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**PEDAGOGICAL TECHNOLOGIES
TO IMPROVE THE SOUND EXTRACTION IN
THE UPPER REGISTER OF THE SAXOPHONE**

ABSTRACT

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The dissertation has **187 pages**, of which 158 - main text and 29 – Appendices. The list of the used literature consists of 124 sources, 8 Bulgarian and 116 foreign, in Latin.

The main text contains an Introduction, three chapters and a Conclusion. It includes 12 tables, 35 figures (photographs) 18 diagrams and 28 music examples.

Chapter One reflects the fulfilment of the first of the main tasks of the dissertation, namely: the study of the evolution of the instrument and the state of the art of the problem of sound extraction in the upper register of the saxophone. **Chapter Two, which** is essentially a theoretical elaboration of the unsolved problems identified in the study of the methodological literature.

The third chapter presents the empirical verification of the system of pedagogical technologies for the improvement of the sound production in the upper register of the saxophone, realized by conducting a pedagogical experiment in three stages: Initial, Formative and Final.

The conclusion of the thesis presents some of the more important summaries of the research results and conclusions.

The dissertation was discussed and directed for defense by an extended council of the Department of Music at the Faculty of Education of Plovdiv University “Paisii Hilendarski”.

The defense of the dissertation will take place at a meeting on 27.06.2024 at 12:30 pm in Meeting Hall No. 505 of Paisii Hilendarski University.

The materials on the defense are available at the administrative secretary of the Departments of Music and Aesthetic Education, Faculty of Education, 115, PS “Paisii Hilendarski”.

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INTRODUCTION.

Object, aim, objectives, methods and hypothesis of the study

The saxophone is a relatively young musical instrument. It was created in the 1840s, but its material, mechanics, and technical capabilities continue to improve to this day. The saxophone performs the function intended by its creator, Adolphe Sax, as a unifying link between woodwind and brass instruments. Its widest use and most rapid development has been in jazz and genre music. In an ensemble, the four most common types of saxophone-soprano, alto, tenor, baritone-can perform both melodic passages and harmony equally well.

Achieving a quality tone on this instrument is the result of the complex action of multiple factors. Among these are the ability to play with a sufficient flow of air (proper, controlled breathing); the appropriate selection of instrument, mouthpiece, and cloths; the correct ambushing; etc. The performer must be well versed in the instrument's application and overblown tones, and spend time daily practicing, achieving results that open new and new horizons to the vast possibilities of this wonderful instrument.

In his many years of performance and teaching practice, the author of the present study has found that the most common deficiencies in tone quality occur in the upper register of the saxophone, called "altissimo." Only some fragmentary guidelines and pedagogical techniques are found in saxophone teaching methodology, but they are incomplete and extremely insufficient to achieve tone quality in this register.

In the available foreign methodological literature for saxophone used in this country, American and Western European editions, the problem of sound production in the altissimo register is

mainly directed to performers with already developed skills at a high level and focuses mainly on fret boards and short exercises for advanced players. In Bulgaria, this problem is addressed only in the saxophone school of Dimitar Simeonov, in the form of a fretboard, without any methodological guidelines for application.

In the methodology of saxophone training, there is a dearth of more extensive and in-depth theoretical research and studies aimed at bridging the gap between short exercises and the needs for solo repertoire.

The absence, in saxophone teaching, of sufficiently specific pedagogical technologies for the improvement of sound production in the upper register of the saxophone implies the use of the current approach, which does not exclude the application of some partial requirements and general methodological recommendations in the work, but is based primarily on intuition, as well as on the expectation that the improvement of the student's sound production will develop by itself over the years. Its main drawbacks are that it is uneconomical in time and that a positive result with it is rather a random phenomenon.

The facts listed so far justify the author's interest in the topic of the present work and the conviction that such a study would contribute to the expansion and deepening of theoretical knowledge, as well as be of practical use in teaching the saxophone.

