Bulletin of the *Transilvania* University of Braşov
Series VIII: Performing Arts • Vol. 18(67) Special Issue – 2025
https://doi.org/10.31926/but.pa.2025.18.67.3.10

Pedagogical Applications of Extended Techniques in Consolidating a Contemporary Flute School (Part 1)

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Abstract: *This paper explores the pedagogical applications of extended techniques in contemporary flute performance and their contribution to a modern flute school. Originating in the avant-garde of the 20th and 21st centuries, these techniques redefine sound production by emphasizing timbre, texture, and unconventional articulation. Their study requires a balanced approach that combines traditional training with experimentation and acoustic awareness. The paper underscores the value of collaborative learning through composer instructions, specialized texts, and practice-based research. It concludes that mastering extended techniques expands the performer's expressive range and supports a renewed aesthetic and pedagogical perspective in flute performance.*

Key-words: *extended techniques, flute pedagogy, contemporary performance, sound production, musical aesthetics*

1. Introduction

Contemporary extended techniques for the flute represent a significant evolution in instrumental performance, offering flutists innovative means to expand their expressive range and engage with modern compositions. Originating in the avant-garde movements of the 20th and 21st centuries, these techniques challenge traditional performance paradigms by prioritizing timbre, texture, and unconventional sound production. As contemporary composers increasingly integrate these techniques into their works, mastering them has become essential for flutists navigating the modern repertoire, whether driven by artistic curiosity or professional necessity.

Learning extended techniques requires a multifaceted approach, blending traditional practice methods with a spirit of experimentation and openness. Unlike standard flute techniques, extended techniques often lack a singular correct

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method of execution. Instead, they demand a personalized exploration of the instrument's acoustic and mechanical possibilities.

This learning process has traditionally been guided by collaborative exploration, drawing on resources such as composer instructions, pedagogical texts, specialist workshops, and recordings. As the boundaries of flute performance continue to expand, these techniques not only serve as tools for interpreting contemporary scores but also empower flutists to contribute their own voices to the evolving language of music.

A fundamental premise of this study is that the traditional conception of the flute – even in the 21st century – as a purely melodic instrument severely limits its vast potential for sonic expression. Robert Dick (Powell 2001), the great American champion of contemporary flute music, explicitly challenges this view in the introduction to his book, *The Other Flute*:

> "I have dropped the following preconceptions usually made about the flute:
>
> 1. The flute has only one basic tone quality and its ability to vary that quality is sharply limited.
> 2. The flute can produce only one note at a time.
> 3. The mechanical construction of the Boehm flute allows the production of only a few microtones" (Dick 1975).

2. Objectives

Given the extensive scope of extended techniques, this study is presented in two parts, organized by technical category. It analyzes the technical and interpretative demands of contemporary flute music and proposes a structured pedagogical framework for its mastery. In response to the continuous evolution of musical language, this systematic approach prioritizes graduated skill development, creative problem-solving, and integration within a musical context.

This study employs a holistic method that analyzes the musical and acoustic basis of extended techniques and formalizes this knowledge into a transferable pedagogical system. The aim is to establish these techniques as essential components of the flute's expressive vocabulary, thereby fostering a deeper understanding of the instrument's full potential for both performers and composers.

3. Categorization and exploration of extended techniques

Mastering extended techniques is a demanding process that depends on a performer's aptitude and receptiveness to unconventional sounds. Although their aesthetic impact is subjective, systematic classification is vital for efficient learning, offering a structured framework for practice.

These techniques largely emerged from the evolving aesthetic needs of contemporary music. Consequently, the modern flutist should adopt an open approach, integrating them as fundamental elements of a comprehensive technical skill set. Their mastery significantly expands a performer's expressive versatility.

As each technique addresses specific elements of performance – such as tone production, articulation, or airflow – categorization enables focused practice and clarifies technical relationships. This structured approach promotes more effective integration into repertoire and supports accelerated technical and artistic development. This first part examines two primary categories: techniques that modify sound quality to produce unconventional tone colors, and those that produce percussive effects and unconventional articulations. A detailed analysis of each category follows.

3.1. Techniques that modify sound quality to produce unconventional tone colors

3.1.1. Harmonics

Among the flute's extended techniques, harmonics are perhaps the most straightforward to conceptualize. A musical sound, or fundamental, is composed of multiple pure tones at different frequencies. The specific distribution of these frequencies decides the sound's unique color, or timbre, which is why the same note sounds different on a flute versus a violin.

