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"A methodological model for the application of mobile technologies in music training"

#### ABSTRACT

On dissertation work for the award of educational and scientific degrees. Professional doctorate 1.3. Music Teaching Pedagogy (Music Teaching Methodology), Higher Education 1. Pedagogical Sciences

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The dissertation was discussed and directed for defense by the Department of Music at the Faculty of Sciences for Education and Arts of Sofia University "St. Kliment Ohridski ". The content of the dissertation covers an introduction; four heads; conclusion, conclusions and recommendations; bibliography and applications. The dissertation contains 189 pages, including bibliography and applications. The text includes 18 tables and 82 pictures. The bibliography contains 135 titles in Bulgarian, 31 in Russian and 359 in English. The abstract follows the structure of the dissertation and preserves the original numbering of the tables and figures in it.

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## INTRODUCTION

The end of the XX and the beginning of the XXI century are characterized by the penetration of information and communication technologies in all areas of human activities, including education. The processes of digitalisation, the entry and use of the Internet and the more general processes of informatization are penetrating the field of education, changing the components of its methodology and methodological system, improving the quality, efficiency and accessibility of training. Modern information technologies as a consequence of the general process of informatization of society are increasingly used in the teaching process in teaching it in different disciplines. Mobile technology, such as educational computer models, has a significant place in the field of digitalisation of education, which is a software and hardware learning environment that enables interactive effects on learning. Today's development and perspective of teaching can be said to be in the formation of new educational systems, the most significant distinguishing features of which are: the transition from learning to education, continuing and advanced education, its fundamentalization, focusing on personality-oriented education and development the creative abilities of the students, the wide and continuous use of information and communication technologies in the educational process in the acquisition of knowledge, the creation of a unified interactive educational space and the transition to open education, one of the most up-to-date training tools. The information society, the development of computer networks, changed the idea of education and led to an understanding of the need for new approaches to open education as a pedagogical method. Technological advances and widespread technological innovations make it possible to change educational models and to combine traditional methods and forms of teaching and pedagogical activity with the use of new technologies to improve and update the teaching system in theoretical and practical terms. To this end, the technical and technological knowledge of teachers and students should be increased and a modern technical base maintained with accessible resources and multimedia resources as a condition for pedagogical

work in school in order to create an appropriate environment for training and creativity. The process of introducing technological innovation for education is dynamic, as the IT sector is one of the fastest growing in the modern world. This requires continuous updating of the knowledge and information of teachers and trainees, as well as getting acquainted with new products and devices on the market and working with them. Education, as one of the most important spheres of human activity that seeks to raise the intellectual level of society, needs to develop pedagogical models and methods for the application of new technologies for educational purposes in accordance with the envisaged training in the approved national curriculum, which would have good result and would widen the perimeter of the acquired knowledge and diversify the lessons. The search for approaches to develop educational models based on the capabilities of information technology has been very intensive in recent decades and has been the subject of much contemporary research.

There is a constantly growing interest in using computer technology in the field of music education. The computer as a musical instrument today is among other, already traditional, musical instruments. A specific step for music education in primary school may be the development of methodological models for the use of contemporary music applications and their introduction into the curriculum with a view to increasing students' interest in the subject, their musical culture, literacy, knowledge and competence, development and deployment their creative assets, performances and potential from a young age in terms of knowledge, performance, perception of music, recognition of musical instruments by type, timbre and sound recognising skills and independent individual musical improvisation. Through music lessons students acquire musical literacy, knowledge of the elements of musical expression, musical genres and styles, develop their hearing, sense of rhythm, emotional experience and enjoyment of communicating with music, creativity, artistry and imagination, form their personal musical preferences. and interests. The aim is to activate the creative

expression and creativity of the younger generation. And also the systematic and purposeful use of computer devices to make music and, in general, in modern music education to improve the learning process. The widespread use of the latest models of mobile phones and tablets enables them to be not only a means of communication but also for the intellectual and creative development of children according to their age and individual abilities in the form of entertaining activities (games) related to the music. Computer technology and computers and other mobile devices can be used as a musical instrument by students to compose and create their own music compositions. This will broaden the topic of the use of computer technology in music beyond theoretical knowledge of the capabilities of electronic instruments to create and perform a variety of music and to give an idea of searching, storing and disseminating music information. This can be achieved by developing learning resources complementary to music training programs in 1st-4<sup>th</sup> grade in the form of, for example, an elective music and technology class to help acquire the knowledge and skills to use the devices and applications for them.

- **Dissertation goal** - The purpose of the dissertation is to investigate and prove how the introduction of innovative educational approaches in music lessons achieves a more opaque absorption of knowledge by students. As well as research, selection and implementation of modern, technological approaches to music education through mobile applications and their introduction into extracurricular forms of education, EPAs, clubs in schools in the country.

To achieve this goal, the following tasks have been defined and fulfilled:

- Mobile applications have been researched and their potential use in music training has been tested

- A methodological model for the use of music applications and their introduction into educational content has been developed and proposed.

