. Students prepared assigned *sofeggio*, recording audio versions, and submitting them to teachers. This method ensured that students submitted refined versions, having had the opportunity to re-record until satisfied.

While this approach intensified individual study, it introduced a challenge for teachers in providing detailed feedback to each student. Listening to a multitude of recorded *sofeggio* required a meticulous response for effective guidance. Despite these challenges, the commitment of students to multiple iterations in pursuit of an ideal submission showcased a heightened dedication to the subject matter.

In response to the limitations of written feedback, a shift towards live online solfeggio sessions on Zoom ensued. This adjustment allowed teachers to offer real-time corrections, enhancing the learning experience. However, the inherent delay in Zoom connections, approximately 1-2 seconds,



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presented challenges. The delay interfered with the correction process, causing confusion among students attempting to align with real-time feedback.

1.5.3 Polyphonic Solfeggio

Polyphonic solfeggio, aligning closely with the collaborative nature of chamber music, presented unique challenges during the pandemic. Initially explored in pre-recorded form, students engaged with recordings of one voice provided by the teacher. Students then recorded themselves singing along with this pre-recorded voice, establishing tempo through pre-recorded beats. This method proved effective in its initial stages.

However, the potential for a more seamless execution of polyphonic solfeggio emerged with the suggestion of utilising electronic platforms or software that minimised delays. Jamulus, a platform recognized for its minimal audio latency, offered an alternative for simultaneous singing, rehearsals, and even solfeggio classes and exams. Proposals for refining this aspect of the discipline included transitioning from pre-recorded material to real-time collaboration on platforms like Jamulus.

1.5.4. In Conclusion

The challenges faced by the Theory-Solfeggio-Dictation discipline during the pandemic necessitated innovative approaches and adaptability. While the transition to online platforms introduced complexities, the commitment of both students and teachers facilitated an effective continuation of the learning process. As the discipline navigated uncharted territories, the exploration of diverse



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methodologies and technologies proved instrumental in sustaining a vibrant and engaged musical education.

1.6. Ear Training: Adapting Dictation and Solfeggio to Online Learning

In the realm of music education at the National Gheorghe Dima Music Academy in Cluj-Napoca, Romania, the discipline of Ear Training faced significant challenges during the pandemic. Dictation and Solfeggio, integral components of this discipline, underwent transformations as the Academy sought innovative ways to engage students in a virtual environment.

1.6.1 Dictation: Transitioning from Pre-Recorded to Live on Zoom

Initially, dictation relied on pre-recorded samples. The teaching staff would send audio materials and dictations to students, prompting them to transcribe what they heard. However, this approach posed challenges. The lack of real-time supervision created uncertainties about the integrity of submissions, and teachers couldn't intervene during the writing process. Recognizing these limitations, the Academy gradually shifted to live dictation on the Zoom platform.

To ensure optimal sound transmission, essential audio equipment like condenser microphones, mixers, and sound cards were acquired. Despite working seamlessly for advanced students, intermediate-level students encountered difficulties. They needed constant assistance, including minor corrections of notes or rhythm, which proved challenging on Zoom. Consequently, the



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progress of intermediate-level students suffered due to the inability to continuously monitor their work.

1.6.2 Solfeggio: from Recorded Solfeggio to Real-Time Corrections on Zoom

Solfeggio at the Academy drew exclusively from international and national repertoire materials. Initially, one-voice solfeggio assignments were submitted in recorded form. Students prepared *sofeggio* weekly, recording them with their mobile phones and submitting them via email. This method ensured intensive study, as students refined their submissions through multiple re-recordings. However, providing detailed feedback proved cumbersome for teachers, who had to meticulously respond to numerous recorded *sofeggio*.

This practice was later abandoned in favour of exclusively online solfeggio sessions on Zoom. Real-time corrections became possible, enhancing the learning experience. Nevertheless, the Zoom connection's inherent delay (approximately 1-2 seconds) presented challenges, affecting the correction process, and causing confusion for students aligning with real-time feedback.

1.6.3 Polyphonic Solfeggio: Navigating Challenges for Collaborative Learning

Polyphonic solfeggio, closely aligned with the collaborative nature of chamber music, presented unique challenges during the pandemic. In the initial stage, pre-recorded material was used, where the teacher recorded one voice, and students sang along, establishing tempo through pre-recorded beats. This method was effective but highlighted the need for more advanced software.



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The Academy proposed performing polyphonic solfeggio on platforms like Jamulus, known for minimal audio latency. The goal was to facilitate simultaneous singing, rehearsals, and even Solfeggio classes and exams without delays. Transitioning to such platforms could address the challenges faced during the pandemic, ensuring a more seamless execution of polyphonic solfeggio.

1.6.4 Leveraging Online Teaching Systems and Tools for Musical Learning

As the Academy embraced online teaching systems, recordings emerged as an initial step. Acoustic instrument recordings in two voices became a fundamental element. Suggestions for program use encompassed compatibility with various operating systems, including Windows, Apple, and potentially Linux.

Beyond program usage, pre-established considerations for both teachers and students aimed to maximise resource utilisation. Identifying potentialities and limitations, especially in higher education, became crucial. While acknowledging that certain aspects of musical learning necessitate face-to-face practice, the proposal positioned online tools as initial or substitute methods during specific periods.

1.6.5 Integration of Technology into Music Education: Looking beyond Traditional Tools

Traditionally, musical education relied on instruments like the metronome or tuner. However, the pandemic prompted a reevaluation, expanding the toolkit to include recordings, self-recordings, along with audio and video files. While recognizing the irreplaceable value of face-to-face practice



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in higher musical education, the proposal positioned online tools as supplemental or introductory aids.

Analysing sound recordings emerged as a pivotal aspect of student learning. Reviewing recorded work facilitated understanding of sound, rhythm, phrasing, and interpretative elements. For teachers, log files became analytical tools to track student progress and encourage the seamless integration of technology into the daily fabric of music teaching.

In conclusion, the challenges faced by Ear Training during the pandemic prompted a reimagining of traditional methodologies. Embracing technology, adapting to new platforms, and exploring innovative approaches became essential in ensuring the continuity of a vibrant and effective music education.

Embracing the realm of recording work by tracks entails a meticulous consideration of various elements to ensure an optimal learning experience. Here are some starting tips that instructors and students should contemplate for the proficient use of this methodology:

- **Previous tuning note** - In the same way that face-to-face rehearsals involve specifying or sounding instruments until a tuning agreement is reached, recording for practice or as a foundation for subsequent tracks requires a prior tuning note. Varying references in different exercises might be beneficial. Acknowledging that tuning can be influenced by external factors like temperature or humidity, proposing slightly different tunings (ranging from A to 440 Hz up to 444 Hz) in different exercises can be explored. Teachers can



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experiment and adapt this proposal based on their daily reality, using acoustic instruments, or adjusting the pitch in MIDI instruments.

- **Initial tempo-beats** - Essential in works where two instruments start simultaneously or when there isn't sufficient time to assimilate the established tempo. Including initial melodies recorded at different tempi facilitates practice, progressing from comfortable or easy speeds to the definitive ones, incorporating necessary or advisable intermediate tempi.
 - **Flexions in pulse or phrasing work** - While challenging in this context, incorporating variations in pulse or phrasing can enhance a student's awareness of listening, intuition, precision in attacks, endings, rhythm, and even the quality of sound. While not a complete replacement for face-to-face work, it can contribute to improved attention.
 - **External microphone** - Utilising an external microphone and, if possible, a sound card based on the computer's capabilities enhances the quality of recordings. This ensures a more accurate representation of the sound being produced, contributing to a more nuanced and authentic practice experience.
 - **External speakers** - When listening to the track being played, computer speakers often lack the power or quality necessary for an immersive experience. For recording purposes, opting for headphones is usually the preferred choice, allowing the musician to hear and play over the recorded music without losing clarity or perception.
 - **Methodology in a triple way** - Exploring the methodology in multiple ways, such as Minus One, recording of two or more voices by the same musician, and recording of two or more voices by different musicians, adds versatility to the learning process. Each approach offers unique insights and challenges, contributing to a more well-rounded musical education.
-



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- **Free programs** - Leveraging free programs like Reaper, FLStudio, Audacity, and Acidstudio provides accessible tools for students and instructors. These platforms offer a range of features for recording, editing, and producing tracks, allowing users to experiment and refine their skills without significant financial investment.

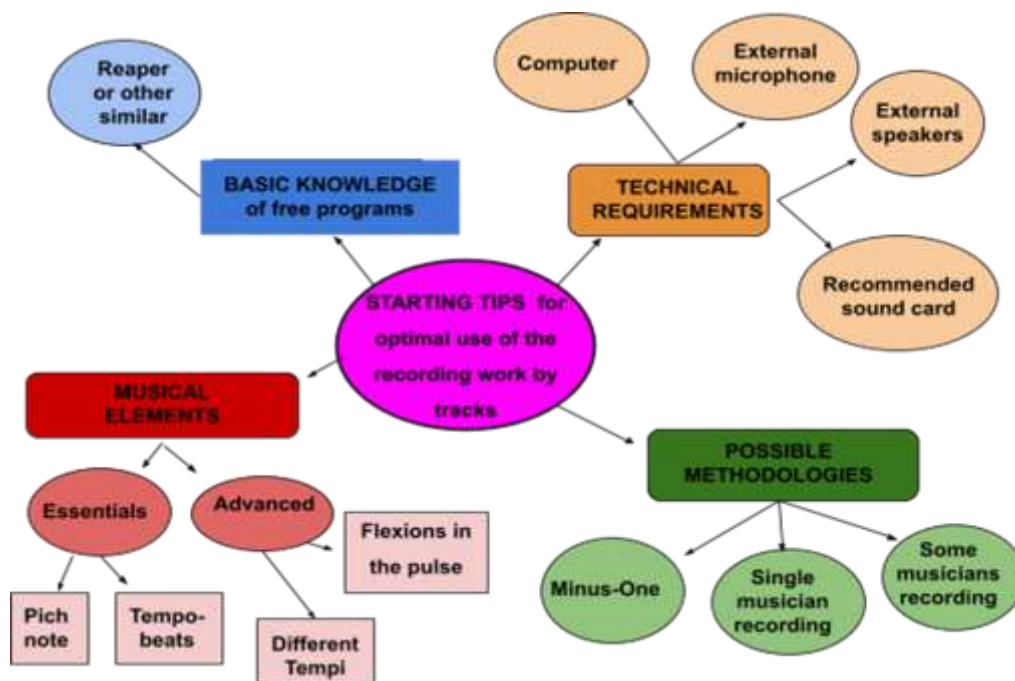


Figure 1 - Concept map.