A complex sound makes up multiple frequencies, or *partials*. A *harmonic* is a partial that is a whole-number multiple of a fundamental frequency, while an overtone is any partial above the fundamental (the first overtone is the second partial). The flute's characteristically pure timbre results from its relatively weak overtone content. A flutist produces a harmonic by suppressing the fundamental and lower overtones, thereby isolating a specific overtone to be perceived as the primary pitch. While a single fundamental can generate multiple harmonics, a single audible harmonic can also be produced from different fundamentals, with each fingering influencing the resulting timbre.

For composers, two key considerations arise. First, higher harmonics show greater resistance, making their production from a low fundamental at soft dynamics particularly difficult. Second, the suppressed lower overtones of a chosen fundamental can create subtle dissonances with the surrounding harmony.

For performers, harmonics is a vital practice tool. Their pure intonation, especially on perfect intervals, makes them ideal for ear training. Furthermore,

their practice develops a resonant top register, improves soft dynamic control in the third octave, and is essential for cultivating a steady, focused tone, given the abundance of harmonic possibilities in the flute's high register.

3.1.1.1. A technical approach to the use of harmonics in the contemporary flute repertoire

While the use of harmonics on string instruments like the violin is a long-standardized technique, its integration into flute composition has been slower, and its notation is less established. Composers are sometimes unfamiliar with the flute's harmonic series and may not specify fingerings for requested harmonics. In such cases, the flutist must select the proper fingering based on two primary factors: the harmonic context of the passage and the desired character of the note.

This situation is illustrated in Figure 1 from Luciano Berio's *Sequenza I* for solo flute, where a harmonic on C_6 is requested without a specified fingering. This pitch can be produced from two different fundamentals: C_4 or F_4. Since the C_6 in this passage has no specific harmonic function and must be played at a very soft dynamic, the fundamental F_4 is the optimal choice. The harmonic C_6 derived from F_4 requires less effort to produce, resulting in superior tone control at a quiet volume.

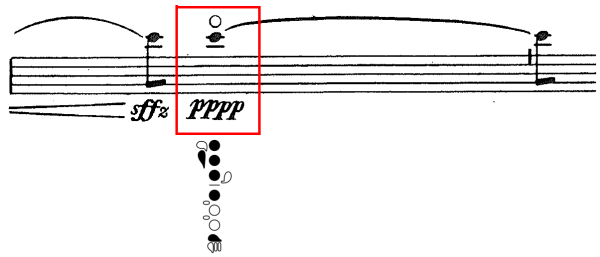

Fig. 1. *Choosing harmonics fingerings in Luciano Berio's "Sequenza I"*

3.1.2. Whistle tones

Whistle tones produce extremely soft, high-pitched sounds by directing a minimal, focused airstream across the embouchure hole. This technique creates localized vibration at the hole's edge, as insufficient air pressure prevents full engagement of the air column. Acoustics, whistle tones isolate a single high overtone from the fingered fundamental's harmonic series, often producing pitches beyond the flute's standard range. The resulting sound is dynamically limited and may be unstable or focused, characterized by an ethereal quality used in contemporary music for creating atmospheric textures.

3.1.2.1. A technical approach to the use of whistle tones in the contemporary flute repertoire

The ethereal timbre of whistle tones is the primary reason for their inclusion in contemporary repertoire. Beyond their coloristic effect, they can also be used to produce pitches freely selected from the harmonic series of a given fundamental.

Unless otherwise specified in the score, the fingerings for whistle tones correspond to those of their standard-pitch fundamentals. This principle is shown in Figure 2 from Mexican composer Mario Lavista's (Miranda Perez 2001) *Canto del Alba* for amplified solo flute. The outer whistle tones in this passage use the standard fingerings for B_6 and $F\sharp_6$. The inner whistle tones, however, are produced using the fingering for the diamond-notated B_3 below the staff. This distinction differentiates between natural whistle tones (derived from standard fingerings) and harmonic whistle tones (derived from a specified fundamental fingering, often notated with a diamond).