- **The object** of the research in the dissertation is to approve an innovative methodological model for the use of mobile technologies

and applications by the students in the initial stage of education and to increase and supplement the effectiveness of the educational work in music lessons through additional elective lessons for better music literacy and in-depth knowledge of music.

- **The subject** of the study is music training with the help of mobile technologies and the use of mobile applications in the elementary (3 – 4th grade) stage of education in the Bulgarian general education school in the form of free elective music lessons.

- **The hypothesis** of the study is that if we create the necessary conditions for the application of mobile applications in music training, as well as their use in music lessons and in extracurricular activities, we would identify the development of students' creativity and performance.

- **Research objectives**

In order to prove the working hypothesis, the following tasks were performed in the course of the study:

- Analysis of the curricula for music in general school (grades 3 and 4)

- Exploring the attitude of students in the initial stages of learning towards the use of mobile devices and applications in music lessons

- Study of the level of music theory knowledge and competences of the students in the initial stage of education in the primary school

- Establishing students' technological skills for working with mobile devices

- Development of a methodological model of work, taking into account the age characteristics of students in the initial stage of education in a primary school

- Development and practical introduction of methodological models and teaching resources, supplementing music training programs in grades 3-4 as an elective music lesson

- Creating a Friends of The Music Club to enhance students' musical skills.

The use of mobile technology in music lessons and in extracurricular activities could help to improve and update the learning and development of students' creativity and expression, to help deepen

their knowledge of music by virtually composing different styles and genres of music through new technologies. The results of music training through the use of mobile technologies would show a noticeable development of students' creative activities, an increase in the level of knowledge and skills accumulation, a lasting interest in music art and better achievement of the expected results envisioned in music programs. .

- **Research methodology and expected results**

The methodology involves the development of a diagnostic toolkit for the study, analysis and selection of music applications suitable for teaching music in primary school and compatible with the intended learning objectives in national curriculum. Through the study of foreign teaching resources and applications, to introduce good pedagogical practices in our general education schools. Developing teaching resources to complement music education programs in grades 3-4 as an elective music and technology class.

## **Chapter I**

- **Setting the Problem** - Today we live in a world where technology is increasingly takeover our days. Mobile phones, ubiquitous Internet access, Global Positioning Systems (GPS), computers and tablets, multimedia devices, digital music players and video games are increasingly available. To people living 100 years ago, our lives today may seem to include some kind of magic with sounds, pictures and videos from around the world, accessible almost anywhere, anywhere, complex processes that take place almost instantly, and instant voice and video communications . In his best-selling book, author Thomas Friedman (2006) attributes technology as an integral part of the globalization of the world - reducing and in some cases eliminating geographical, financial and other constraints that affect the way people live and work.

Like any other aspect of life, music is also heavily influenced by technology. They are an integral part of the way music is created, performed, stored and listened to in the modern world, and can be an

authentic aspect of the expression of individual music art. Musicians use instruments, both digital and other, that have been enhanced with technology. In particular, pop artists achieve the unique sounds and effects of their concerts through digital technology. Performances are recorded using advanced software and hardware that allow easy recording and editing of sound. Composers use sequencing and notation software to create printed notations and compositions. Some of these applications have undergone a remarkable transformation; As they become more popular, they are also easier to use - for example, professional audio recordings can now also be created in non-professional music studios.

Technology enables music to be experienced and experienced in ways that were previously impossible. Personal digital music players like iPods and even many smartphones along with streaming music services like Spotify and Deezer allow their users to access an entire music library from which to choose what to listen. With the help of powerful yet easy-to-use software, even without special music education, it can be composed by combining music lines (pre-recorded audio pieces) in different ways. Through blogs, podcasts - asynchronous radio broadcasts on the Internet, and websites for anyone to listen to music of different styles and genres in a home setting. Podcasts are audio or video files available for download from the Internet. Users have the choice to listen (or watch video) to a computer or player (MP3 player). This allows you to listen at any time. The convenience of this format is contributing to its increasing popularity. Mobile software packages and applications also help to develop music skills and culture.

Technology is an integral part of the world we live in, affecting many aspects of our daily lives. Today, young people are embracing technological innovation and using technology seamlessly. Music and technology are intertwined in many ways, and technology enables us to be musical in many ways, even without special training. It would then be logical for schools to use technology in the teaching process to help students and music educators integrate appropriate technology into music pedagogy.

- **The concept of m-Learning (mobile learning)**

For the first time, the term m-learning was used by Alan Kay in the mid-1970s. Mobile learning is the ability to obtain or provide educational content to personal handheld devices such as personal digital assistants (PDAs), smartphones and mobile phones. Educational content refers to digital learning tools that include any form of content or media provided on a personal device.