The main thesis of the present work is that the mastery of the basics and the improvement of the technique of sound extraction in the saxophone, and in particular in its upper register, takes place according to certain, clearly formulated rules, which should be known and followed. Along with the knowledge and observance of these rules, an important condition for a qualitative result is the systematic work on the tone quality both during the lesson and in

the independent preparation, with clear and precise instructions from the teacher. The formulation of this thesis is based on:

- personal observations on the performances of famous saxophonists;
- theoretical knowledge acquired from specialized literature;
- own many years of teaching and performing experience.

The subject of the dissertation is a specific problem in the field of saxophone teaching methodology, namely the mastery by students of this instrument of the fundamentals and improvement of the sound production of the saxophone and in particular – in the altissimo register. The choice of the subject is conditioned by:

- the weaknesses observed in the performance practice in our country in terms of the technique of sound extraction and consequently reflecting on the quality of tone and the final artistic result;
- the lack of sufficient clarity in the theoretical literature on the technique of sound extraction, the absence of fully defined rules for mastering its elements and the lack of a specific system of technologies for improving sound extraction in the methodology of saxophone teaching.

The object of the study is the process of saxophone training of students studying the Special Subject Saxophone, majoring in Jazz and Pop Performing Arts at Paisii Hilendarski University of Performing Arts and Assen Diamandiev Academy of Performing Arts in Plovdiv.

The aim of the present study is to formulate pedagogical technologies, through which in the process of training, on the one hand, to improve the technical competencies of the students of saxophone to improve the sound production in the upper register of the instrument, and on the other hand, to expand the possibilities

of the students to perform prominent solo passages and their application in the improvisational parts in the interpretation of musical works.

The main tasks for the realization of the objective thus formulated are:

1. To study the history and evolution of the instrument and its application in different styles of music.

2. To investigate the state of the art in the methodological literature on the problem of sound extraction in the saxophone and in particular in its upper register, identifying which issues have been resolved so far and which need further research.

3. To systematize the issues of the sound extraction technique and in particular the altissimo register by defining rules and indicating practical algorithms for its mastering.

4. To compose pedagogical technologies for improving the sound production in the upper register of the saxophone in the process of training.

5. To conduct a pedagogical experiment to practically test the effectiveness of technologies for improving the upper register of the saxophone in teaching saxophone at the advanced level.

Research methods: pedagogical observation, analysis (of theoretical, visual and sound information), abstraction, comparison, generalization, pedagogical experiment.

The methodology of the study is based on the belief of the subordination of the elements of technical skills and their dependence on the quality of performance, i.e., strict coordination of all elements in the overall system:

Research hypothesis: “the application of pedagogical technologies to improve the sound production in the upper register of the saxophone in advanced saxophone training would contribute:

- To improve the effectiveness of training to master the altissimo registry;
- for the overall technical development of the students and for the improvement of the artistic performance."

1. CHAPTER ONE.

A STUDY OF THE EVOLUTION OF THE INSTRUMENT AND THE STATE OF THE ART OF THE SAXOPHONE UPPER REGISTER SOUND PRODUCTION IN THE SPECIALIZED LITERATURE

Chapter One reflects the fulfilment of the first of the main tasks of the dissertation, namely: to investigate the evolution of the instrument and the state of the art of the problem of upper-register saxophone voicing in the specialist literature, identifying which issues have been addressed to date and which need further investigation. 8 Bulgarian, 93 foreign publications and 23 websites were studied.

There are 77 theoretical sources, 8 are sheet music editions and 16 are teaching aids related to the high register of the saxophone.

1.1. History and evolution of the saxophone from its inception to the present day

The first section of this chapter presents the results of research into the history and evolution of the saxophone from its inception to the present day, covering Adolph Sax's original patents, the development of the saxophone in the early 20th century – the emergence of the modern saxophone, and its application to different styles of music.

1.2. A study of the problem of the upper register of the saxophone in the methodological literature

Chapter One presents the results of the research on the problem of sound extraction in the upper register of the saxophone, in the methodological literature related to:

- altissimo
- using advanced techniques such as sound effects and
- using overtones in the voicing of the altissimo register.

1.3. Sigurd Rascher – contribution to the development of the upper register of the saxophone (altissimo)

The third section of Chapter One presents Sigurd Rascher's contributions to the development of the altissimo register-Rascher's concept of quality tone, mouthpiece selection, and technology for mastering the high register of the saxophone.