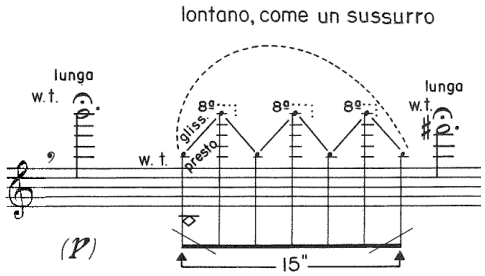

Fig. 2. *Whistle tones in Mario Lavista's "Canto del Alba"*

This 15-second passage is particularly challenging. In addition to producing the whistle tones, the flutist must execute a glissando that moves between the approximate partials shown in the score. This demands a highly flexible yet stable embouchure and excellent tonal control. The composer reinforces the ethereal character with the expression marking *lontano, come un sussurro* („distant, like a whisper"). This instruction is intended to evoke the soft, atmospheric effect of a breeze blowing through a bamboo field.

3.1.3. Aeolian (airy) sounds

Aeolian sounds, also called airy sounds, reconnect the flute with its most elemental source: the sound of wind itself. While modern flute playing often aims for a clear, pure" tone free from breath noise, this historical texture is a valuable expressive resource. Technically, aeolian sounds are created by emphasizing the flow of air itself over the creation of a stable pitch. The flutist produces a breathy,

atmospheric tone by directing the airstream so that most of it passes over the embouchure hole rather than into it, preventing the air column inside the flute from vibrating fully.

The resulting sound is a cluster of low, airy pitches. This effect resonates most effectively within the flute's first octave, from B_3 to $D\sharp_5$ (on flutes with a B-foot). While the range can be pushed up to $F\sharp_5$ by using the trill keys, the sound becomes less stable and more difficult to control at these higher pitches.

For the flutist, practicing this technique offers significant benefits beyond its use in contemporary music. The physical control required to manage the airstream also helps build a stronger, more flexible embouchure and improves overall breath support.

3.1.3.1. A technical approach to the use of aeolian sounds in the contemporary flute repertoire

The inherently intangible quality of aeolian sounds makes them a compelling resource for contemporary composers looking to imbue passages with an air of mystery and subtlety. However, American French composer Drake Mabry,[2] takes a different approach by using aeolian sounds as the primary mode of sound production in his piece *5.4.88* for amplified solo flute.

In Figure 3, Mabry constructs a melody of a somewhat melancholic character entirely from aeolian sounds. Despite the limited dynamic range – spanning only from *piano* to *mezzo-piano* – the passage demands clear articulation to ensure the melodic line is perceptible and undisturbed.

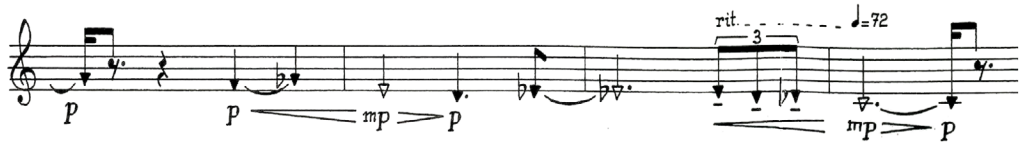

Fig. 3. *Melodic use of aeolian sounds in Drake Mabry's "5.4.88", m 165-168*

3.2. Percussive effects and unconventional articulations

3.2.1. Flutter-tonguing

Flutter-tonguing is one of the oldest and most established extended techniques for the flute. Known as *frullato* (Italian) and *Flatterzunge* (German), it is now

[2] See https://www.universaledition.com/en/Contacts/Drake-Mabry/

considered a standard part of the flutist's technique, appearing often in orchestral, chamber, and solo repertoire.

This technique produces a tremolo effect through rapid, percussive articulation. It can be executed in two primary ways: by rolling the tongue against the hard palate just behind the teeth (as in a strongly pronounced „R"), or by producing a guttural sound from the back of the throat (as in "Grrr"). Composers rarely specify which method to use, leaving the choice to the flutist's discretion based on personal facility and the musical context. Two key factors should guide this decision:

First, the flutist's native language can be a determining factor. Speakers of languages with a rolled „R" (such as Spanish or Italian) typically produce a more defined and articulate tremolo. In contrast, speakers of languages with a softer „R" (such as French or English) often default to the guttural method.

Second, the flute's register is a crucial consideration. The sharper, more defined articulation of the rolled-tongue method is most effective in the high register, while the softer, more diffused quality of the guttural method blends better in the delicate low register.