By definition, mobile learning (m-learning) is using wireless devices from learners wherever there is a continuous wireless Internet connection. Mobile devices include not only smartphones, but also devices such as tablets and personal digital assistants (PDAs). The definition of m-learning contains three key components: technology mobility, learner mobility, and learning process mobility. Mobility of technology refers to the mobile nature of the installed hardware and software that allow permanent wireless Internet connection. Student mobility means that students are no longer physically connected to one or more learning sites and can be mobile and learn at the same time using their personal mobile devices. Finally, learning mobility is a result of both technology and learner mobility.

To date, there are two basic concepts for using mobile devices in education: BYOD (Bring Your Own Device) and GYOD (Give Your Own Device). It was first used by IT company AstriCon in 2004 as part of their new business model, but gained popularity when IT giant Intel began to use it massively in 2009. BYOD is a concept in which students use their own devices. GYOD (Give me your device) - Students provide their mobile devices.

It is worth mentioning the following advantages of BYOD:

- the convenience of using any mobile device in addition to its technical characteristics;
- use of devices for personal use by students;
- preparing students for participation in a society increasingly relying on digital systems and communication. The use of digital devices in a school environment allows students not only to acquire skills related to their personal development, but also how to work safely and adequately online;

- learning goes beyond the classroom. The students can personally improve their knowledge both at school and at home, using only their personal devices;

- improved communication between teacher, student and parent. Using systems like email, Google Classroom enables much better communication between all stakeholders in student education.

The introduction of m-Learning in educational models has grown exponentially over the last decade and is well received and applied in today's learning environment. Although it can make progress in learning, it has not yet reached its full potential and is still developing. Innovative mobile technologies and new mobile tools aimed at accessing and processing information also provide new learning opportunities. In such a learning environment, more personalized and contextual learning opportunities can be provided to students:

- finding relevant and up-to-date information;
- acquisition and sharing of new knowledge and skills. This includes mastering the networking skills necessary to be part of the community in the learning process;
- analysis, synthesis, organization and evaluation of information;
- selection of appropriate information to solve a specific task or problem;
- acquaintance with alternative opinions and assessment of information;
- information age literacy.

- **Innovative educational technologies. Specific features of training through mobile technologies**

The digital world is being updated and evolved every day. Mobile devices with smaller sizes and more functionality and power are emerging on the market, allowing the processing of huge amounts of information. The devices combine convenience with functionality. We need to add new ways of obtaining, storing and disseminating information (including cloud technologies).

The use of tablets and smart mobile devices is increasing and becoming more widespread. They are convenient and functional as a resource platform for fun and interactive learning. There are already a

huge number of readily available Internet applications and services available to them. The main purpose of such training is for teachers and students to have access to the information they need from any point at any time. This will contribute to the introduction of innovations in music education, as well as to the improvement of the organization and automation of learning processes. The economic impact of the introduction of mobile technologies in education is also not neglected.

The Android (Google) and iOS (Apple) platforms are currently up-to-date, as well as their Google Drive and iCloud cloud storage services, as they allow any kind of information (photos, text, video, audio, apps, contacts) to be stored and synced tablet and smartphone data with cloud data. These resources are extremely convenient for educational purposes. For example, the Google G Suit and Microsoft Live @ edu educational services applications include a huge set of tools that can jointly create, edit, transfer standard office suite files (spreadsheets, text files, presentations, drawings) from any digital device on a remote server without installing office software on the device itself. In this way, all student activities are stored in the cloud and synchronized with the devices of other users, including the device of the teacher, who directly monitors and evaluates the results of the learning process in real time. This model could also be used in music training.

Another advantage of mobile devices is their intuitive software. This further facilitates their handling. No special knowledge is required to use the devices themselves. Application developers make the process as easy as possible by making it intuitive.

The mobile learning process includes basic pedagogical functions (motivational, informational, educational management activities, supervisory and corrective functions as well as skills and cognitive functions) and the opportunity to use information technology to stimulate creative activity in learning material.

Access to training tools and adequate forms of interaction between teachers and students are at the heart of any pedagogical process. Mobile technology makes this easy to achieve. The technical features of the devices and the internet technology open up access for

students to a vast base of knowledge under the control of the teacher and for digital communication (commenting, discussion, video chat, etc.). The devices are equipped with a touch keyboard and interface, which makes them autonomous to use.

The tablet could play the role of an electronic textbook. Its interactive and multimedia capabilities are constantly evolving and improving (immediate search for relevant information on the Internet, updating it, creating hyperlinks, listening to audio, watching video). Students can use music libraries (collections) containing works from different music genres, composers and performers from different eras, participate in teacher-created music quizzes and tests using online applications and resources (Google Drive). The audio system turns the device into a mobile stereo system. Allows shared music listening, volume control, frequency adjustments, using the virtual player installed on the device. And the built-in video player makes it a complete multimedia system. In addition, headphones can be used to listen to educational audio materials, which will help to absorb the learning material more fully.

- **Elements of technology. Hardware devices and software environment. Justified choice of operating system and applications.**

As mentioned above, the popularity of mobile devices in education is due to their greater accessibility and functionality. If we look at tablets in particular, it can be argued that they have more functionality than, for example, smartphones and e-readers because of their following features: larger screens, the ability to install more and more interactive applications, higher processing power, higher battery power and the availability of audio and video recording software. As more functional than other mobile devices, and as their prices continue to decline, tablets are becoming available for use in schools at an ever-lower cost.