1.4. Generalizations and conclusions

The altissimo registry, which became widely popular in the late 20th and early 21st centuries, took years to master. Even after that, work must be done continuously to ensure that the skill is not lost. The physical and mental aspects of learning the upper register of the saxophone helps to understand why this is one of the best practices for a saxophonist to cultivate in order to improve their skills. Rascher's view that the altissimo register requires dedication on both a physical and mental level proves the difficulty of this technique. He believes that even after memorizing all the fingerings for the high tones, without awareness and hearing the exact tone, reproduction will be very difficult. It can even be said that instrumentalists who think they have mastered the technique sometimes hesitate when playing in their performances.

Moments of contribution in the development of the problem of mastering the high register of the saxophone

Fingertip indications are found in almost all sources, some of which match tones in the working range of the instrument, while others are radically different. While in Sigurd Rascher and Eugen Rousseau the air jet plays an essential role in the sound production in the upper register of the saxophone, Liebmann considers the position of the larynx to be more important, and Rosemary Lang even gives indications for the ambushed position, even touching on the position of the tongue. For the first time, Rascher writes about the importance of “imagining” each tone in the altissimo register and “inner hearing,” and Steve Lacey believes that prior preparation to build this “inner hearing” is a priority for any saxophonist. Regardless of the difference in the initial approach, everyone claims that mastering the first few steps takes a long time and is very labor intensive.

Issues not clarified and subject to further elaboration

In general, questions of pedagogical technology in the field of altissimo register have been little explored, since for a very long time playing off-guitar tones was considered only part of the “extended techniques”. It was thought that their use was an effect rather than an actual increase in the range of the saxophone. Over time, however, more and more saxophonists became interested in the upper register of the saxophone. They included it more and more in their performances, both in the jazz repertoire and in classical works. Although Jean-Marie Londeix made the subject significant as early as the end of the 20th century, it still remains under-explored. Until then, the most detailed work in the field of altissimo register remained that of Rascher, while the others partially dealt with various elements, and not always sufficiently elucidated. Often, pedagogical techniques for mastering the upper register of

the saxophone are briefly mentioned in teaching manuals that deal with other elements of saxophone instruction.

The results of the study indicate that:

1. There is no unified opinion about the fingering in the high register of the saxophone; there are even diametrically opposite indications in different sources.

2. There are contradictions related to the performer's breathing and the ambusher.

3. Tone quality, dynamics and phrasing are not affected.

4. There is a lack of guidance on the selection of appropriate mouthpiece and cloth to facilitate the process of sound extraction in the altissimo register. Only Rascher addresses the issue of mouthpiece selection, but only as a construction of sonic timbre in the saxophone. His guidelines concern the working range of the instrument rather than the altissimo register.

5. There is no uniform terminology worldwide associated with the high register of the saxophone. Some of the authors of works related to pedagogical technology in this field use the term “altissimo”, Rascher insists on calling them “top tones”, and others call them off-fret tones, “flageolet”, “alternative fret”, etc.

6. The Bulgarian textbooks do not cover the topic at all. This problem is touched upon only in Dimitar Simeonov's Saxophone School, in the form of a stave grif, without any methodological instructions for its application. No works are offered, not a single technical exercise, nor any sheet music in this direction.

7. There is very little music literature such as etudes and plays. All the editions are foreign and are limited to transcription of individual solos from the pop and jazz repertoire, a few sheet music editions with etudes in classical contexts, which do not work in

jazz saxophone teaching because of the differences in understanding of rhythmic and phrasing.

The results of the study categorically establish the absence of a system of pedagogical technologies for improving the upper register of the saxophone in Bulgaria, which justifies the need for the development of such in the present

2. CHAPTER TWO. PEDAGOGICAL TECHNOLOGIES FOR IMPROVING THE SOUND PRODUCTION IN THE UPPER REGISTER OF THE SAXOPHONE

Chapter two is a theoretical elaboration of the unsolved problems identified in the methodological literature review.