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Part 2 - Guidance for Teachers on Virtual Online Exchanges, Selecting Digital Apps, Score Sharing, Audio Editing and Live Streaming

In the contemporary landscape of music education, the integration of technology has become indispensable, especially in the realm of chamber music. With the advent of sophisticated software and digital applications, musicians can now engage in virtual rehearsals and collaborative experiences that closely resemble in-person classes. However, ensuring a seamless online chamber music experience demands careful consideration of various factors.

2.1 Online Chamber Music Real Time Tools in Higher Music Education

Networked Music Performance (NMP) in higher music education enables chamber musicians to rehearse and perform together remotely in real-time, leveraging high-speed internet, specialised software, and low-latency audio interfaces. This technique minimises the need for physical presence, facilitating collaboration across geographical barriers. NMP offers students flexibility in scheduling, exposure to diverse musical styles, and the chance to work with international peers. While technical challenges remain (such as maintaining audio quality and minimising lag), NMP fosters adaptability and prepares musicians for an increasingly digital performance environment.



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To achieve an optimal online chamber music rehearsal through NMP techniques, several prerequisites should be met.

- A robust internet connection is fundamental to a stable and uninterrupted session.
- Utilising software that facilitates real-time collaboration among musicians is essential. Applications like Jamulus² offer a platform for synchronised playing with good sound quality.
- Minimising latency in devices is crucial for achieving an experience closer to an in-person session. This involves disconnecting Bluetooth, using wired headphones and microphones, opting for Ethernet over Wi-Fi, optimising computer settings, and avoiding unnecessary USB connections.
- Ensuring good sound quality is paramount. External microphones can significantly enhance audio, and the use of an external sound card can streamline configuration.
- Thoroughly testing and configuring devices before rehearsals is imperative to address any technical issues that might arise.
- Long wires for headphones and microphones provide freedom of movement during play.
- Eliminating external noises contributes to a focused and immersive rehearsal environment.

² <https://jamulus.io/>



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2.2 How to Select Suitable Digital Apps for Digital Enhanced Education in the Context of Ensemble Music

Choosing the right digital apps is critical for successful online chamber music exchanges. Consider the following criteria.

- **Accessibility** - Apps should be free of charge and compatible with various operating systems to ensure all participants can access them.
- **Ease of use** - The selected apps should be user-friendly to avoid compromising students' study time.
- **Permission** - Some apps might require permission for use within an educational network.

The choice of a suitable tool depends on the geographical distribution of group members, especially in the case of NMP based rehearsals and live streaming platforms. In fact, other digital apps for distant interaction (such as score and extra musical sharing) are less demanding in terms of the internet connection stability and speed.

- If group members are in different locations, rehearsing online in real-time using software like Jamulus is an excellent option. However, pre-recorded tracks (Partial PlayBack) can be considered for study when real-time rehearsals are impractical.
- For groups playing together in one place with the teacher in another location, online rehearsal apps can offer immediate feedback. Alternatively, video recordings can be shared for detailed evaluations.



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2.3 Collaborative Score Editing, Sharing and Music Fonts

Collaborative score editing and sharing are essential in the digital transition of higher music education as they enhance interactive learning, peer feedback, and co-creation. The following tools allow students and teachers to annotate scores in real-time, providing immediate insights on interpretation, technique, and style:

- IMSLP App: available on App Store for Android and Apple systems, it allows users to download, edit, and share scores in a non-real-time environment.
- Partifi.org: an online score editing tool designed for separating parts.
- Flat: collaborative music notation software, available in free or commercial versions.

Music writing tools and music fonts are key in music education's digital transition as they streamline notation, composition, and analysis. These tools enable students and educators to produce and share high-quality scores easily, essential for collaborative learning, precise feedback, and musicological studies.

- Traditional music editors such as Musescore³, Lilypond⁴, InScore⁵.
- Commercial solutions like MakeMusic Finale and Sibelius.

³ <https://musescore.org/>

⁴ <https://lilypond.org/>

⁵ <https://inscore.grame.fr/>



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Also non musical tools can be used for basic score annotations, such as Microsoft PowerPoint or Google Slide. In IMSV project we are using a sharable tool such as Google Slide. The following lines suggest a procedure for that:

Using Google Slides as a Collaborative Score Editing Tool

1. Download a score in PDF format.
2. Convert it to PowerPoint using online tools.
3. Upload the PowerPoint to Google Drive.
4. Convert the file into Google Slides format.
5. Share the Google Slides document with fellow musicians.
6. Edit it collaboratively.
7. Download the edited Google Slide doc and convert it to PDF.

However the use of Google Slides raises some practical problems. The most evident is that Google Slides lacks music fonts. The solution to this could be the uploading of external music fonts for experimentation. Find here some special musical fonts.

Special Music Fonts

- EMS Serenissima⁶: specifically designed for writing early music into Word.
- MusicSync⁷: a general font for writing music.

⁶ <https://www.earlymusicsources.com/more/font-serenissima>

⁷ <https://fonts2u.com/musisync.font>



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2.4 Digital Audio tools for Higher Music Education

Digital Audio tools are invaluable in chamber music education, offering enhanced practice, collaboration, and performance experiences. Tools like DAWs (Digital Audio Workstations) allow students to record, layer, and analyse their parts independently, promoting self-assessment and understanding of ensemble balance. Additionally, tempo and pitch control software aids practice flexibility, while spatial audio tools simulate live acoustics, essential for nuanced interpretation. These tools collectively deepen engagement and refine listening skills, helping students better prepare for live ensemble dynamics.

Audio Recording and Editing

Enables precise capture and manipulation of sound, crucial for performance review, analysis, and refinement. Tools include DAWs like Audacity and Reaper, which support multi-track editing, EQ adjustments, and noise reduction for professional-quality audio.

- Audacity⁸: a simple and open-source audio recorder.
- Reaper⁹: a complete Digital Audio Workstation compatible with Jamulus.
- Cakewalk by BandLab: a free Digital Audio Workstation with advanced features and cloud integration.

⁸ <https://www.audacityteam.org/>

⁹ <https://www.reaper.fm/>



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Sound Morphing for Contemporary Music

Focuses on transforming audio textures and timbres, used widely in avant-garde and electronic genres. Tools like FAUST language, PlugData and Csound allow musicians to experiment with unique sonic characteristics, pushing creative boundaries in composition and sound design.

- FAUST IDE¹⁰ & Playground¹¹: a browser-based programming language for mixed electronic music.
- PlugData¹²: a visual open-source programming language for interactive electronic music based on the PureData language, similar to Max MSC.
- Csound¹³: a programming language for sound creation and morphing.

Chords and Rhythm Sequencers

These tools facilitate pattern creation and rhythmic experimentation. Free sequencers help students understand harmonic progression and rhythm patterns, providing a foundation for improvisation and structured compositions.

- iRealPro¹⁴: a pocket band free software.

¹⁰ <https://faust.grame.fr/>

¹¹ <https://faustplayground.grame.fr/>

¹² <https://plugdata.org/>

¹³ <https://csound.com/>

¹⁴ <https://www.irealpro.com/>



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- Hydrogen Drum Machine¹⁵: a free drum editor.

Sampling Players for VST and MIDI Instruments

Software such as Kontakt or other free sample players allows musicians to play and manipulate digital samples, providing access to diverse instrument sounds. Essential for MIDI-based composition and orchestration, these players enhance musical versatility and accessibility.

- Kontakt Player: a commercial sample player by Native Instruments.
- TX16Wx¹⁶: a freemium sample player.

Virtual Sound Technology (Plugins Tested on Reaper)

VST plugins extend DAWs functionality with virtual effects and instruments, from reverb to synthesisers. These plugins enrich sonic palettes, helping musicians explore nuanced tonal variations and complex audio layering for realistic or innovative soundscapes.

- Spitfire Audio: an excellent collection of VST sounds.
- Sonatina Orchestra: a lightweight collection of VST sounds.

¹⁵ <https://hydrogen-music.org/>

¹⁶ <https://www.tx16wx.com/>



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2.5 Digital Tools for Audiovisual Streaming in Higher Music Education

Live streaming plays a transformative role in ensemble music within higher music education by extending the reach of performances and enhancing learning accessibility. Through live-streamed rehearsals and concerts, students gain the chance to showcase their work to a broader audience, allowing remote audiences, peers, and even remote instructors to engage in real-time feedback and support. This technology also enables inter-institutional collaborations, as ensembles can perform together virtually, breaking geographical barriers and promoting cross-cultural exchanges. Additionally, live streaming offers students the opportunity to develop their stage presence and technical skills in adapting to digital audiences, an increasingly valuable experience in today's interconnected music landscape.

In live streaming music performances, Twitch, YouTube, and OBS each play distinct roles:

- **Twitch**¹⁷ is a platform focused on real-time audience engagement, offering musicians interactive features like live chat and monetization options such as subscriptions and donations. This platform is ideal for informal or interactive performances and helps artists build loyal communities but may lack the high audio fidelity needed for professional music quality.
- **YouTube** provides a versatile space for both live streaming and archived performances. Known for high video quality and extensive reach, it's well-suited for formal concerts and

¹⁷ <https://www.twitch.tv/broadcast/studio>



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educational sessions, with superior searchability and discoverability. Its monetization options and broader audience also make it valuable for growing professional visibility. Find in the footnotes a link¹⁸ to a Guide for Live Streaming on Youtube.

- **OBS (Open Broadcaster Software)**¹⁹ is not a platform but rather a powerful, open-source tool for creating and managing high-quality live streams. It allows advanced configuration of audio and video, ideal for balancing multiple inputs during ensemble performances. OBS integrates with platforms like Twitch and YouTube, giving performers control over scene transitions, sound mixing, and overlays, essential for producing polished, multi-layered broadcasts.