Much of the tablet research confirms the findings of the mobile technology studies discussed above. Dhir, Gahwaji et al. (2013) review the literature on the role of tablets in education and identify a number of commonly reported benefits that include ease of use, the

ability to learn anytime, anywhere, use for both classroom demonstrations and small group training , a wide range of educational applications, the ability to maintain interactive and collaborative learning and better communication between students and teachers. Another benefit is the use of e-reading tablets, which includes the ability to help students with literacy problems, including language learning. In addition, it has been found that tablets can potentially reduce teacher workloads by enabling electronic collection and evaluation of assignments and by providing easy creation and provision of student learning content. They also provide greater student autonomy and motivation to learn.

To sum up the many benefits of using tablets in training, they include ongoing access to information and communication, increased collaboration between students and teachers, increased motivation, improved quality of student and teacher presentations, more creativity, more variety of resources and types study materials, IT skills development, and more personalized learning where students have the opportunity to work at their own pace. The practical benefits include reducing paper usage and the ease of organizing notes and other study materials.

- **Hardware Devices** - There are various mobile devices (tablets and smartphones) available, each with its key features and how it can be used in the school environment according to the preferences of the participants in the learning process.

- **Apple iPad tablets.** Following the success of the iPhone and Apple iOS iPad is the next big achievement of the tech giant in the market. A successful, flagship tablet device since its launch in 2010, the iPad is in huge demand in the tablet segment, suitable for use in schools because of its intuitive interface and range of new applications.

- **Android tablets.** Appearing a little later, Android-based tablets compete successfully in the Apple iPad market. Based on Google's operating system, many top manufacturers, including Samsung, Motorola, Lenovo, Toshiba, Acer, and Asus, have launched high-end Android tablets.

- **Justified choice of operating system** - In the dissertation we looked at working with Android OS. The choice is driven by the global deployment of this operating system, its accessibility, and its ease of use. Not least are the intuitive interface and the numerous free apps for it available to anyone on the Google PlayStore platform.

- **Software environment** - When choosing software to use to work with students, teachers should have several considerations in mind:

- general information;
- training documentation and assistance;
- content;
- educational design and pedagogy;
- what type of software is (commercial, Shareware, Freeware);
- a system of evaluation and record keeping.

- **Software Types** - There are different types of software suitable for music teacher work in different price segments:

- Commercial - applications sold by companies. Their prices vary. They can be purchased from retailers or downloaded online;

- Demo software - a free version of commercial software that is not fully functional, designed to demonstrate the features of a program, but without all the features of the program;

- Shareware - available for testing over a period of time;

- Freeware - free software;

- Open Source - free software. The source code of the software is accessible and anyone can make changes to suit its needs;

- Recently, monthly or annual subscription software is very popular.

- **Types of applications** - A major factor in choosing software applications is the ability to develop complex hybrid forms that combine working with multiple programs in one project. In this case, you must first select an integrative program that combines all the separately created objects into one structure. Such programs used in this educational project are Maestro and Walk Band.

- **Conclusion**

Music as an art and as a subject matter is important for unlocking students' creative potential. With the increasing penetration

and accessibility of mobile devices (tablets and smartphones), technologies can be used to help students develop skills in creating, performing and responding to music. Technology is an integral part of the way music is created, performed, stored and listened to in the modern world, and can be an authentic aspect of individual musical expression. They allow music to be experienced and experienced in ways that were not possible before. Using easy-to-use software, even without special music education, music can be created in many ways. The undeniable advantage of mobile music applications is that they transform learning into a fun process welcomed by teens. Therefore, mobile smart technologies in schools could be used in schools to help students and music educators integrate appropriate technologies into music pedagogy.

Mobile learning is a completely new form of work that requires relevant research to be implemented as an innovation in education. Educational materials must be tailored to mobile devices and the interface of the mobile platform must be recyclable and easy to use. The use of mobile technologies in music training requires the implementation of new pedagogical approaches for collaboration, communication and mobility.

## **Chapter II. Methodical model**

The purpose of music education is to build an aesthetic taste for music, to form a critical approach to music content. The tasks of music education are to discover and develop students' musical abilities, which is a prerequisite for their successful participation in music activities; forming skills for the perception, performance and composing of music.

### **• Description of the Walk Band and Maestro applications Walk Band - Virtual Music Production for Android OS.**

The Walk Band is an application with a highly intuitive interface containing a variety of virtual music instruments. There is an opportunity to play in the interactive application environment, as well as to share the played music material on the Internet.

### **Maestro - music notation and composition for Android OS.**

Maestro is a music notation and composition application that comes as close as possible to writing notes and other musical symbols on a simple sheet of music. It also has the opportunity to play in the interactive application environment as well as to share the played music material on the Internet.