It presents performance techniques as well as suggestions for selecting equipment suitable for forming a quality tone in the saxophone and in the altissimo register in particular. **The following issues are covered:**

2.1. Ambush – types of ambush staging in historical perspective

The origin of the term Ambushur, the meaning and the development of the Ambushur staging historically are explained.

2.1.1. Muscles responsible for the functions of the oral cavity and parts of the oral cavity associated with the embouchure system in saxophone sound production

In order to make clearer the importance of the embouchure system, which is inextricably linked to sound production in the saxophone in all registers, it is helpful for students to be familiar with the muscles responsible for the functions of the oral cavity, as well as the structure of the oral cavity itself. It is a good idea to cover only those muscles and parts directly involved in the formation of the embouchure, so as not to overload the student with unnecessary information, as this may demotivate him.

To get the correct ambuchure in the upper register of the saxophone requires a thorough study and use of the ambuchure in the middle and then lower register of the saxophone, starting with the middle register where the voicing is easiest. This should be done

gradually and methodically, without haste, so as not to make mistakes that are then difficult to overcome. The question of the choice of the appropriate mouthpiece and cloth, which is strictly individual for each instrumentalist, must be made very clear. Methodical supervision by the teacher is required, starting initially with more closed mouthpieces and lighter cloths, and subsequently varying according to the different stages of the student's development.

2.1.2. The choice of mouthpiece and plate – an important condition for the formation of quality tone in the saxophone and in particular in the altissimo

The mouthpiece is a small but vital component of the saxophone, having a huge impact on the qualities of sound the instrument produces as well as the comfort while playing. Choosing the right mouthpiece for your desired style could present a major challenge, due to the ever-growing array of brands and models available on the market today. All of the mouthpieces described in this work are suitable for the high register of the saxophone and are the result of years of research by the author in the field of the altissimo register.

The thesis also describes:

1. The main materials used by the manufacturing companies.
2. Openings on the top and comparison tables for them.
3. The length of the side rails.
4. Chamber volume and chamber opening and their effect on sound.
5. Recommended combinations of tip opening and cloth stiffness.
6. How the length of the rails affects the sound
7. Choosing a mouthpiece for jazz, also suitable for the altissimo register
8. Fabric selection and fabric processing criteria

2.1.3. Inserting the correct ambuculum at the initial stage for the absorption of the altissimo register

It should be emphasized here that this is an ambushed instrument, which is more jazz than classical. The typical saxophone embouchure for classical music is described in detail in the writings of Sigurd Rascher, mentioned in Chapter One as one of the most important teachers and instrumentalists in a classical context and with the greatest contribution to the study of the upper register of the saxophone (altissimo).

Care should be taken that the upper incisors are not too far back in front of the mouthpiece, as this changes the tone overall. It becomes nasal and very thin without enough overtones, intonation is hampered and it becomes impossible to play loud. If, on the other hand, the mouthpiece is taken up too much, so that the lips almost touch the fretboard, it turns out that too much air is needed and it may even be impossible to produce sound. If any sound is produced, however, it will resemble a ship's whistle. In either case there is a rapid fatigue of the muscles of the mouth, even sometimes pain in the throat and head. A good embouchure does not require too much strain when playing the saxophone, although many people think the opposite. And if there is such tension, the cause may be improper staging.

The stable ambuche requires consistency and a lot of practice as it involves many fine muscles described above in 2.1.1 of this thesis. In everyday life these muscles are not used as intensively as when playing the saxophone, which sometimes leads to severe fatigue. In such cases, the muscles of the ambuciform system become unmanageable. Air escapes from the edges of the lips, poor tone quality and incorrect intonation are observed.

2.1.4. Executive breathing. Singing and its relation to sound production in saxophone

Breathing when playing the saxophone is central to the sound being generated. Since it is a function of the body that is performed instinctively, it needs to become a conscious process to be used in playing a wind instrument. For proper intonation, articulation, phrasing and dynamics it is important to develop proper performance breathing.