3.2.1.1. A technical approach to the use of flutter-tonguing in the contemporary flute repertoire

Flutter-tonguing is commonly used to add textural complexity to the flute's sound. The tremolo effect it creates introduces a layer of musical tension, excitement, or agitation, which typically resolves only when the technique ceases or the flute returns to a natural tone. As a precisely defined technique, flutter-tonguing offers performers little room for subjective interpretation about its execution.

Some of the most demanding applications in the contemporary solo flute repertoire involve executing flutter-tonguing at extreme dynamics across the instrument's full range. A prime example is found in Luciano Berio's *Sequenza I* for solo flute. In this passage, a rapid flutter-tongued line begins on a high $B\flat_6$ at *fortissimo*, descends to a sustained A_4 marked *ppp*, and then abruptly returns to a natural tone (see Figure 4).

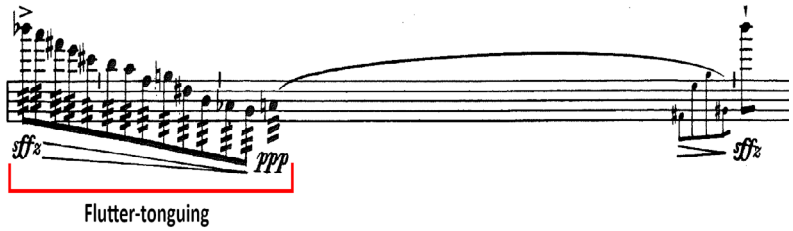

Fig. 4. *Flutter-tonguing in Luciano Berio's "Sequenza I"*

3.2.2. Key slaps

Key slaps, also called key clicks, are a percussion technique where the flutist strikes the keys firmly to produce a pitched sound. This effect can be produced in two main ways: either without any airflow for a dry, percussive sound, or combined with a fingered note played with the breath for a sharp, „popping" articulation.

Due to their inherently quiet nature and limited dynamic range, key slaps are most effectively used in solo music, where they will not be overshadowed by other instruments. Composers typically use them to reinforce rhythmic patterns or to add a distinct attack to specific notes. An important acoustic limitation is that, without a supporting airstream to create resonance, key slaps only produce a clear pitch within the flute's first octave, from B_3 to C_5.

The technique holds a significant place in history. Its most notable early use, and the first documented use of any extended technique in the solo flute repertoire, is in Edgard Varèse's *Density 21.5*, where key slaps are integrated into a rhythmic pattern (see Figure 5).

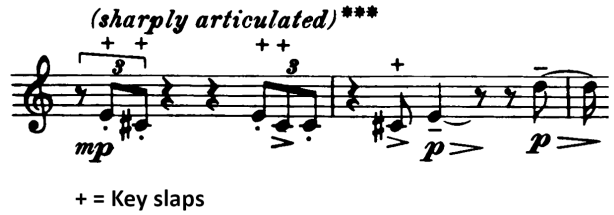

Fig. 5. *Key slaps with sound in Varèse's "Density 21.5 for solo flute"*, *m 24-26*

Two more variations extend the technique's sonic possibilities. Performing a key slap with the lips withdrawn from the lip plate raises the resulting pitch by about a semitone. Completely covering the embouchure hole during the slap on a C flute lowers the resulting pitch by approximately a major seventh.

3.2.2.1. A technical approach to the use of key slaps in the contemporary flute repertoire

As previously noted, key slaps hold the distinction of being the first extended technique incorporated into the flute repertoire. During the early 20th century, composers and performers began experimenting with new methods to add texture and create a sense of polyphony on the monophonic flute. One effective strategy was the use of rhythmic key slap patterns to simulate percussive accompaniment.

This application is illustrated in Figure 6 from Drake Mabry's *5.4.88* for amplified solo flute. Here, the composer employs key slaps in *pianissimo* rhythmic

patterns, alternating with other extended techniques to evoke the sound of a distant percussion instrument. Despite their inherently limited dynamic range, the flutist should approach key slaps with the goal of emulating a pitched percussion instrument, striving for a steady and resonant quality in their execution.