The conclusions we can draw are that the increased interest and positive attitude of students to music training using mobile devices and applications is evidence of the effectiveness of the proposed experimental model.

The broad perspectives on the use of mobile technologies in different fields of music education set a number of new tasks for the pedagogical approach to this type of training. One of them is their integration into the learning process and the discovery and stimulation of students' creative potential and creativity. Mobile technologies also offer great opportunities for use. All this puts the teacher ahead of many new methodological problems, other than traditional approaches to learning, related to the organization of the learning process, the selection and content of the learning material, the activity and engagement in and out of the classroom, quality, efficiency, forms of work, incl. and teamwork.

In these forms of education, unlike traditional education, learning is not limited to the teaching of a particular set of knowledge, but focuses on the individual participation of students in the acquisition of knowledge and skills and their personal development through various pedagogical techniques for learning new material . It also draws on the potential of information technology as a cognitive resource in learning activities. They create a recycled work environment for training that complements traditional forms of training.

#### **• The practical relevance of the proposed methodological model - increasing children's interest in further music lessons**

The results of the dissertation research can be used in teaching music. The results obtained are directed to the graphical representation of the model, the algorithm, the analysis of the quality of education,

the specific expressions for calculating the effectiveness of education, their descriptions and variants of test tasks. They allow them to be used as a basis for organizing training in different segments of music training.

• **Conclusions** - The central focus of innovative educational activities using mobile technologies is related to the game in the form of a creative project with an integrative nature, using tablets and smartphones. The introduction of new information technologies into the music education process will enable improvement - the methods of teaching and applying completely new ones, as well as changes in the content of music lessons.

It has been found advisable to use the tablet and smartphone as a means of:

- presentation of theoretical materials;
- quick access to resources of all types;
- automation of practical exercises;
- development of harmonious hearing, timbre hearing;
- work on musical dictation;
- recognition of timbre of musical instruments;
- wider application of creative tasks;
- possibility to check writing.

### • **Chapter III. Planning and conducting an experimental study**

#### • **Organization**

The experimental part of the dissertation research was conducted in the 51st Secondary School, Sofia. The findings of the study are for students in grades 3 and 4.

The first stage of the empirical study is ascertaining (informative). Questionnaires are used, which are filled in by each student. The main task of the survey card is to reveal the benefits of the entry and use of mobile / smart technologies in music training. The information obtained from the study was summarized in a quantitative-qualitative analysis, which is essential for all stages in the whole research work.

The second stage of the study is related to the concrete implementation of the proposed approaches in the educational process in music training. The positive impact of the use of smart technologies in elementary students (grade 3 - 4) is summarized.

The third stage of the experiment is control / comparative and presents a modern methodology for having more fun and effective music lessons with students in grades 3 and 4.

In the experimental work, the students were divided into two groups: a control group (works with paper textbooks and notebooks) and an experimental group (works with a mobile device and applications).

- **Development of a methodological basis for the implementation of an educational project based on mobile technologies**

The aim is to create a new model of music education for adolescents and young people, to develop new methods for creative development. Training using tablets and smartphones is project-based. The teacher offers students thematic projects, intellectual work methods and tools for realization.

The hypothesis put in the dissertation was proved by an experiment conducted in three stages, carried out in the 51st Secondary School - Sofia, with students in grades 3 and 4. The methodological solutions are aimed at complementing and expanding the music learning process through the use of mobile technologies (mobile devices and applications) in the initial stage of training. There are differences in the degree of mastering of the music theory material, as well as different learning outcomes, depending on the methodology used.

- **Pedagogical experiment. Main stages**

- **First stage - ascertaining (informational) experiment**

The survey began in October 2019 through the method of observation of the studied groups of students. In the current pedagogical practice of the researcher, subjects are monitored during

the training sessions to determine how they respond to the use of mobile technologies (tablets or smartphones) during the educational process at school. Also make a comparison and see the difference in their attitude to the academic work in the classes that did not use multimedia technologies. Also relevant was the fact that the classroom teachers had used similar methods of work in previous lessons and how familiar the children were with them.

The following methods were applied during the experiment:

- analysis of educational software documentation;
- study of musical knowledge and skills of students;
- conversations with music teachers and students;
- tests to determine the level of knowledge at the time of the experiment;
- clarification of the levels of theoretical knowledge of students in their previous music training;
- the possibility of using this knowledge;
- an opportunity to analyze the music material offered.

Clarifying these questions allowed us to determine the level of mastery of the material by the students, the level of acquired knowledge and skills and the possibility of their practical application in the future.

The study was conducted in 3 and 4 class of 51st Secondary School - Sofia. The surveyed students were allocated to a control and experimental group. The composition of the two groups was as close as possible to the initial level of training. The training in the control group was conducted in the traditional way, and in the experimental group - according to the methodological recommendations developed here, including the use of the Maestro and Walk Band applications. At the end of the training tests were given to check the level of knowledge and skills acquired by both groups.

- **Conditions for conducting the experiment** - The selection of appropriate assessment criteria and indicators for the students' level of knowledge and skills is key.