For good control of **the performer's breathing**, it is appropriate to do daily exercises to help create an awareness of the process and its automation afterwards. When something is sung and heard by the saxophonist's own voice, the inner-auditory awareness when making music creates security and safety on a psycho-physiological level. The sooner the learner is freed from the thought that the tone begins to sound as it is played on the saxophone, the sooner a good sound will be developed and the learner's idea of it in all registers of the instrument.

2.1.5. Sound extraction and articulation in the altissimo

One of the most important criteria for good sonority and articulation in the upper register of the saxophone is the formation and control of tone in the low and middle registers. Only after the student is pre-prepared with these steps can they move on to sound sampling and proper articulation in the altissimo register.

Singing has the important function of transmitting the sound inside the body, which contributes to a clearer feeling of the specified tones. This sound can then be easily transformed into the sound of the instrument. This is especially important for instrumentalists playing any wind instrument. The intonation should be as pure as possible. When one hears it with one's own voice, it causes the larynx to move in the right direction. For this purpose,

the student should stand in front of a mirror and, singing the melody by heart, play the tones with the saxophone. It is very important to be careful not to play the higher tones with lip pressure or chin lift instead of with the larynx. **The octave valve and the larynx**

The octave valve was in fact the first invention of Adolph Sax, which was basically intended to unify the fingerings in both registers. It also facilitates the transition from the lower to the upper register. However, it is not necessarily necessary for certain tones to be generated. Rather, the exercises described in this dissertation are pedagogy techniques for training the larynx, the embouchure, and the performer's breathing in such a way that each register of the instrument can be used, whether the octave valve is depressed or not. In addition, these exercises would be helpful in equalizing the sound of the saxophone in all registers.

Overtones

The number of overtones is theoretically unlimited. On wind instruments without the aid of valves, valves or finger holes, a series of natural overtones can be played using only ambushed technique and appropriate performance breathing.

The overtone structure of the saxophone depends on several factors:

1. The size of the bore and the conical shape of the pipe.
2. The trajectory and chamber of the mouthpiece.
3. Thickness, cut, surface and profile of the fabric.
4. The quality of the paddles and the height of the opening of the flaps.
5. The instrumentalist's oral cavity and skills in the direction of the embouchure and performance breathing.

The saxophone in the altissimo register can be considered in two aspects – as a natural instrument and as a modern instrument, technically advanced and creating new possibilities.

Sounding the overtone should only be done with a downward movement of the larynx, without changing the pressure of the lower lip and jaw, because this can reduce the strength of the air-flow and make the tone too quiet or not sound at all.

2.1.6. Concept of mastering the vowel sounds and their relationship to mastering the high register of the saxophone

Tone reproduction can be described as the manipulation of the oral cavity, particularly the soft tissues. This is a technique that is not unique to the saxophone – the pronunciation of vowels in everyday speech requires the use of the same muscles. Speaking a vowel sound simultaneously with tone production allows for improved timbre, intonation control, and ease in the altissimo register.

In order to maintain the interest of the students, it is better not to limit the notated material to a few etudes and one solo, but to build up a repertoire of primarily notated pieces. Only then can the teacher require the student to use the high register of the saxophone in his or her own improvisational patterns.

2.2. Generalizations and conclusions

Experimental activity in the field of music performance should take place under strict control over a multitude of factors and should be risk-free, both for advanced musicians already somewhat established and for beginners. However convinced the teacher may be of the promise of his new approach, it is incumbent upon him to verify his technologies beforehand, by a series of one-off experiments on himself and their effectiveness in practice, and their complete safety in physiological and psychological terms. It

is therefore necessary to accept the mandatory necessity of building a series of one-off experiments of a qualitative type.

The structure of the saxophone upper register learning technologies is presented in this paper as a series of different exercises, each of which can actually be presented in several lessons with several steps at the teacher's discretion. The individual steps do not involve strict adherence to any timetable, but rather depend on the reactions, qualities, health and mental state of the student. The tutor may lengthen or shorten each step as much as he or she deems appropriate at the time. To change the places of the exercises if he deems it necessary. Since this is not a technology for beginning instruction on a brass instrument, no particular order need be followed.