For musicians in higher education, combining OBS for production with YouTube or Twitch for distribution can provide both a professional look and high interactivity, depending on the performance's goals.

By embracing these tools and approaches, educators and students can navigate the virtual realm of music education with enhanced efficiency, collaboration, and creativity. Whether it's online rehearsals, collaborative score editing, or exploring innovative sound technologies, the integration of digital resources opens up new possibilities in the ever-evolving landscape of music education.

¹⁸ <https://restream.io/blog/ultimate-guide-to-youtube-live/>

¹⁹ <https://obsproject.com/>



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Part 3 - Experimentations and Significant Case Studies to Exemplify the Different Aspects and Implementations of the Teaching Model Developed in the Project

3.1 Insights from Teachers' Experiences Amidst the Covid-19 Pandemic in Online Music Instruction

In navigating the challenges posed by the Covid-19 pandemic, Professor Alessandra Montali from Conservatory of Music La Spezia (Italy) embarked on an innovative journey, epitomising the concept of "Integrated Digital Teaching". This experimental approach embraced both asynchronous and synchronous modes, forming the backbone of her participation in the regional initiative known as CLAss_Liguriacanta. Her focus was on the choral masterpiece "Abendlied" by Joseph Rheinberger, a project uniting 186 singers and 20 choirs.

In the asynchronous mode of distance part learning, each chorister received meticulously crafted recordings tailored to enhance their musical proficiency:

- **Individual part recordings** - Choristers were equipped with recordings specific to their individual parts, be it soprano, alto, and so forth.



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- **Superimposed voice recordings** - another layer of complexity was introduced with recordings featuring two superimposed voices (e.g., S/B), each having recorded their parts in person.
- **Multiple voices recordings** - The complexity deepened with recordings incorporating three (e.g., S/B/A), four, five, and six superimposed voices, providing a dynamic ensemble experience for the learners.

These recordings served a dual purpose, aiding in both part consolidation and facilitating collaborative practice by singing alongside other pre-recorded vocal parts.

The synchronous tests unfolded on popular platforms like Skype, Zoom, or Google Meet, presenting distinct scenarios:

- **Separate sections** - Teachers performed a vocal part, and singers, with muted microphones, responded from a distance. This reciprocal interaction allowed individual singers to showcase their part, with others joining in sequentially.
- **Unified sections** - Singers, with microphones muted, engaged in synchronised singing, harmonising their parts in tandem with the designated leader.

To culminate the project, each singer, equipped with an audio reference in headphones, delved into the recording process. They were provided with a link to a choir performance by The Cambridge Singers, enhancing their auditory perception, while a video featuring a conductor's gestures synchronised with the chosen execution guided them. Singers captured their parts, with special



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attention to dynamic and agogic nuances. The interpretative ease of expressive indications contrasted with the nuanced challenge of adhering to agogic instructions, particularly during the final "rallentando".

Exploring renowned choral compositions involved leveraging resources like the Choralia mp3 catalogue (<https://www.choralia.net/index.html>). While such catalogues facilitate note learning, they fall short in capturing the subtleties of timbre, phrasing, dynamics, and agogic elements inherent in authentic vocal recordings. Real vocal recordings proved indispensable in conveying the full spectrum of musical expression, enriching the learning experience beyond mere note acquisition.

3.2 Joint Case Study: Homer, Alfonso, Dante and Bob Dylan

The musicians who were involved in the IMSV project participated in a particularly innovative joint case study, a concert which took place at the Conservatory of La Coruña (Spain), in May 2023. The program, named *Homer, Alfonso, Dante & Bob Dylan. Music and Poetry throughout the Millennia*, originated from a concept by Carla Zanin and was realised under the guidance of Federico Bardazzi, who not only was the conductor, but also took care of most of the arrangements and transcriptions of the pieces. Major contributions came also from Dimitri Betti, Angela and Debora Tempestini and, concerning Bob Dylan's songs, from Massimo Bandini.

This joint case study aims to go beyond the usual boundaries of the classical music sector which is referred to in a chamber music department; this happens through the integration of early music and



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pop/rock repertoire, in the belief that it is extremely important for classical music students to broaden their views and get full awareness of the whole range of western music. For this purpose, the program spans over two thousand years, including music from the ancient Greece to the contemporary age.

The central idea underlying the project is the figure of the poet and his role as medium, the one who is able to connect the Divine with the Human, to flow between different worlds and make the voice of God heard to his audience. Outstanding representatives of this gift are Homer, who let himself be inspired by the Muse to narrate the wonderful adventures of his heroes; Dante, the Sommo Poeta, who brings us into a fantastic, unprecedented journey across the afterlife and makes us really “see” God thanks to his verses; Bob Dylan, the modern Vate (seer), who was able to bring popular music back to the people in its original poetic form. Along with them, a fourth figure appears in this context, Alfonso X “the Wise”, king of Castile and a notable poet himself. At his court, one of the largest and most important collections of monophonic sacred songs of the Middle Ages was created: the *Cantigas de Santa Maria* (13th century), 420 poems with musical notation, written in the Galician language and dedicated to the Virgin Mary. King Alfonso himself is credited with many of these poems.

Another main concept of this case study is the use of the contrafactum technique. This was a very common practice in the Middle Ages, which shows the absence of a real contrast between secular and sacred music: it consists in borrowing a song from one sphere and making it suitable for use in the other by the substitution of words. The contrafactum had been extensively used by the musicians of Ensemble San Felice Florence in the past years. Under the guidance of Prof. Julia Bolton



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Holloway, Federico Bardazzi, Marco Di Manno and Carla Zanin curated a great project on Dante and the music of the Divine Comedy, which was performed throughout Europe and in the Florence cathedral for the 750th anniversary of the Poet's birth (2015). The same technique was applied in the CD dedicated to Francesco Landini's vocal music *Cantasi come. Laudi e contrafacta nella Firenze del '300*, recorded by Ensemble San Felice and released in 2015 by Bongiovanni.

Starting from these experiences, Carla Zanin devised a new concept of music and poetry focused on great authors and on the relationship between ancient and contemporary ages. Each piece was chosen starting from the poetic text or from the inspired melody or from both; the composition therefore becomes a poetic-musical excursus and an aesthetic journey, to celebrate beauty which is nothing more than the form in which the Art is shown. The universal message conveyed by music is enhanced through the use of many different languages: from ancient Greek to Latin, from vernacular Italian to English as the privileged idiom of contemporary music, capable of spreading the poetic message to a wider audience.

Preparation and Performance

From a didactic and performative point of view, the purpose of this case study was to test the possibility of using Networked Music Performance in the context of European higher education. For the preparation, a specific folder on Google Drive was created, while all the following materials were exchanged also on a WhatsApp group:

- the complete score, with the conductor's notes;
- separate parts for those who required them;



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- audio tutorials/recordings of some pieces;
- links to Youtube videos.

Starting from January 2023, some online rehearsals were scheduled, involving musicians from the six partners' countries (Belgium, Hungary, Italy, Romania, Slovenia, Spain). They interacted through a video platform (Zoom) and an audio software to minimise latency (Jamulus). Like in other circumstances, the experimentation confirmed that, in this kind of remote interaction, the best results are achieved under particular conditions:

- musicians should gather in groups in order to reduce the number of connections;
- some technical requirements are necessary: a fast and reliable connection, a good microphone, the use of earphones;
- the online rehearsals are a technical test: it is not possible to study difficult passages, so musicians should be prepared in advance.

The experimental character of this case study becomes clearer when considering the instrumental ensemble. Traditional, acoustic instruments mingled with electric and MIDI instruments to form an original and fascinating combination. The effect was particularly captivating, especially for the famous songs by Bob Dylan and Neil Young and the Pink Floyd, for which a completely new version was produced. The table below shows the instruments used.

Table 1 – The instruments used.

ACOUSTIC INSTRUMENTS	ELECTRIC INSTRUMENTS	MIDI INSTRUMENTS
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Violin Viola Flute Guitar Recorder Fiddle Gamba Piano Percussions	Electric guitar Electric bass	Keyboard EWI
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The program was divided into five sections, one for each of the poets that were mentioned before, with the addition of Neil Young and the Pink Floyd. Except for the two mediaeval sections, the ones on Alfonso X and Dante, where a more traditional sound was preserved through the use of acoustic instruments only, in the other parts the different types of instruments played together. A big contribution was provided also by MIDI instruments, which supported the whole program thanks to a wide range of sample sounds: mediaeval harp, psalter, bells, organ, bombardon, dulcian, trumpet, trombone, vibraphone. Regarding the EWI, it played two of the sounds included in its own software, namely the tenor saxophone for *Like a Hurricane* and *I shall be released* by Bob Dylan and a sort of synthesiser as a drone in a traditional Greek song.

As for the arrangements, they can be defined as “classical” in terms of harmonic structure and composition style. The strings were treated as an orchestral group, while the winds either had their own parts or doubled the voices. Great importance was given to the rhythmical part as well as to improvisation. Concerning the vocal parts, the melody was enriched by adding other voices and choruses, sometimes only in the refrain, sometimes in the whole piece.



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3.3 Case Studies: Unravelling the Dynamics of Joseph Kreutzer's Trio op.3 n.9 in D Major

The project leader of this case study is Professor Lisa B. Friend, who teaches flute at the Conservatory of La Spezia. Embarking on the intricate journey of mixed chamber music trio, the focal point of the experimentation we are talking about revolves around second year bachelor degree students diligently mastering Joseph Kreutzer's Trio op. 3 n. 9 in D Major. This distinctive ensemble comprises 2 flutes and a guitar, creating a harmonious blend of sounds that transcends the boundaries of synchronous and asynchronous learning. Two performers share physical space while the third operates remotely, all under the watchful guidance of a dedicated teacher orchestrating the symphony from afar.

The learning process unfolds through a meticulously crafted combination of group and individual work, each session enriched by the virtual presence of the teacher. The methodology encompasses several distinctive steps, ensuring a holistic and immersive learning experience for each participant.