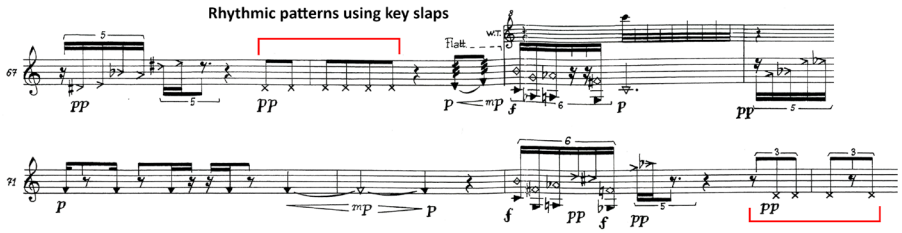

Fig. 6. *Key slaps in Drake Mabry's "5.4.88"*, *m 67-74*

3.2.3. Pizzicato

Like key slaps, *pizzicato* is an extended technique that produces sound without an airstream. Its name is borrowed from the plucking technique used on string instruments. On the flute, it creates a dry, percussive effect through hard articulation.

The technique offers two distinct articulations: a sharp „whipping" sound from the tongue and a softer „popping" sound from the lips. Like other airless techniques, *pizzicato* produces pitched resonance primarily within the flute's first octave (B_3 to $D\sharp_5$), with possible extension to $F\sharp_5$ using the trill keys, though with decreased stability.

Some important considerations include the variable maximum speed of successive *pizzicati* between performers and the technique's inherent acoustic limitations – specifically, its narrow pitch range and limited resonance due to the absence of sustaining air. While a related effect called *sputato* („spit tongue") can simulate this articulation up to C_6, it employs a different production method. *Pizzicato* is most effectively used in defined rhythmic patterns where its percussive character can be clearly perceived.

3.2.3.1. A technical approach to the use of pizzicato in the contemporary flute repertoire

Pizzicato appears often in the contemporary flute repertoire. Composers often integrate it directly into the melodic line, blending it with other extended techniques or conventional sounds to create hybrid textures.

This melodic application is shown in the introduction to Drake Mabry's *5.4.88* for amplified solo flute. As shown in Fig. 7, Mabry assigns a melodic function to the *pizzicato*, weaving it into the primary thematic material. This approach elevates the technique beyond a mere percussive effect, using it instead to enrich and change the flute's textural palette.

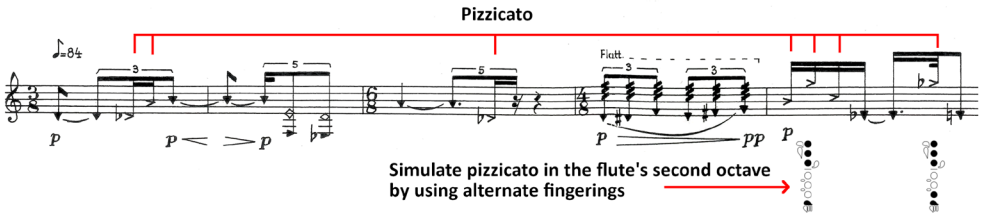

Fig. 7. *Melodic use of pizzicato in Drake Mabry's "5.4.88", m 1-5*

3.2.3.2. Practical applications of pizzicato in the standard flute repertoire

While *pizzicato* is often explicitly notated in contemporary works, one of its most common applications in standard flute repertoire is found in transcriptions of music originally for instruments like the violin, guitar, or harp, where plucking is a fundamental technique. A prime example is French virtuoso Patrick Gallois's transcription of Niccolò Paganini's *Caprice No. 24, Op. 1*. In the original violin version, Paganini's Variation IX employs a demanding combination of left-hand and right-hand *pizzicato*.

This rapid, unbroken sequence of *pizzicati* presents a considerable challenge for flutists. Gallois's ingenious solution, as shown in Fig. 8, is to combine tongue *pizzicato* articulated with double *staccato* and key slaps, effectively replicating the violin's sharp, plucked articulation.

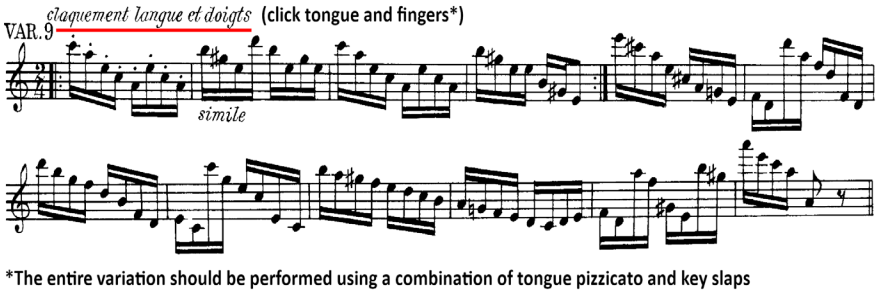

Fig. 8. *Tongue pizzicato and key slaps in Niccolo Paganini's "Caprice No. 24, Op. 1"*

True *pizzicato* is ineffective above D♯5, as it depends on the lower register's resonance. In this passage, however, the *sputato* technique can simulate the effect from C5 upward. When paired with light key slaps – as Gallois's transcription specifies – this combination produces the sharp, percussive attack needed to emulate a plucked string.