Exercises have been developed to bring certain overtones to the fore using the octave valve and larynx, the position of the lower lip and jaw, and ideas for initial repertoire related to the high register of the saxophone. Saying certain vowels before voicing the altissimo register also creates a sense of familiarity with something familiar, like speaking and singing.

The psychological moment is also extremely essential, which gives the student the impetus to believe in himself and to have the feeling of progress.

It is a good idea to select repertoire to work on with the help of the teacher, but it is up to each student to decide in what order it should be tried out. The pleasure of making music should never be neglected. The path to the goal should also create pleasant sensations. In this way, the result comes imperceptibly, without thought of how long it took to achieve it.

3. CHAPTER THREE.

EXPERIMENTAL STUDY OF PEDAGOGICAL TECHNOLOGIES FOR IMPROVING THE SOUND PRODUCTION IN THE UPPER REGISTER OF THE SAXOPHONE

3.1. Pedagogical experiment

The pedagogical experiment was implemented within 2 school years in the period 2021 – 2023, with 14 learners studying saxophone as a special subject / basic instrument at the “advanced” level, who are:

- students from Plovdiv University “Paisii Hilendarski”, specialty “Jazz and Pop Performance Art”;
- students from AMTII “Asen Diamandiev”, Plovdiv, specialty “Jazz and Pop Performance Art”;

Conducting in natural teaching conditions a pedagogical experiment in the sphere of instrumental performing arts, and especially in saxophone – an instrument not very popular in Bulgaria, is an extremely specific scientific research task, the implementation of which is not feasible in strict compliance with absolutely all the requirements described in the textbooks, valid for pedagogical experiments “in general” in areas other than the present one. It is impossible to conduct the training of the EG and the KG in parallel, in the same time slots and by different teachers. These facts do not prove that experimental work in the field of saxophone teaching methodology is impossible and the results obtained are necessarily controversial.

The above circumstances necessitated the need to find adequate solutions:

1. The training of the students of both groups (EG and KG) was implemented by the same lecturer – the author of the present study, but in strict compliance with the requirement that he should not allow the KG in any case to slow down its development and extremely conscientiously apply the relevant usual technologies in the process of training the students of this group, aiming at maximum progress and the highest possible results.

2. The experiment was conducted over time with each group in turn – first with the CG and then with the EG, but with the same duration of the formative (developmental) stage for both groups – two semesters.

3.1.1. Initial establishment phase

In the initial stage, the aim of the study was to identify in KG and EG students the presence and level of their executive dexterity in indicators that are essential for the content and implementation of the experimental technologies. For this purpose:

- a diagnosis of the level of the students' performing skills was carried out by:
- the manner of testing the persons was determined;
- diagnostic indicators were determined;
- the evaluation system and the evaluation criteria were specified.

The results of the diagnostics were analyzed and conclusions were drawn, which summarized as follows:

Students from both groups (EG and KG) are in an equal position at the start of the formative stage of the experiment, on two factors that are relevant to the content and implementation of the experimental technologies.

3.1.2. Formative (developmental) stage

In the Formative Stage, **the** experimental technologies were introduced to the EG students to improve the sound production in the upper register of the saxophone, while the previous methods were used in the CG. A detailed description of the process is presented. The feasibility of using the technologies in question is dictated by the applicability of the altissimo register in the interpretation of musical works with more complex artistic and aesthetic issues, which are part of the repertoire at a more advanced stage of saxophone training. The superstructural nature of technologies in the high register of the saxophone and the weaknesses observed in the initial finding stage in the students' performances in terms of **staging, embouchure, performance breathing and articulation**, also justify the application of the relevant technologies from the system to improve these skills in the learning process. Thus, in the formative stage, a wide range of technologies for the development and refinement of the altissimo register is subjected to empirical investigation, encompassing almost all the components of the system described in Chapter Two.