- **Step 1: synchronous sight reading sessions** - Each student embarks on individual sight reading during online sessions. The unique aspect lies in the synchronisation of all three students and the teacher through the medium of Skype. This allows the professor to navigate through the nuances of each part, offering personalised guidance to enhance the understanding and execution of the composition.
- **Step 2: online listening dynamics** - While one student takes centre stage, the others engage in a virtual listening experience, tuning in online to foster a collaborative understanding of



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the music. This digital symphony encourages mutual support and comprehension among the ensemble.

- **Step 3: comprehensive resource sharing** - The collaborative spirit extends to the exchange of valuable resources. Links are shared, providing access to sheet music, scores, and recordings of diverse performances of the same composition. This multifaceted approach not only broadens the students' musical palette but also enhances their appreciation for varied interpretations.
- **Step 4: collaborative recordings** - The fusion of technology and artistry is evident as a previously recorded rendition of the guitarist's part is shared for upload by each flautist. Further contributing to this digital tapestry, the flautists independently record their segments. These recordings serve as a virtual bridge, connecting the musicians and their teacher in a shared pursuit of musical excellence.

3.3.1 Performance Criteria and Technological Considerations

Navigating the intricacies of online performance demands a thoughtful consideration of performance criteria:

- **Controlled tempo** - The inherent latency in online platforms necessitates a deliberate pacing, intentionally slower than synchronous YouTube recordings. The teacher's audio shares during lessons, and student commentaries during "share" sessions facilitate nuanced discussions on tempo and expression.



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- **Precision and dynamics** - recognizing the limitations of microphones, emphasis is placed on achieving precision in notes, rhythm, and dynamics within the constraints of the available technology. This meticulous attention to detail contributes to the refinement of the ensemble's overall performance.
- **Technical considerations for wind instruments** - An essential technical aspect involves unchecking the automatic sound regulation box on Skype, a crucial step for all performers, particularly wind instrumentalists. This measure is vital for maintaining audio fidelity, ensuring that the unique nuances of wind instruments are preserved in the digital realm.
- **Integrated digital didactics** - The learning process is further enriched through the seamless integration of digital didactic methods. This forward-looking approach optimises the online learning environment, leveraging technology as a facilitator rather than a barrier.
- **Interpretation challenges** - Acknowledging the unique challenges posed by online teaching, the teacher shares interpretation criteria with the students. The discussions delve into the intricacies of period customary performance practices from the Biedermeier era. Students actively engage in debates on how stylistic interpretation faces challenges due to latency and the varying sound quality dictated by individual microphones and internet connections.

3.3.2 Assessment and Learning Progress

Evaluation is a cornerstone of this comprehensive learning experience, focusing on technique and rhythm for two movements of Kreutzer's Trio during the lockdown period. Despite the challenges posed by the digital divide, the students exhibit noteworthy progress, evidenced by top marks in an



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examination conducted five months after the total lockdown. This assessment serves as a testament to the resilience, adaptability, and unwavering dedication of the ensemble.

The subsequent academic year, 2021-22, witnessed the triumphant culmination of the ensemble's efforts as they completed the study of the entire work post-Covid19. This triumph over adversity not only marks a testament to their musical growth but also emphasises the enduring power of collaboration, innovation, and the pursuit of artistic excellence in the face of unprecedented challenges. The resilience displayed by these students not only ensures their musical prowess but also underscores the enduring significance of music as a source of inspiration and connection, transcending the boundaries of physical and digital realms alike.

3.3.3 Chamber Music in a Unique Format: Audition Preparation in the Virtual Realm

In the realm of audition preparation, chamber music takes on a distinctive form, transcending physical boundaries and uniting students and professors across Dusseldorf, Piombino, and Florence through the digital platforms of Zoom and Skype. The unconventional ensemble comprises two or three flutes, challenging the traditional definition of chamber music within the orchestral context.

The very essence of an ensemble is scrutinised, especially in an orchestral setting where sections function as small groups under the guiding hand of a conductor. However, this project introduces a unique perspective by defining chamber ensembles without a conductor. The rationale behind this inclusion lies in the necessity for students to master the art of performing together, blending the



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voices of the 1st flute, 2nd flute, and piccolo/3rd flute in harmony. Despite the absence of a conductor, the students engage in a "chamber music experience," drawing parallels between orchestral excerpt training for auditions and chamber music practice.

These lessons form an integral part of the Orchestral Excerpt Training course, catering to both master's and bachelor's levels. Given the inherent talent of the students, the lessons strike a balance between collective sessions involving all three and individual sessions with the teacher. The online format spans 21 hours for master's students and 15 hours for bachelor's students.

A repertoire of 12 master-level excerpts and 8 for bachelor-level candidates is carefully selected. The students delve into the following three key websites for comprehensive study:

- **Site A: *Play along! Orchestral Accompaniment for Flute Excerpt Peter and the Wolf - S. Prokofiev*** (<https://www.youtube.com/watch?v=KgAqBa5ATp>) - An informative resource with a minor drawback — the flute part is played using a digital keyboard.
 - **Site B: *Orchestra Excerpts - Study Audition Excerpts and Win*** (<https://orchestraexcerpts.com/flute-prokofiev-peter-and-the-wolf-reh-2-4/peter-and-the-wolf-flute-orchestra-excerpt/>) - An excellent site providing access to precise excerpts in outstanding orchestral performances. A slight drawback is occasional omission of the complete necessary excerpts.
 - **Site C: *Free Flute Sheet Music*** (<https://www.flutetunes.com/>) - A reliable source, though not always comprehensive in providing the required excerpts.
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Supplementary learning includes delving into various YouTube examples and lessons.

Homework assignments require students to record three excerpts weekly, submitting them for assessment by Professor Lisa Friend.

The transition from Google Meet to Skype to Zoom rooms marks a notable improvement in lesson quality. The integration of Jamulus with Zoom proves particularly effective, facilitating synchronised play of all parts, a boon for challenging excerpts like Ravel's "Daphnis et Chloe". However, it is acknowledged that utilising Jamulus demands heightened concentration and practice compared to in-person rehearsals.

Early lessons adopt a demonstration-centric approach by the teacher, followed by individual student performances. Despite the progress facilitated by technology, simulating a live audition proves challenging. Factors such as sound quality, lip control, and posture efficiency remain elusive, even with the aid of excellent connections and tools like Jamulus and Reaper. Nonetheless, a silver lining emerges as students focus on the memorization of excerpts, demonstrating adaptability and resilience in the pursuit of musical excellence within the virtual realm.

3.4 Case Studies 2023: *Curves* by Ian Clarke, for 3 Flutes and Piano

The authors of the Case Study are Prof. Lisa B. Friend (Conservatory of Music La Spezia, Italy) and Prof. Cesar Concheiro (Conservatory of Music La Coruna, Spain), with input from Prof. Daniela Troiani, who teaches at the Conservatory of Music Cosenza, Italy, a stakeholder in the project.



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The work selected is *Curves* by Ian Clarke, for 3 flutes and piano (first edition 2012), winner piece of the National Flute Association Newly Published Music Competition 2013 in the category Small flute Ensemble with piano (Edition: IC MUSIC - www.ianclarke.net). For the Jamulus Online Experimentation, the three flautists chose Movement I (Magical and Woven) and Movement II (Plaintive).

Note: Due to the extreme velocity, repeated notes, etc., it would only be possible to study online very slowly Movement 3, even with the minimal asynchronous aspects of Jamulus; a positive online experience for distance learning is best applied to only the first and second movements of *Curves*.

The pianist who joined in the performance is Andrea Bareggi, Professor of Engineering at ESME, a private, higher education institution based in Lyon, France. Overall, the musicians set up seven rehearsals, five thereof online (four from four different locations and one with one flautist and pianist together in the same room), and two in presence before the concert. The final performance took place in La Coruna, Spain, on May 10, 2023. Performance notes were Included in the published edition by Ian Clarke.

The work is preceded in each part by explanations of the notation usage in the piece, including diamond note-heads, quarter-tone fingerings, note-bends, colour fingers (2nd movement), bracketed notes (3rd movement), articulation, explanation of weaving/swapping parts and roles and textures. Definition of the role of the piano, which compliments, interacts, and at times takes centre stage.



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It is suggested to use open-hole French model flutes with open-hole plugs. Should a student use a closed hole or plugged flute, different fingerings may sometimes have to be used instead of the ones proposed by the composer. The author, Lisa B. Friend, has prepared a chart (available upon request) of alternative fingerings for closed-hole flute, and, as part of the experimentation, actually used a closed-hole flute to make the experimentation complete and to assist future students.

Note: program notes are included on the last page of the piano part and will not be included here. It is important, however, to note that the renowned composer Ian Clarke, a flautist, premiered this piece in 2011 himself at the Guildhall School of Music and Drama. In conclusion, this piece is an excellent work for Jamulus experimentation, for learning modern flute techniques, and for learning some of the wider flute language even in distance learning.

The title reflects the thematic material, such as the opening theme. In the first movement, the use of quarter-tones across all three flute parts leads to a first theme that depicts curves. The mixture of the four parts is unique in the repertoire, allowing both a flute professor and a Chamber Music professor to work on a chamber work efficiently through mixed distance and in-person pedagogy/lessons.

In the second movement, the piano starts with a totally different atmosphere compared to the first movement. The flautists are requested to use a Reedy tone or Bamboo tone with particularly defined texture changes on notes where marked. These changes, as indicated in the 2nd movement-3rd flute part, proved more difficult on a closed-hole flute, and it was necessary for the third flute



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part to slide with the first trill key or no Eb key OR changing with head movement or lip movement instead of following the suggested fingerings in the second movement.

The equipment needed includes a computer, headphones, microphone, and installed apps: Jamulus, Avios, and Zoom for recording/filming, and optional: Reaper. It is suggested to use separate headphones and a mike and not the cell phone headphones with a mike attached. Also, it is suggested to turn off the mike from the wireless headset and to use a separate mike IF wireless earphones are used.

1st rehearsal: gets pushed to a week later because the connection from Coruna Spain proves disturbed and distorted both from the conservatory and from the home of the flautist. A week is spent with a few meetings online between the pianist who is also a technician, in order to correct.

