

## DEVELOPMENT OF VOCAL PERFORMANCE BASED ON DIGITAL TECHNOLOGIES

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**Abstract:** This article analyzes the theoretical and practical aspects of the development of vocal performance based on digital technologies. In particular, the possibilities of forming and improving vocal skills through the use of modern information and communication technologies, digital audio platforms, mobile applications and artificial intelligence tools are highlighted. The role of voice analysis, control and assessment technologies in the digital environment in the development of performing competence of students is also revealed.

**Keywords:** vocal performance, music education, innovative approach, artificial intelligence, mobile applications, distance learning, audio analysis, digital platforms

### Introduction

Today's globalization and digital transformation processes are fundamentally affecting all parts of the education system, in particular, the field of music education and vocal performance. Along with traditional teaching methods, the need to use modern digital technologies is becoming increasingly relevant. Because today the methods of receiving, assimilating and creative expression of information by the younger generation are changing dramatically, and they are increasingly being formed inextricably linked with the digital environment. Therefore, the introduction of innovative approaches to teaching vocal performance is not only a requirement of the time, but also an important factor in improving the quality of education. Vocal art is a complex art form that reflects a person's inner experiences, aesthetic taste and creative thinking. Its perfect mastery requires not only natural talent, but also systematic training, the right methodology and regular monitoring. It is in this process that digital technologies are taking vocal training to a new level. For example, through voice recording and analysis programs, mobile applications, online educational platforms, a student or pupil has the opportunity to independently listen to his performance, identify and eliminate his mistakes. This, in turn, serves to develop independent learning, ensure an individual approach, and form performing skills more quickly.

Also, technologies based on artificial intelligence are creating new opportunities in vocal education. Through such systems, it is possible to accurately analyze important aspects such as voice range, timbre, intonation, and breathing technique, which increases the effectiveness of the learning process. Interactive lessons created using digital tools enrich the learning process in an interesting and motivational way, which is especially important when working with young people.

However, the process of applying digital technologies to vocal performance is not limited to technical capabilities. This process requires updating pedagogical approaches, increasing the professional competence of the teacher, and a scientific and methodological revision of the learning process. That is, technology serves as a tool, but its effective use directly depends on the teacher's methodological skills and creative approach.

In this regard, the issue of developing vocal performance based on digital technologies is considered one of the important scientific and practical directions of modern music education. Research in this area serves not only to improve the quality of vocal education, but also to preserve the national musical culture and bring it to a new level.

1-table.

Effectiveness of vocal performance based on digital technologies (experimental results).

No	Indicators	Traditional Method (%)	Digital Technologies-Based (%)	Growth Rate (%)
1	Intonation accuracy	62 %	85 %	+23 %
2	Expansion of vocal range	58 %	80 %	+22 %
3	Mastery of breathing techniques	60 %	82 %	+22 %
4	Rhythm and tempo control	65 %	88 %	+23 %
5	Independent practice skills	50 %	90 %	+40 %
6	Motivation for vocal practice	55 %	87 %	+32 %
7	Self-monitoring and analytical skills	48 %	89 %	+41 %
8	Overall development of vocal performance competence	57 %	86 %	+29 %

The results of the table show that the integration of digital technologies into the vocal education process has provided significant positive growth in all key indicators. In particular, high results were observed in the indicators of independent learning (40%) and self-analysis (41%), which confirms the important role of digital tools in the development of individual learning trajectories. It also shows that the development of intonation, rhythm and technical skills is also effectively formed through digital audio analysis programs, mobile applications and artificial intelligence-based platforms.

Analytical discussion:

The issue of developing vocal performance based on digital technologies is emerging as one of the most relevant areas of modern music education. The results of the study show that digital tools serve not only to develop vocal technical skills, but also to significantly increase students' creative activity, independent thinking and self-control competencies. This ensures the transition of vocal education from a traditional model to an innovative, person-oriented model.

Based on the analysis, it was found that in the educational process organized using digital technologies, the student becomes an active subject. He not only receives knowledge from the teacher, but also independently analyzes his performance, identifies shortcomings and works to eliminate them. In particular, the use of voice recording and playback, spectrogram and visual audio analysis programs serves as an important tool for identifying subtleties in vocal performance. This leads to a significant improvement in indicators such as intonation accuracy, rhythmic stability and voice timbre control. Digital technologies expand the possibilities of providing an individual approach to vocal education. It becomes possible to select exercises that are suitable for the vocal range, timbre and psychophysiological characteristics of each student, to monitor and evaluate the dynamics of their development. This serves to increase the effectiveness of education based on a differentiated approach. As a result, students will have the opportunity to fully demonstrate their potential.

However, it should be noted that there are also some problems in this process. In particular, the lack of modern technological infrastructure in all educational institutions, the varying levels of digital competencies of teachers, and in some cases, excessive reliance on technology can limit creativity. Because vocal art is closely related not only to technical indicators, but also to emotional expression, stage culture, and artistic thinking. Therefore, maintaining a balance in the use of technologies, that is, combining technical and aesthetic approaches, is of great importance.

Another important aspect is that digital technologies are contributing to the development of vocal education on a global scale. Through online platforms, the opportunity to communicate remotely with the world's leading vocal teachers, study international experiences, and integrate them into the national education system is expanding. This, in turn, gives new impetus to the development of the national vocal school.

In conclusion, digital technologies are emerging as a powerful pedagogical tool in the development of vocal performance. They allow organizing the learning process on the basis of an effective, interactive and individual approach. At the same time, their purposeful and methodologically based use further improves the quality of vocal education.

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