The summary of the observations carried out in four semesters on the students assigned to two groups, Control and Experimental, leads to the following intermediate conclusions:

1. At the end of the experiment, the students in the control group gave satisfactory results, although the learning process lasted quite a long time. Some of the students needed further clarification due to the lack of precise instructions in Rascher's method for the ambush setting. For this purpose, elements of the Liebman method related to the staging of the throat, oral cavity and larynx were used. Liebman's descriptions, although brief, are quite abstract, making the class a bit boring. This necessitates that the division of the actual work sometimes occurs in more than the allotted hours. The juxtaposition of exercises from both schools,

Rascher's and Liebmann's, further aggravates the situation. The lack of examples from real repertoire using tones from the high register of the saxophone further contributes to discouraging some students from developing the range of their instrument and using it in their performances. However, working with the control group had a good outcome, but with some risks at the beginning and middle of the training.

2. In contrast to the control group, the experimental group – although less experienced in using the high register of the saxophone – showed more interest and motivation, probably because of the faster initial results. Diversifying the lessons with specific musical material involving tones from the altissimo register contributed to the development of the students' repertoire and technical skills. The introduction of the tones through direct visual impressions of the physical actions that the student has to reproduce contributed to the facilitation of the tasks, however complex they may seem at first sight. The teacher provides verbal explanations, demonstrates the method of sound production in the upper register of the saxophone, and controls the process through direct observation of each student. He corrects mistakes and creates a conducive environment for each student's technical improvement. An individual approach is mandatory due to the difference in character, mental characteristics of each individual and the physical skills of the instrumentalist. New approaches are sought by assigning self-study tasks related to the individual developmental needs of the student.

3.1.3. Final stage

In the final stage, the main objective was to assess the effectiveness of the application of the technologies for improvement in the upper register of the saxophone by comparing the level of the learners' technical dexterity reported in the initial, ascertainment

stage with the level at the conclusion of the formative stage of the experiment.

For this purpose, a diagnosis of the learners' level of executive dexterity was carried out using the same tools used in the initial finding stage: the results of the diagnosis were analyzed and compared, and conclusions were drawn. Diagram 17 in the thesis shows the level of development of executive dexterity by indicators in the initial and final stages in CG and EG, based on the arithmetic mean scores obtained from the assessment system used, equated in percentages. On the additional indicator “**Speed of learning the altissimo register**”, the experimental group showed significantly higher scores than the control group. The acquisition of the altissimo register in the EG occurred as much as 51% faster, which is a significant achievement in terms of psychological and practical results and saves time that can be used to master other musical and technical skills besides those of perfecting the upper register of the saxophone.

3.2. Conclusions

The analysis of the results of the final stage of the pedagogical experiment provides grounds for the following conclusions:

1. The development and improvement of the altissimo register of saxophone students at the “advanced” level can be realized in the learning process through the systematic application of technologies for the improvement of its constituent elements. The effectiveness of the practical application in saxophone training of the technologies described in this paper is proved conclusively by the significantly higher results achieved by the EG learners in the final, compared to the initial ascertainment stage of the experiment. Evidence of the effectiveness of the system is also provided by the results in the EG on the additional metric, “**Speed of acquisition of the altissimo register**”.

2. Effective application of technologies for mastering the high register of the saxophone at the advanced level can be realized only if the corresponding technologies are applied in the learning process in parallel with technologies for the development of other components of performance technique.

3. The systematic application of technologies for the improvement of the upper register of the saxophone in training at the advanced level contributes to the effective development of the performance technique of the trainees as a whole.

4. Raising the level of development of the performance technique of the trainees in the altissimo register, in particular, contributes to increasing the artistic qualities of the performance.

With the formulation of these conclusions, the last of the tasks set in the final stage of the pedagogical experiment was fulfilled, thus proving the rest of the hypothesis of the study, which turns it into a thesis, namely:

The application of the technologies from the saxophone high register improvement system in the teaching of a special advanced subject contributes to the effective technical development of students and to the improvement of their artistic performance.

Conclusion

The results of the study of the problem of sound extraction in the altissimo register of the saxophone presented in the three chapters of the present work provide grounds for the following more important topical generalizations and conclusions, which are of theoretical nature and significance:

1. To date, no system of technology has been developed to improve the high register of the saxophone in Bulgaria for learners. In the specialized literature published so far:

2. Determination of the essence and the constituent elements of the saxophone performance technique on the basis of the theoretical knowledge of psychology of musical dexterity and the knowledge of the constructive features and the principle of sound formation in the saxophone makes possible: the differentiated study of these elements, the systematization of the issues of performance and in particular – of the altissimo technique, as well as the formulation of technologies for the development of performance and in particular – of the altissimo technique in the process of training.