3.2.4. Tongue-ram

The tongue-ram is an extended technique that produces a strong, percussive sound. As the name implies, the effect is created by forcefully articulating the tongue against the back of the upper teeth while the lips seal the embouchure hole. This action propels a small, quick burst of air – often just the air present in the mouth cavity – into the flute.

Due to the short airstream and the sealed embouchure, the technique produces a resonant pitch that sounds approximately a major seventh below the fingered note on the C flute. For clarity, composers typically notate both the fingered pitch and the resultant sounding pitch in the score.

Like other percussive techniques, the tongue-ram is only effective for producing pitched resonance within the flute's first octave, from B3 to C♯5, as it relies on a minimal airstream with the embouchure hole covered. Its range can be exceptionally extended to D♯5.

3.2.4.1. A technical approach to the use of tongue-ram in the contemporary flute repertoire

Composers employ the tongue-ram to reinforce rhythmic structure while adding a layer of pitched resonance, making it effective for emulating percussion instruments like tom-toms. This application is clearly proven in a scherzo-like section from Drake Mabry's *5.4.88* for solo amplified flute (see Fig. 9). Here, the tongue-ram forms a rhythmic pattern that supports the main voice, combined with other extended techniques such as aeolian sounds and glissandi. A particular complexity arises from *appoggiaturas* that must be played simultaneously with the tongue-ram, requiring precise execution to keep the integrity of the rhythmic structure.

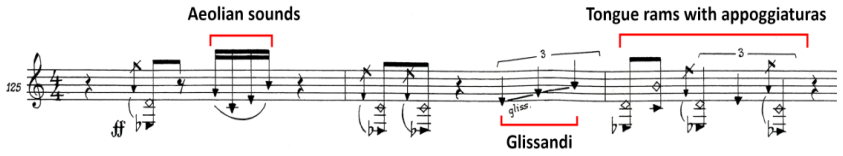

Fig. 9. *Tongue-rams in Drake Mabry's "5.4.88", m 125-127*

The notation in this excerpt is also instructive: diamond-shaped noteheads indicate the fingered notes, while triangular noteheads below represent the approximate resulting pitches. When a composer uses a specialized notation system for extended techniques, they must provide a clear explanation in a performance notes section, as Mabry does in his score.

3.2.5. Jet whistle

The jet whistle is an extended technique that produces a loud, shrill sound reminiscent of a jet engine. It is executed by blowing a fast, forceful airstream into the flute while the lips completely seal the embouchure hole, resulting in a noisy glissando that can sweep upward, downward, or in both directions.

This technique requires considerable and rapid exhalation to generate the effect. Consequently, it cannot be sustained for long periods of time and is generally only practical on the C flute. The resulting pitch sounds approximately a major seventh below the notated pitch. The physical gesture for producing a jet whistle is like that of the tongue-ram, though it involves a much greater volume of air.

3.2.5.1. A technical approach to the use of jet whistles in the contemporary flute repertoire

The opening phrase of Mexican composer Aldo Rodríguez's *Ciudad de Cruces* for amplified flute and electronics features a series of three consecutive jet whistles. During the author's collaboration with Rodríguez, the composer clarified that these initial gestures were intended to set up a mood of despair and anguish that permeates the entire work[3].

Rodríguez emphasized that these opening sounds should be perceived as visceral gestures rather than conventional flute tones. The author's solution was to use jet whistles, whose effect resembles three deep, progressively heavier sighs. After testing this approach with amplification and sound processing, the jet whistle proved to be the most effective choice.