2nd-5th rehearsal: occasionally one or another has a bit of distortion, but the rehearsals are useful. The movements are performed with Jamulus in rehearsal 2 and 3 without Zoom (sound only), slower than suggested by metronome markings of Clarke. A metronome (turned on by the second flautist in Cosenza) proves to assist the rehearsing greatly due to the slightest of asynchronous effect. Ending points of phrases are worked out and always more synchronised as rehearsals progress. The second movement proves a bit easier to rehearse because it is a slow movement, but the textures are a bit lost with distance rehearsing. This probably could be improved by a better microphone and better internet connections. The last Jamulus-Zoom rehearsals are recorded for the project. Dynamics are worked on; synchronisation is worked on; entrances and worked out better. By the fifth rehearsal, as professional performers and teachers, all are anxious to return to live rehearsals



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and a performance. All concur that the piece is an excellent piece and also an excellent piece for distance learning, without the third movement. The pianist/engineer, Andrea Bareggi, states: «This is one of the best Jamulus experiences I have had».

3.5 Case Study: Initiating the Journey with Jamulus as a Blended Learning Tool

The onset of the pandemic triggered a cascade of new educational challenges, reshaping traditional conceptions of music instruction that had endured for centuries. While theoretical classes adapted relatively seamlessly to online tools with minor adjustments, the landscape for teaching music underwent a radical transformation.

In the realm of instrumental learning, tools like video recording and popular video meeting platforms such as Skype or Zoom partially bridged the gap, despite sound quality limitations. However, the true challenge emerged with group subjects, which faced near-cancellation in the early stages of the pandemic.

Among the arsenal of online audio programs, Jamulus, a prominent free software, surfaced as a powerful tool. Acknowledging its limitations, notably latency, sound issues, and technical constraints, Jamulus found a niche in chamber music environments during less complex ensemble rehearsals.



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It's crucial to recognize that Jamulus isn't a panacea for online synchronous rehearsal but can serve as a valuable complement alongside other specific tools and apps. After two years of experimentation by our teams, two significant aspects have come to the forefront, which we try to summarise below.

- **Preparation is key** - Due to the technical demands and complexities inherent in online audio interaction, the online rehearsal should not be perceived as a platform for in-depth musical study. Musicians should arrive at the rehearsal well-prepared, having tackled musical intricacies individually or in smaller groups beforehand. Adequate preparation involves sharing scores with clear indications and utilising tutorials, whether self-generated or sourced from the web, to support individual study. Once the musical groundwork is laid, musicians can shift focus to aspects like active listening, maintaining tempo, ensuring technical settings are correct, adjusting volume, and other ensemble nuances.
- **Blended modality yields best results** - Optimal outcomes are achieved through a blended modality, particularly in larger groups. For rehearsals spanning musicians from different countries, it is advisable for each national team to convene in a single location to mitigate excessive connections that could negatively impact the session, even with excellent technical equipment. The recommended number of connections should ideally not exceed 4 or 5.

Jamulus proved instrumental in streamlining roles for students residing outside the city, effectively reducing the number of rehearsals required for a performance. However, the program's utility



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necessitates an essential phase—one that involves each student in familiarising themselves with the tool.

Initiating the use of Jamulus is not merely a matter of starting the program; it demands two or three sessions to troubleshoot technical issues, which can be numerous, and acclimate to rehearsing with the inherent delay—a discomfort particularly pronounced initially. To get more acquainted with the basic use of Jamulus, we suggest the following tutorial.



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Part 4 - Assessing the Distance Learning Journey: Challenges and Adaptations

Navigating the realm of online music education prompts reflections on the alignment of goals in virtual and face-to-face teaching. While the conventional approach remains the foundation, recent global circumstances have demonstrated that virtual teaching can be more than a supplement—it can be a lifeline, even supplanting traditional methods when necessary.

In the evolving landscape of collaborative music projects in the 21st century, the integration of virtual communication tools has become paramount. Teachers and students alike must adeptly wield these tools, not merely as a response to global challenges but as integral components of their musical journey. From crafting learning materials to orchestrating musical montages online, the seamless incorporation of virtual tools is an essential skill set for the contemporary musician.

4.1 Implementing Evaluation in Distance Learning

In the ideal scenario for implementing evaluations—a scenario still to be fully realised—the prerequisites include robust access to virtual work tools for music learning and a reliable internet connection. While various applications are available for free, the onus is on both teachers and students to not only grasp their functionality but also ensure their consistent operational use during classes and rehearsals.



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Effective assessment of remote ensemble music work hinges on addressing the following fundamental questions:

- Have the basic technical challenges faced by each student been resolved?
- Are students proficient in independently navigating various applications for online music collaboration?
- Can students troubleshoot problems that arise in the context of distance learning?
- As a teacher, am I equipped to remotely resolve technical issues for a seamless class or rehearsal?
- Can both teacher and students collectively troubleshoot and adapt their musical collaboration to address challenges effectively?

To gauge the learning process and measure the progress of distance learning, evaluating the following aspects becomes crucial:

- **Computer skills and tool utilisation** - Assess students' proficiency in handling virtual tools, emphasising the real goals of music education over the technical aspects.
- **Interactivity in classes/rehearsals** - Evaluate students' ability to connect easily, adapt to challenges, and overcome technical obstacles during collaborative sessions.
- **Work outputs and tool mastery** - Review the work produced by students, analysing their growing competence in utilising virtual tools for music collaboration.



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- **Recordings and playback** - Scrutinise student recordings, particularly those involving playback and rehearsal sessions with peers, offering valuable insights into individual and collective progress.
- **Progress in tool proficiency** - Observe advancements in students' adeptness with the virtual tools employed in the learning process.
- **Process evaluation** - Consider the efficiency gains—both in terms of time and resource utilisation—resulting from distance learning. Assess the tool's efficacy in actively fostering collaborative music assembly.

Evaluation, as a pivotal component of the didactic process, assumes a critical role in depicting the students' acquired skills and overall growth. The accuracy of grades reflects the evolution and dedication exhibited by students throughout the semester.

4.2 Case study: the Evaluation Process at “Gheorghe Dima” National Academy of Music in Distance Learning

Within the "Gheorghe Dima" National Academy of Music in Cluj-Napoca, the pandemic catalysed a need for innovative evaluation methods. A questionnaire, designed collaboratively with input from both educators and students, served as a powerful tool to assess the efficacy of chosen methods, ensuring a unidirectional understanding of the evaluation strategies implemented during this unprecedented period.



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The section below outlines the evaluation process at the Academy “Gheorghe Dima” at the time of online courses and exams.

- **Choice of evaluation method** - The teaching staff at the Academy, in a collaborative decision, opted for student evaluation through video recordings during the period of online courses and exams. Students, utilising their available resources, recorded themselves performing the required pieces and submitted the recordings to the faculty for assessment. Despite online classes and seminars (conducted via Zoom, Skype, etc.), the evaluation format was anchored in the recorded submissions. For chamber music, students physically gathered in the academy's halls, adhering to strict distancing rules, to produce the necessary recordings.
 - **Evaluation during the semester** - Given the limitations of audio-video platforms in capturing interpretative nuances and sound quality, ongoing semester evaluations were challenging. Instead, focus shifted to assessing repertoire assimilation and the students' level of engagement, acknowledging the complexities imposed by the evolving pandemic. The faculty recognized the need for flexible evaluation criteria, emphasising adaptability and resilience in the face of unprecedented challenges.
 - **Evaluation in exams—sound quality, rhythm, synchronisation** - During exams, teachers faced the task of considering sound quality, adherence to rhythmic components, and other instrument-specific elements. The exclusive use of recorded performances posed challenges in assessing sound quality, as each student recorded with varying capabilities. Rhythmic precision, a crucial aspect of correct interpretation, remained a focal point. Teachers encouraged students to focus on refining these elements in their individual practice, recognizing the constraints of remote assessment.
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- **Adaptability of students in online learning** - Given the tech-savvy nature of today's students, adaptation to the new online landscape was generally swift. Instances where students faced challenges were addressed collaboratively, with the student community and the academy providing technical solutions and necessary equipment. However, the effectiveness of online teaching proved limited, as while melodic and rhythmic aspects could be corrected, interpretative nuances could only be fully appreciated in physical interactions between students and teaching staff. The adaptability of students in embracing virtual learning was commendable, showcasing their resilience in overcoming unforeseen obstacles.
- **Proposals for enhancing online evaluation** - Diverse opinions surfaced among the teaching staff regarding the future of online evaluation. Some advocated for maintaining online evaluation as an exceptional measure, emphasising the necessity of physical presence for holistic assessment. Conversely, other teachers expressed openness to continued online assessment provided that technology and dedicated software evolve sufficiently to offer reasonable possibilities for audition, synchronisation, and bidirectional communication. Proposals included investing in advanced audio-video tools and exploring innovative approaches to recreate the depth of in-person evaluation in a virtual setting.

In the evolving landscape of music education, the Academy grappled with the challenges of maintaining assessment integrity while navigating the limitations of virtual platforms. The delicate balance between leveraging technology and preserving the essence of musical evaluation will continue to shape the discourse around the future of online assessments within the institution.



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Part 5 - Transforming Education Through IMSV Model and Digital Technologies

In the realm of higher education in music ensemble disciplines, the IMSV model emerges as a beacon, orchestrating the application of digital technologies and distance modes in a harmonious training symphony. The transformative landscape of education unfolds with the integration of mixed online experimental training, employing a digital blended approach to enrich the chamber music learning process. In this digital age, the educational system, fortified by computerised information and e-learning, provides accessible gateways to a wealth of knowledge. Offering simplicity and efficiency, these methods stand as alternatives to perpetual education in our contemporary and future information-driven society.

A pivotal shift occurs as digital teaching transcends the passive absorption of information, ushering in an era of interactive dialogue. Learners engage in a dynamic exchange, interrupting, redirecting, and customising the complexity, speed, and presentation of information. Embracing multi-sensory learning, multimedia courses intertwine graphic elements with audio and video, creating a holistic learning reality. This multimedia format empowers learners to interact across various parameters within the realm of virtual experience.



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5.1 Blended Learning Reshaped

Blended learning undergoes a metamorphosis, shedding the conventional model for a multimedia electronic course book hosted on an electronic teaching platform. This innovative approach mirrors traditional face-to-face interactions with teachers, offering a realistic simulation in the virtual space. Moreover, the multimedia course tailors information to individual characteristics, enabling access on diverse levels. The fusion of digital technologies and traditional training methods propels ensemble music education into a dynamic era, embracing the ever-evolving landscape of educational possibilities.