3. Ambuchure and performance breathing represent the two basic, equal in importance, components of saxophone performance technique. The development of the saxophone's high register enables the student to perfect these two components as a whole and to control the instrument in all its registers.

4. The development of the students' instrumental technique by improving the high register of the saxophone was demonstrated in both groups participating in the experiment. The mastery of both the sound characteristic and the possibilities of the saxophone fingering technique were found to be more complete.

5. The formulation of the complete rules of correct staging securing the quality of tone has the significance of a methodological starting point, an axiomatic first basis of the possibilities of developing the learners' altissimo register.

6. The determination of the characteristics of the articulation of the individual tones in the altissimo register, the ambuscour and the performer's breathing in relation to the dynamics, the quality of the tone and the phrasing as a whole, the indication of the specific performance actions for the corresponding management of finger combinations , makes it possible to draw up technologies for the development of the high register in saxophone training in relation to the quality of the artistic result in the performance of musical works.

8. The technique for perfecting the high register of the saxophone in any piece of music is based on universal, precisely formulated basic principles. Proper phrasing and articulation play an important role here.

9. The sound production in the upper register of the saxophone, the control of the air flow and the technology of performance in the articulation of individual tones, as well as the possibilities of applying dynamics and phrasing in musical works contribute to: the enhancement of the artistic and expressive qualities of the saxophone sound in performance, the enrichment of artistic performance expression with new articulatory means and the performance of works from the original (for the instrument) music literature used in contemporary

10. The system of technologies for improvement in the upper register of the saxophone is a unified whole of interrelated elements, including, on the one hand, the technology of air control as a complex of performance movements, on the other hand, technologies for converting these movements into dexterities, and on the

third hand, guidelines for the role and practical application of the altissimo register in the performance of musical works. Only the simultaneous interweaving of all three areas leads to the real development and mastery of the high register of the instrument. The system has a universal character – it contains both basic principles and algorithms and specific ones, applicable only in certain cases and stages of saxophone technology training. It constitutes a kind of base from which the elements applicable at the respective stage of training can be extracted, according to the level and repertoire of the specific learners.

Generalizations and conclusions with practical application and significance:

1. So far, in the practice of saxophone teaching in our country, no system of technologies for improving the high register of the saxophone has been applied. Weaknesses are observed in the trainees in terms of staging and all elements not only in the altissimo register, but in general. A manifestation of these weaknesses is the understated quality of the artistic result. In the attempt to successfully realize the perfection of the high register of the saxophone, intuition rather than the knowledge and observance of certain rules is the leading factor.

2. The mastery of the altissimo register is carried out in the process of training according to certain rules and algorithms, which should be known and followed, with clear and precise instructions from the teacher and systematic work on the altissimo register both during the lesson and during independent preparation. This approach, compared to the intuitive one, saves time and effort and increases the possibilities for a positive result.

3. The development of the learners' altissimo register is paralleled by the development of the other major component of the performer's technique, the embouchure.

4. The application of the system of technologies to improve the high register of the saxophone in advanced saxophone training, contributes to: the effective construction of the basics of the embouchure, finger technique and performance breathing of students and their development; for the overall technical development of learners.

Publications on the dissertation topic

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2. Karageorgieva, C. (2022) Sigurd Rascher- Contribution to the development of the upper register of the saxophone (Alti-simo). *Proceedings of the eleventh scientific forum. Volume I*, Plovdiv University Press ISSN2738-8859. (pp. 57 – 64)

3. Karageorgieva, C. (2023) The saxophone- constructive development of the instrument since its inception. *Scientific Works of the Union of Scientists Plovdiv, Series B. Natural Sciences and Humanities, Vol. XXIV. Plovdiv 2023. ISSN-2534-9376 (online), ISSN-1311-9192 (Print).* (pp. 120 – 125).