There are two types of criteria used: quantitative and qualitative. Quantitative criteria are criteria that are derived from the rock division, and can be statistically processed. Qualitative criteria include:

- level of knowledge of the training material;
- level of understanding of the study material;
- the degree of proficiency in the course material;
- level of knowledge of intellectual skills.

Taking into account the qualitative criteria, questionnaires were compiled, including theoretical tasks and general questions related to the digital competence of the respondents.

The survey method is used at this stage. It was conducted in class hours and lasted 20 minutes. The students were provided with a questionnaire containing questions that met the criteria. The survey used the following questions, divided thematically into two modules:

**Module 1.** Music theory questions. The first module of questions informs us about the level of learning of the theoretical material taken by the students. The total number of questions is 10.

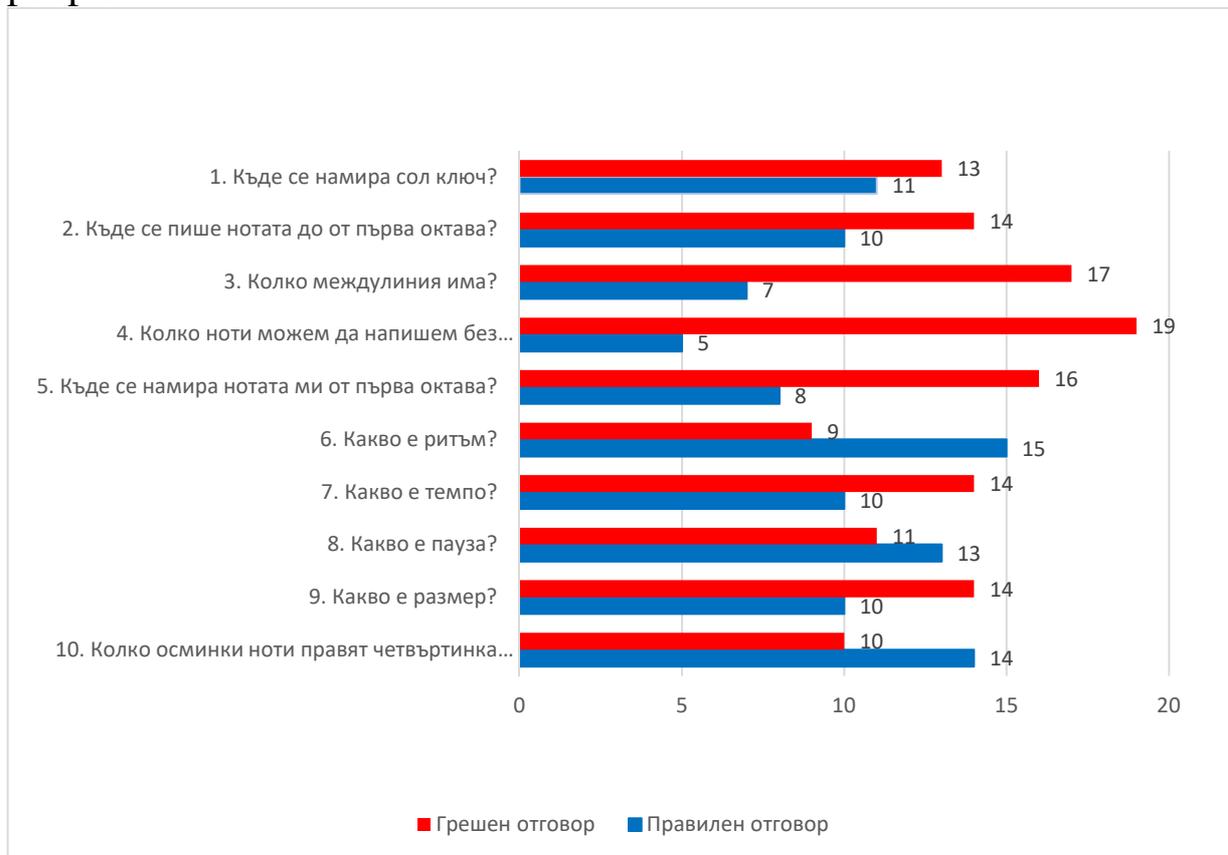
**Module 2.** Digital competence. The second module of questions gives information about the degree of digital competence related to the free use of students with digital devices - computer, tablet, smartphone. The total number of questions is 10. The answers are only positive (Yes) or only negative (No).