As we navigate the nuances of the IMSV model, the marriage of digital prowess with the timeless essence of musical education paves the way for a comprehensive and transformative learning journey. This synthesis of traditional wisdom and digital innovation sets the stage for a future where music education resonates with the rhythm of progress and embraces the boundless potentials of the digital age.



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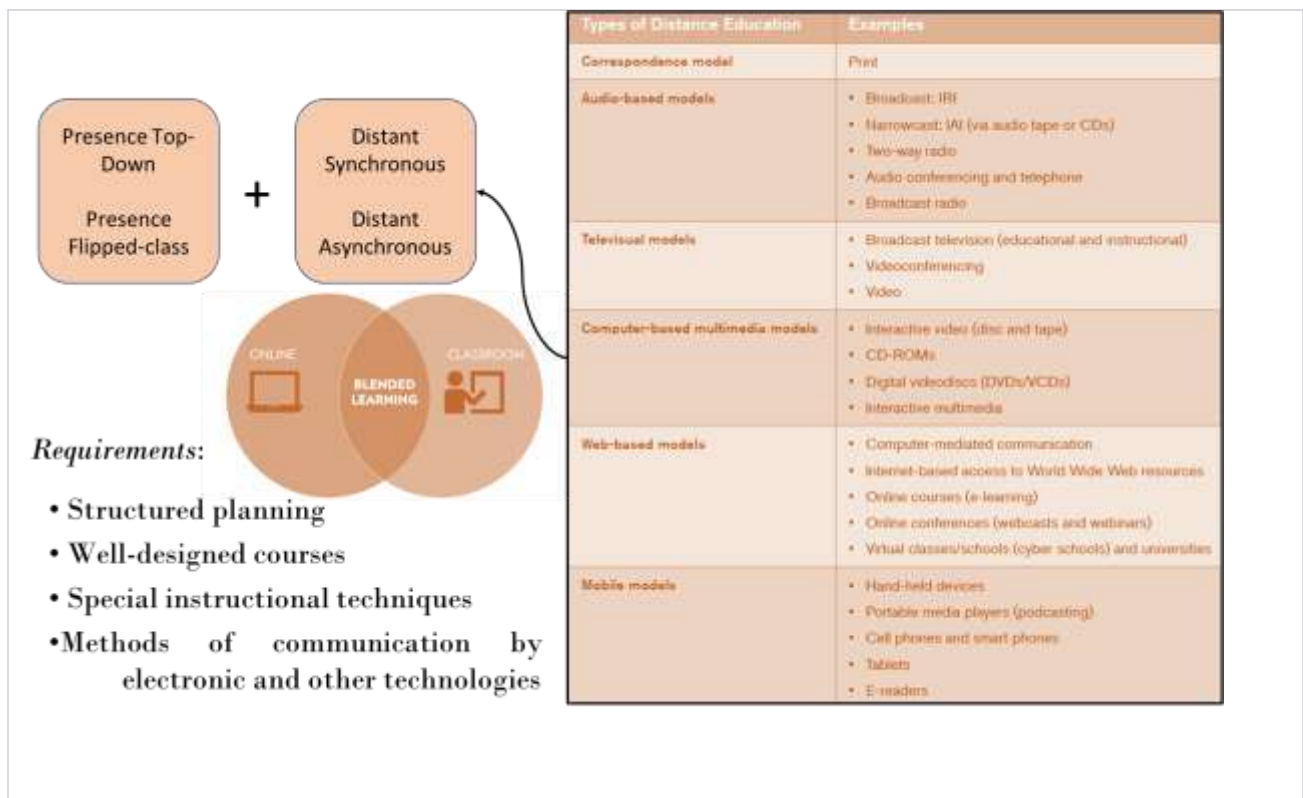


Figure 2 - Blended learning model with digital tools for higher education.

5.2 Multimedia Unveiled: Navigating the Dynamics of Interactive Learning

The blended learning model of IMSV makes a wide use of multimedia technology. Multimedia, a versatile entity, dons various garbs: linear, offering content without intervention possibilities, and nonlinear, inviting interaction and engagement.



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The inception of the term "multimedia" can be traced back to Bob Goldstein in 1966²⁰, christened for his show *Light Works* at L'Oursin in Southampton, Long Island. Its connotations evolved over time: in the 1970s, it entailed combining sound and diverse projections. However, its contemporary meaning emerged in the 1990s, earning the accolade of "word of the year" in 1995 from the German Language Society (Gesellschaft für deutschen Sprachgebrauch).

Multimedia, at its essence, embodies the fusion of distinct media delivered through a computerised system. A true multimedia course format extends beyond the conventional written textbook, integrating an array of elements:

- **Pictures** - Illustrative, demonstrative additions, often found throughout the study module or in appendices.
- **Animations** - Utilising .gif formats, animations bring dynamism to technical moments in the course.
- **Audio sequences** - Exemplifying musical examples or offering explanatory content, aiding in understanding phenomena through spoken explanations.
- **Video sequences** - The most commonly utilised medium, offering demonstrations and explanations that are easily perceptible.
- **PowerPoint** - Serving as a graphical support, PowerPoint's distinctive feature lies in its ability to distil essential information, acting as a valuable summary tool.

²⁰ <https://www.historyofinformation.com/detail.php?entryid=3039>



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For a course to embody true multimedia, it must encapsulate three pivotal aspects:

- **Associativity** - The seamless integration of different media elements to create a cohesive learning experience.
- **Interactivity** - The engagement and involvement of learners, fostering active participation.
- **Interdisciplinarity** - The amalgamation of diverse disciplines, providing a holistic view of the subject matter.

Pictures, as the simplest form of multimedia integration, accompany textual content, offering illustration and exemplification. Animations, often in .gif format, add a dynamic layer to technical aspects. Audio sequences, whether integrated into the course or presented separately, serve to illustrate musical examples or provide spoken explanations for enhanced understanding. Video sequences take centre stage, offering the most tangible and easily comprehensible demonstrations. The preference is often given to in-house examples, showcasing the institution's audio-video library and underlining the need for dedicated production centres within academic institutions. PowerPoint, while serving as a graphical support, excels in essentialization, aiding professors in teaching and providing students with concise summaries.

The culmination of these diverse media elements results in the creation of video courses, incorporating lectures, PowerPoint presentations, and audio-video examples. This comprehensive video streaming, accessible through various platforms, allows students to selectively engage with and assimilate lessons of their interest. In instances where institutions lack dedicated audio-video



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centres or proprietary materials, caution and adherence to copyright laws are imperative when incorporating external audio-video examples.

In the dynamic landscape of multimedia education, the interplay of diverse media elements unfolds as a symphony of learning, offering students a multi-dimensional and engaging educational journey. It is recommended to host these courses on an educational electronic platform, an e-learning platform, as it facilitates the incorporation of other features essential for a multimedia course: associativity, interactivity, and interdisciplinarity. For small groups of students, Sharing platforms such as Google Drive, Microsoft OneDrive, or the free platform Framadrive can be used. For wider audience, a Course Management System (CMS) such as Moodle²¹ is advised.

Hypertext serves as a method for structuring and navigating knowledge based on associativity. Throughout the course's duration, key terms relevant to the subject appear, guiding the user through various stages to deepen their understanding of the phenomenon. Hypertext enables personalised exploration, allowing users to follow their interests and eliminating the linear structure of information sources. The student's interests take precedence as they navigate freely, fostering a sense of autonomy and engagement with the content.

²¹ <https://moodle.org/>



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Interactivity stands out as the cornerstone of a multimedia course. In contrast to the traditional one-way flow of information from teacher to student, interactivity empowers students to engage with informational media through self-evaluation tests, examination papers, and interactive games.

Self-evaluation tests provide a straightforward means for students to assess their knowledge levels. These tests may take the form of multiple-choice questions, true/false questionnaires, or grid-in question assessments. The electronic learning platform can calculate the score for correct answers, enabling students to gauge their own progress and identify areas for improvement. This formative assessment fosters a continuous learning process.

Online examination papers, while requiring manual grading by the teacher, can be compiled into specific resources like a glossary of terms, an anthology of idioms, or an analysis compendium. This approach encourages students to actively contribute to the course content, promoting collaborative learning and a sense of ownership in their education.

Interactive games, such as crosswords or interactive journeys requiring answers to progress to the next level, contribute to both ongoing student assessment and the creation of a user-friendly platform interface. The multimedia course interface should prioritise simplicity, employing symbols and animations to emphasise key information for user navigation.

Interdisciplinarity involves integrating multiple disciplines to construct specific aspects. The electronic platform housing all of a student's courses enables seamless navigation across disciplines



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to address integrated problems within shared information spheres. This integration is essentially a high-level application of associativity and hypertext, transitioning into what is known as hyperlinks.

Feedback is a crucial aspect of the multimedia course, achieved through constant communication between course tutors and students via email exchanges and the organisation of a portal for open discussions among students and other participants. This feedback loop not only facilitates clarification of doubts but also promotes a sense of community and collaborative learning.

From the user's perspective, a multimedia course is more engaging, easier to comprehend, and simpler to assess. It serves as a foundational element for educational institutions, aiding in their overall mission of providing effective and modern learning experiences.

Multimedia applications in computer-assisted training reflect the ongoing evolution of technology, with computer-based training now deemed indispensable in the realm of continual education. Integrated into the dynamic learning process, multimedia products and complex databases are tailored to the evolving needs of learners. Hypermedia connections, dynamic and continually evolving, ensure a learning experience firmly grounded in everyday reality, offering a swift and efficient path. The freedom to navigate within a multimedia framework empowers users to choose their own learning journey, requesting the system to propose paths aligned with their needs, thus fostering individualised and student-oriented organisational flexibility.

At the core of multimedia documents lies the seamless interconnection of information and media. This demands a new approach to document creation, requiring the harmonisation of text with



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visuals, text with film, and more. Courses developed in this manner must be attractive, innovative, easy to navigate, up-to-date, and readily downloadable.