In Fig. 10, these gestures are notated without an explicit „jet whistle" instruction. Instead, Rodríguez uses the marking *attaca subito* to show a sudden,

[3] Composer Aldo Rodríguez dedicated *Ciudad de Cruces* to the author in 2007. Throughout the writing process he frequently consulted him on the proper use of extended techniques. He asked which techniques would best suit the effects he imagined while composing, and together with the author tested various options repeatedly to listen the results, both acoustically and after they had been put through sound processing software.

striking gesture of profound pain. This direction is complemented by the performance marking *Lent et trés espressif... comme un plagaire doloreuse* [sic][4].

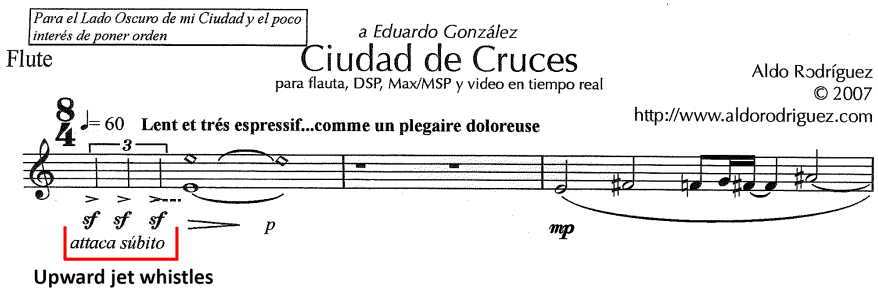

Fig. 10. *Use of jet whistle in Aldo Rodríguez's "Ciudad de Cruces", m 1-3*

4. Conclusions

The contemporary flute repertoire demands that performers develop three interdependent competencies: advanced notational literacy to interpret complex scores, kinesthetic awareness to coordinate gesture with sound production, and technological ability to integrate electronics. Given these expanded demands, a structured pedagogical approach is essential. Beyond technical skill, flutists bear an ethical responsibility to cultivate a reflective awareness of the aesthetic values underlying their technical choices, ensuring extended techniques serve expressive intent rather than mere novelty.

In response to this need, this study has proved how extended techniques can be integrated into – and enriched by – performance practice. This integration marks a decisive step toward a „new school" of flute performance, one that embeds physical interpretative intelligence, digital literacy, and acoustical experimentation into its core pedagogy, thereby challenging preset standards to redefine excellence.

Each category of extended technique has been illustrated with practical case studies from the contemporary repertoire. By combining theoretical explanation with annotated musical excerpts, this paper enables flutists to grasp the acoustic and technical basis of each technique within a musical context and apply it directly in performance. The analysis of these works confirms that interpretative aesthetics

[4] The term *plagaire doloreuse* is a typographical error in the printed score. The composer's intended expression was *prière douloureuse* (painful prayer).

have decisively diversified, leading performers to embrace timbral mutation, spatial gesture, and sonic layering as tools equal in importance to the melodic line.

Rather than treating extended techniques as optional effects, this paper positions them as central to a modern flute curriculum. It concludes that a cultural reorientation is necessary: extended techniques must be taught alongside traditional fundamentals like tone, articulation, and phrasing, recognized as innate elements of musical literacy for the twenty-first century.

5. References

Dick, Robert. 1975. *The Other Flute: A Performance Manual of Contemporary Techniques*. New York: Oxford University Press.

Miranda Pérez, Ricardo. 2001. "Lavista, Mario." *Grove Music Online*. https://www.oxfordmusiconline.com/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000045207

Powell, Ardal. 2001. "Dick, Robert." *Grove Music Online*. https://www.oxfordmusiconline.com/grovemusic/display/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000042647

"Works by Drake Mabry". Accessed January 21, 2025. https://www.universaledition.com/en/Contacts/Drake-Mabry/

Music scores

Berio, Luciano. 1958. *Sequenza I: per flauto solo*. Milan: Edizioni Suvini Zerboni.

Lavista, Mario. 1980. *Canto del alba: para flauta amplificada*. México D.F.: Ediciones de Música Mexicana.

Mabry, Drake. 1990. *5.4.88: pour flûte amplifiée.* Paris: Editions Musicales Transatlantiques.

Paganini, Niccolò. 1992. *24 Caprices, Op. 1 Pour Flûte*. Paris: Alphonse Leduc.

Rodríguez, Aldo. 2007. *Ciudad de Cruces: Para Flauta, DSP, Max/MSP y Video En Tiempo Real*. Culiacán: HDM Music.

Varèse, Edgard. 1946. *Density 21.5*. New York: Colfranc Music Publishing Corporation.