## Analysis of the answers

### Module 1

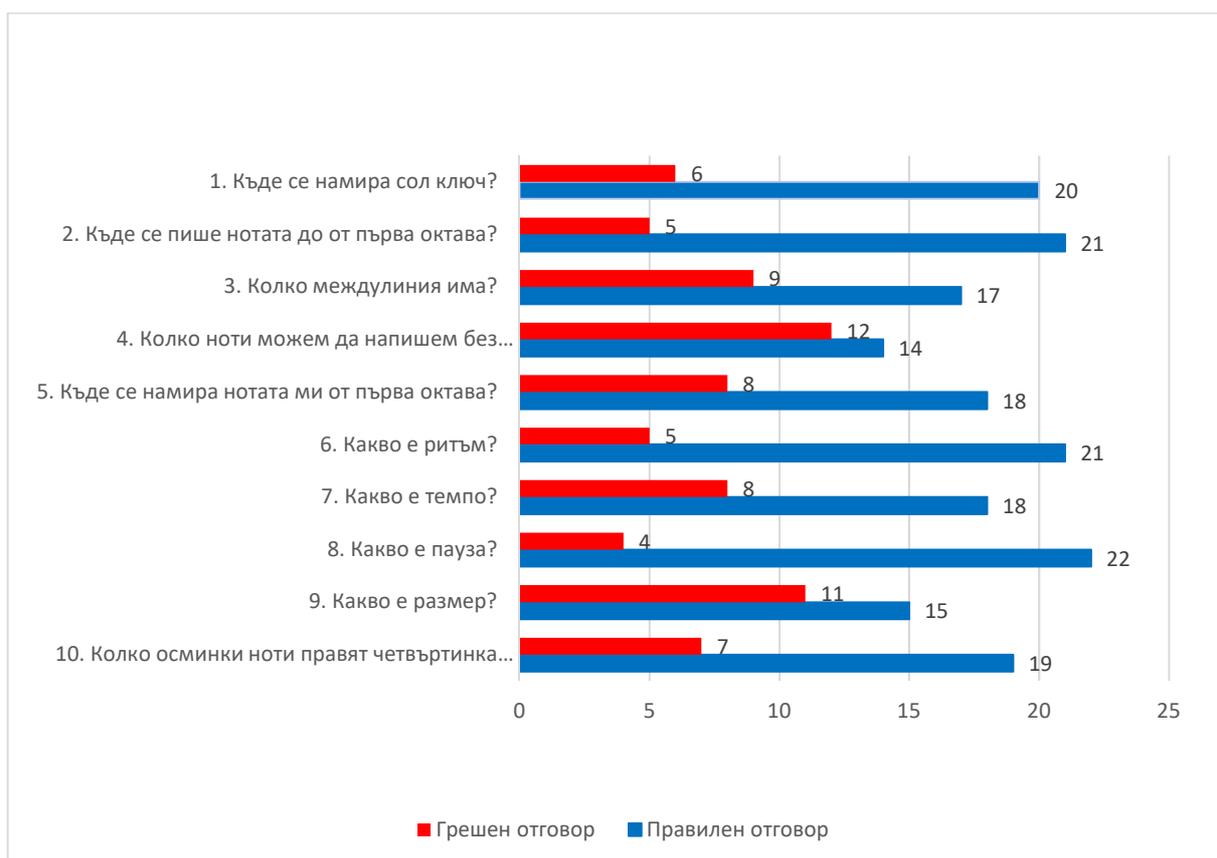
#### Grade 3 - Control group

The following table shows the level of knowledge of Grade III trained in traditional educational methods. Number of respondents - 24 people.