A comprehensive multimedia course typically includes:

- **Interactive presentation of new knowledge** - Realised in an interactive manner, these presentations facilitate a dynamic dialogue between tutors and students.
- **Computer-assisted practice** - Utilising specific programs to reinforce knowledge through repetitive tasks, exercises, and assessments.
- **Computer-assisted assessment** - Incorporating tools and programs for efficient evaluation.
- **Computer-assisted simulation** - Representing the controlled replication of a phenomenon or real system through a model with analogous behaviour.

The advantages of a multimedia course are manifold, offering students an active role in learning at their own pace and with personalised strategies. It stimulates interest in new concepts, fosters imagination, develops logical thinking, simulates phenomena and processes, optimises teaching efficiency through multiple examples, and cultivates a generation through self-education.

In practice, multimedia applications integrate various forms of media - such as text, images, video, sound, and animations - to present information in an engaging and straightforward manner. Interactive multimedia systems allow users to interact with the content, navigate through different information segments, and seek specific details along predefined paths.



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Educational resources in distance learning programs play a pivotal role in their effectiveness. A blend of printed and electronic materials accommodates individualised learning, necessitating the guidance and coordination of course tutors. Modern presentation methods enhance flexibility and appeal, adapting to the needs of adults who seek learning opportunities free from constraints of time, space, and lifestyle. The production of educational resources involves training authors and progressing through distinct phases, including structuring, text and illustration generation, material design, preparation and printing, and the creation of applied materials. This comprehensive approach ensures that the resources align with contemporary educational needs.

The distance learning system relies on specific resources presented in various formats, adapting to diverse environments, such as print, audio-video, CDs, or embedded on web pages.

Study materials play a crucial role in facilitating remote access. Accompanied by guides for multiple materials, they provide reading instructions, evaluation criteria, and performance standards. Among these materials, the coursebook stands out as the most vital source in the distance education system, serving as a replacement for in-person classes attended by traditional students.

To ensure the effectiveness of coursebooks in the distance education system, certain mandatory components must be incorporated. These include organising materials (whether in print or multimedia format) into modules, lessons, and study units, each with an indicated average time for completion. The coursebook should employ effective teaching methods to conclude lessons, such as summarising topics, presenting conclusions, providing illustrative examples, and formulating learning tasks. Additionally, each unit of study should include self-assessment tests to facilitate



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continuous self-monitoring of acquired knowledge and skills. A minimal yet mandatory bibliography is essential for those engaging with the system.

For a coursebook to fulfil its role effectively, it must align with educational objectives, ensuring a harmonious correlation between targets, training methods, and assessment criteria. The structuring of the course and the envisaged learning methods may vary among teachers, but it must adhere to the format specific to distance learning.

The electronic environment plays a pivotal role in providing students with the means for distance learning. The advantages of a blended learning system lie in its capacity to foster interactive dialogues, allowing users to interrupt and redirect information at their own pace. It enables students to alter the complexity, speed, and presentation of information, offering a dynamic learning experience. Diverse learning environments in this electronic setting facilitate the assimilation of knowledge, catering to a "new type of student" well-versed in technological developments.

New information and communication technologies (ICT) play a crucial role in creating varied learning environments, enabling quick and easy access to information from any location at various hours. This flexibility removes constraints associated with traditional learning methods.

Combining instructional guidance is paramount in navigating educational resources effectively. Students need to comprehend the role of these resources, recognizing their function in responding to teaching and learning tasks related to specific content. In essence, the electronic environment



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becomes a catalyst for a dynamic and interactive learning experience in the realm of distance education.

5.3 Sharing Musical and Extra-Musical Information for the Interpretation of a Chamber Music Piece Online

While exclusive online rehearsals for chamber music may not yield optimal results, effective preparation can be achieved through the use of various online tools and shareable materials.

Preparing for a chamber music session involves several important steps. First and foremost, it is essential to share and edit the scores, incorporating the professor's notes, metronome markings, text pronunciation and translations for singers, fingering, technical advice for instrumentalists, and musical analysis. Tools that can be used for this purpose include PowerPoint, Miro²², Adobe Pro (with a paid account), Musescore²³, IMSLP²⁴, and other sheet music repositories that require subscriptions. The scores can be sent in PDF format, scanned using a traditional scanner or mobile apps like CamScanner²⁵ and TurboScan²⁶ (for MacOS).

²² <https://miro.com/>

²³ <https://musescore.org/en/download>

²⁴ <https://imslp.org/>

²⁵ <https://www.camscanner.com/>

²⁶ <https://apps.apple.com/us/app/turboscan-document-scanner/id1017559099>



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Another crucial aspect is sharing interpretations. It is helpful to circulate good interpretations through platforms such as YouTube and audio recordings in MP3 or FLAC²⁷ format. Professors can also provide audio or video recordings of the problematic parts of the scores. Additionally, web channels offering masterclasses, such as medici.tv, can be utilised to further enhance the preparation.

Sending professional or concert recordings of pieces provides students with exposure to different interpretations, enhancing their understanding of the music. During the pandemic, students received accompaniment recordings via Partial PlayBack (PPB) from the institution, which proved valuable for preparing chamber music lessons.

The online analytical phase of chamber music preparation can be highly convenient. To optimise this phase:

- sheet music should be centralised in one location;
- corrections in the score or parts must be synchronised for everyone simultaneously;
- a dedicated platform should be provided for each piece (score and parts);
- clearly marking various design parts of the piece during the analysis phase by sharing the score online (differentiating sections harmonically helps students understand their individual roles in greater detail);
- listening to recordings of exemplary performances;

²⁷ <https://en.wikipedia.org/wiki/FLAC>



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- recording students' chamber music sessions and analysing their performances through the recordings.

By incorporating these online tools and practices, the preparation process for chamber music can be streamlined and enhanced, ensuring a comprehensive understanding and effective collaboration among students and instructors.

5.4 Case Study: the Experience of Blended Learning at the Gheorghe Dima Music Academy in Cluj-Napoca

The Gheorghe Dima Music Academy in Cluj-Napoca has been a pioneer in organising study programs for distance education, accumulating over two decades of valuable experience. The team responsible for developing and providing study materials for students has continuously adapted to technological changes, ensuring the effectiveness of the system based on student feedback and outcome evaluations.

The didactic materials from the Distance Learning Department fall into three distinct categories: primary resources, auxiliary materials, and optional resources. The primary resources include coursebooks, music collections, and solfège materials, while auxiliary resources encompass tests, syllabi, and collections of audio examples for music, solfège, and dictation. Additionally, optional elements provide students with extra information, incorporating books and materials from the general bibliography of the coursebooks. The D.I.M.A. platform stands out as a comprehensive multimedia database, offering a diverse range of information, explanations, videos, music, and



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more. This platform, available at www.didamgd.ro, takes the form of a multimedia anthology, allowing users to approach the domain from various perspectives according to their interests.

The Department of Distance Education conducts programs that cover the entire range of subjects in modular form—one module for each semester. These programs include auxiliary and optional materials, as well as ISBN coursebooks. The regular updating of study materials and their adaptation to distance education requirements is a top priority for teachers. This process is closely monitored by those responsible for the study program, ensuring that coursebooks are completed within deadlines and available to students on time.

The distribution of learning resources is managed by a specific department at the Gheorghe Dima Music Academy, which strives to continually enhance existing materials. Media support is provided for disciplines requiring assistance with web-based technology, with the department's e-learning laboratory taking on the responsibility of training teachers and tutors for the design of multimedia materials.

All teaching materials, whether in physical or electronic form, are accessible on the corresponding platform. This dynamic training platform, developed in multi-modules within an object-oriented environment, serves as a Learning Management System (LMS), Virtual Learning Environment (VLE), and Learning Content Management System (LCMS). Users only need a browser (IE, Chrome, Firefox, Opera), an Internet connection, and a compatible operating system (Windows, Mac OS X, Netware, etc.) to access the platform. The information is stored in a database on a central server within the institution.



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Educational resources within the distance education system are meticulously composed to facilitate the achievement of training goals. These resources are structured to correlate intermediary stages of learning with assessment, ensuring that the goals reflect the desired outcome of the teaching activity.

In conclusion, the Department of Distance Learning at the Gheorghe Dima Music Academy employs rigorous procedures for the assessment of study materials. This approach not only facilitates the ongoing improvement of the education system but also provides statistical insights that offer a comprehensive view of the organisational efficiency of the educational process, allowing for corrective interventions where necessary.

5.5 Synchronous Learning in Chamber Music by Networked Music Performance: Definitions, Context, and General Guidelines

The previous sections in Part 5, describe the asynchronous online learning process for the theoretical part of music training, with particular emphasis on chamber music. This approach allows students to view instructional materials each week at any time they choose and does not include a live audio and video lecture component. On the other hand, synchronous online learning means that students are required to log in and participate in class at a specific time. The main difference between asynchronous learning and synchronous learning is this live instruction component occurring at a set time.



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In the IMSV context, Synchronous Learning in chamber music is ensured by Networked Music Performance (NMP). This technique represents such a concept that musicians who are physically separated can carry out real-time rehearsals or concerts across the network with acceptable audio quality. Aimed at solving the aforementioned problems which occur in traditional music performance, NMP is a challenging application where a number of factors complicate this task.

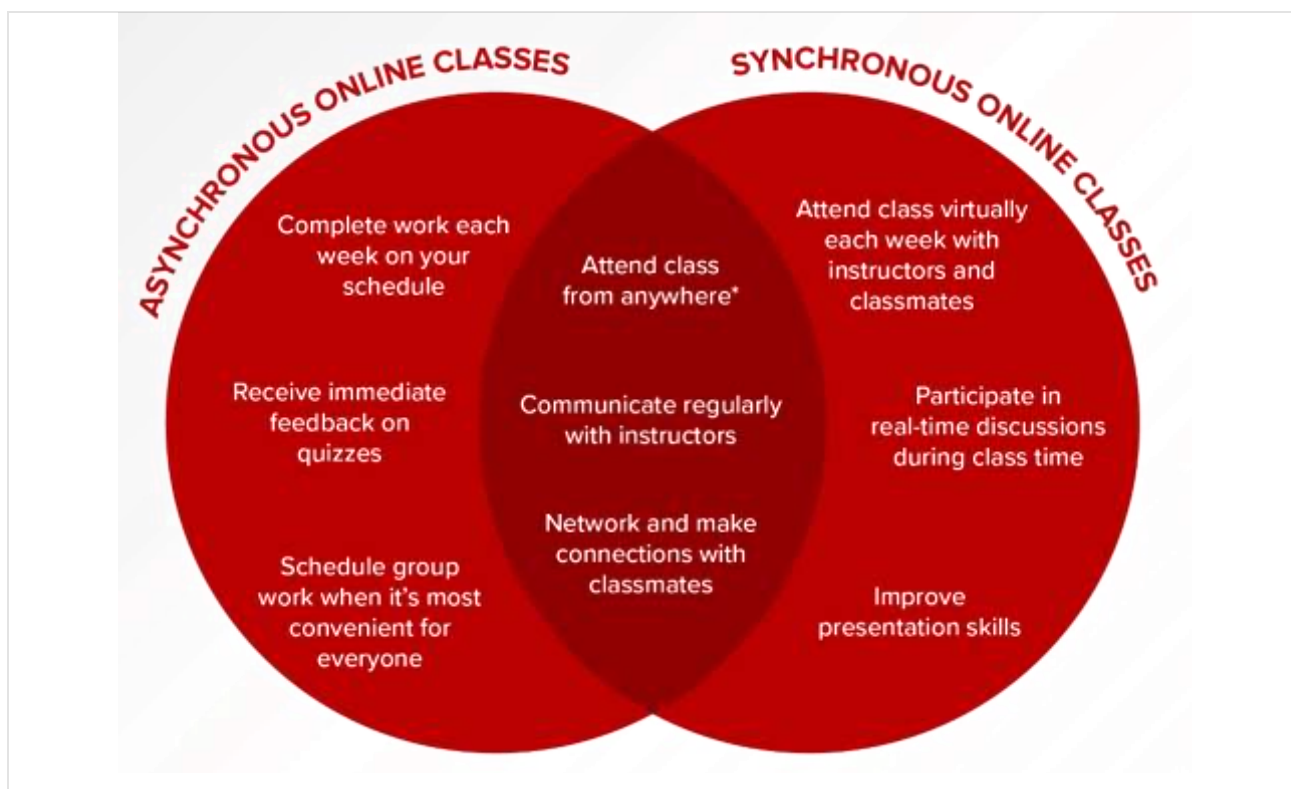


Figure 3 - The merging of synchronous and asynchronous classes in the blended learning model.



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- **Bandwidth demanding** - real-time audio streaming-based teleportation (the type of application NMP belongs to) is one of the most bandwidth-intensive applications in today's networks. Transmission of mono PCM (raw) CD-quality audio requires a data rate of 0.7Mb/s. When stereo/multi-channel or high-definition sound (high sampling rate e.g. 48k/96k/192kHz or better quantized e.g. using 24 bit) is needed, the network can be further stressed. To efficiently use network bandwidth, audio compression represents an essential need.
- **Highly delay-sensitive** - Due to the fact that human hearing is very sensitive to delayed or missing information in music, especially that played on fine acoustic instruments, the pre-buffering mechanism that is common in most Internet music systems today simply will not help when contents are generated on-the-fly and intensive interactivity is a must. NMP tests have indicated that the typical tolerable one-way delay for real-time interactive applications is in the order of 100 ms. In the case of distributed musical rehearsal, the requirement is even more stringent. Jitter is another issue here. If one of the components that are responsible for audio processing does not have data to process or play out, unpleasant stuttering of the audio, ranging from hardly perceptible to intolerable, occurs. For optimal audio quality, jitter must be kept at a minimum and one-way latency has to be controlled at about 50 ms.
- **Strict requirements on audio stream synchronisation** - Due to the characteristics of the application, multiple audio streams from musicians located at different places have to be synchronised to form consistent music presentation. However, various components such as the clocks of the computers, latencies from the sound cards and their drivers, network



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interface cards, and network components, rhythm adjustments among different players, all raise difficulty for synchronisation. This calls for support from both end-systems and networks. Yet, the current source coding mechanisms and the best-effort nature of the Internet pose many challenges on the way to achieve this goal.

Achieving a satisfactory synchronous audio interaction for chamber music within these general guidelines requires meticulous attention to bandwidth considerations, addressing delay sensitivity, minimising jitter, and ensuring robust audio stream synchronisation. These challenges underscore the complexity of implementing NMP but also highlight its potential to revolutionise synchronous learning experiences in the realm of chamber music.



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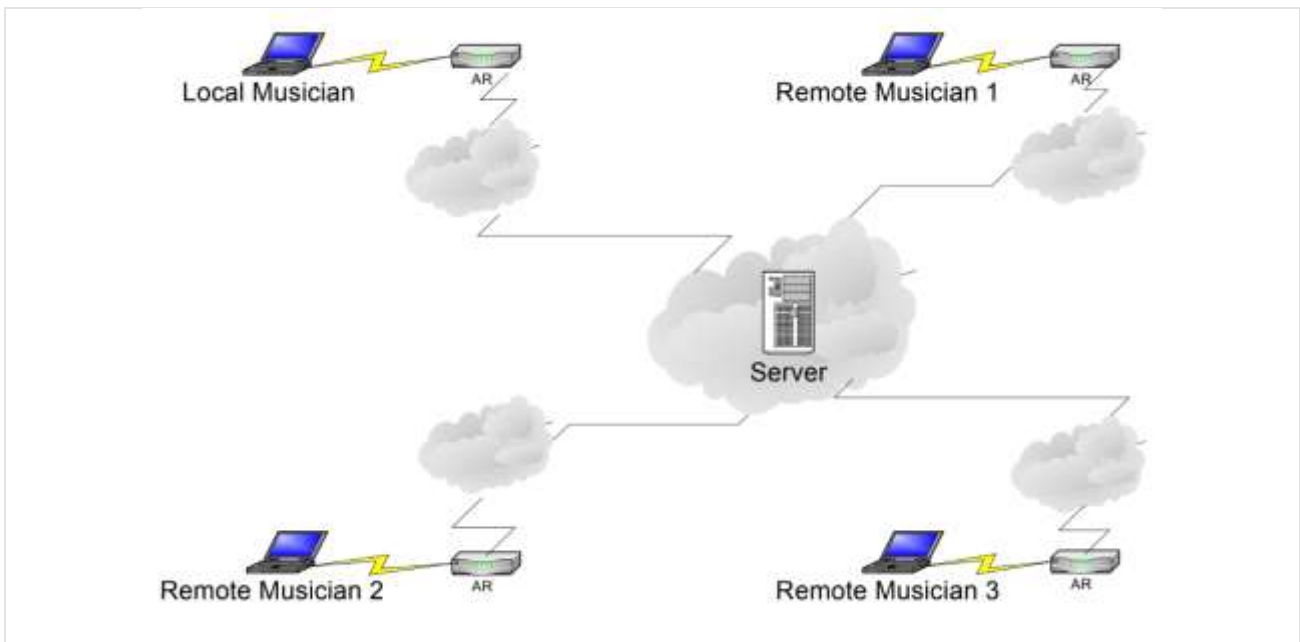


Figure 4 - The server-based approach to NMP.

5.6 Quality of Experience in NMP Sessions

Ensuring the Quality of Musicians' Experience (QoME) in Network Music Performance (NMP) is intricate, influenced by technical, environmental, and psycho-acoustic variables. Although experimental NMP setups on research networks can deliver top-tier audio quality with minimal delay, musicians on public internet connections face bandwidth constraints necessitating a compromise between audio quality and increased delay due to compression. Quantifying musicians' tolerance for audio delay and quality is crucial for striking a balance between them. From a technical point of view, audio information travels along the network in the form of packages. NMP techniques



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are based on UDP internet protocol, that minimise latency by avoiding additional controls on the loss of packets, therefore the loss cannot be avoided. Current research in the IMSV team working on NMP, lead by Andrea Bareggi, is involved in measuring the number of packets lost²⁸ compared to the audio quality obtained by audio recording using the IMSV Jamulus2Reaper²⁹ template by Nicola Cavina and Andrea Bareggi.

²⁸ https://en.wikipedia.org/wiki/Packet_analyzer

²⁹ <https://www.mediafire.com/file/vbe70le8eu8z26e/templateReaper2Jamulus.rpp/file> refers to the Handbook for the use of this template in Reaper



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Conclusion

The "New In Media Stat Virtus Method for Distance Training in Vocal - Instrumental Chamber Music: Guidelines for Training" document provides a comprehensive framework for adapting chamber music education to an online format. It outlines both the challenges and successes encountered in this transition, emphasising the importance of leveraging technology to maintain the quality and integrity of musical training.

Key points from the document include the following.

1. **Integration of Technology** – The document underlines how the use of platforms like Jamulus, Zoom, and Reaper is pivotal in facilitating synchronised online rehearsals and real-time feedback. These tools help overcome some of the inherent limitations of remote learning, such as latency issues and the difficulty of simulating live auditions.
2. **Innovative Teaching Approaches** - The document highlights various innovative methods adopted during the pandemic, such as using pre-recorded materials for initial learning phases and transitioning to live sessions for more interactive and immediate feedback. This approach ensured that students continued to receive a robust education despite the lack of in-person interaction.
3. **Case Studies** - Detailed case studies, such as the experimentation with Ian Clarke's "Curves for 3 Flutes and Piano" and the experience provided by the *Gheorghe Dima Music Academy*, illustrate the practical applications of the IMSV method. These case studies provide valuable



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insights into how online tools can be effectively used to teach complex musical pieces and techniques.

4. **Challenges and Adaptations** - The document does not shy away from discussing the challenges faced during the transition to online learning, such as the difficulties in ear training, dictation, and polyphonic solfeggio. However, it also highlights the adaptability and resilience of both students and teachers in navigating these challenges.
5. **Future Implications** – The document shows how the experience gained from this transition has broader implications for the future of music education. The integration of digital tools is seen not merely as a temporary solution but as a complementary approach that can enhance traditional methods and offer greater flexibility in learning.

In conclusion, the IMSV method provides a detailed and thoughtful approach to distance learning in vocal and instrumental chamber music, offering valuable guidelines and insights that can help educators and students alike navigate the complexities of online music education.



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