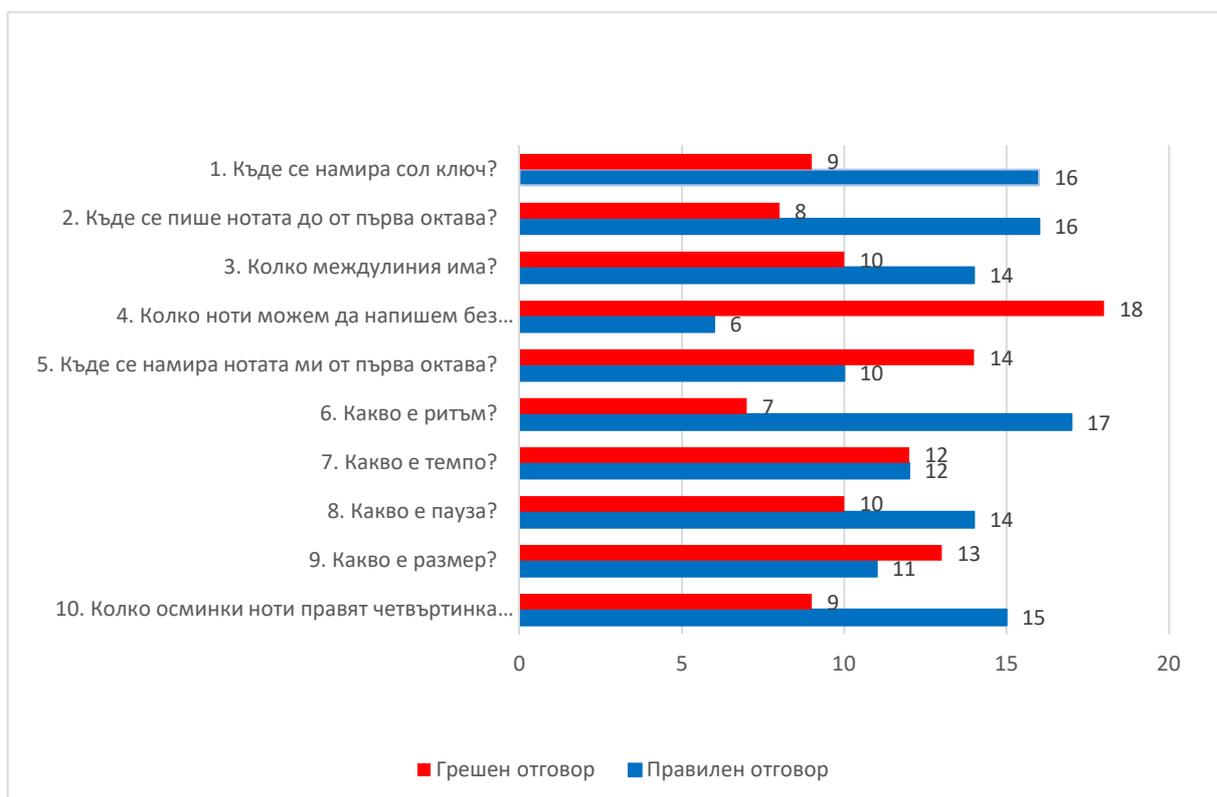
### Grade 3 - Experimental group

The following table shows the level of knowledge of class III trained in mobile and app work. Number of respondents - 26 people.



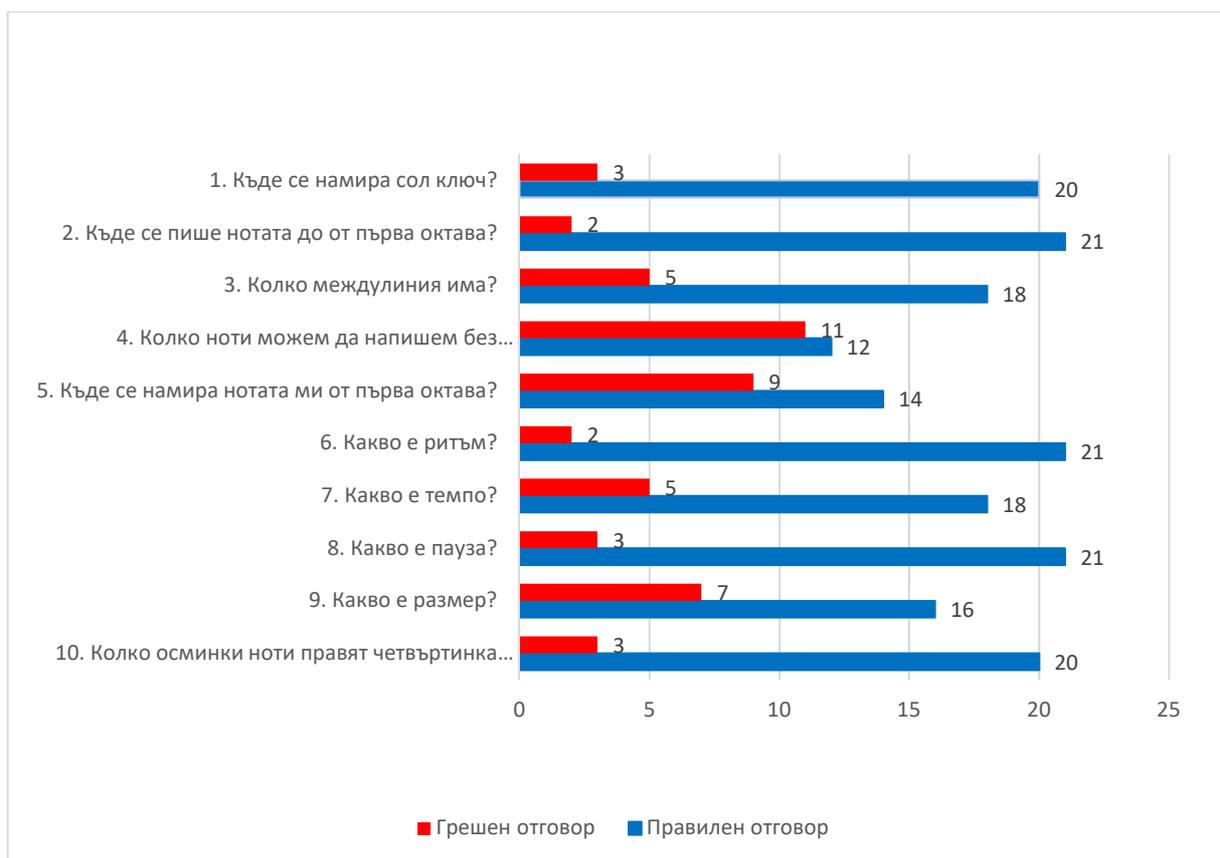
## Grade 4 - Control group

The following table shows the level of knowledge of Grade IV taught by traditional educational methods. Number of respondents - 24 people.



## Grade 4 - Experimental group

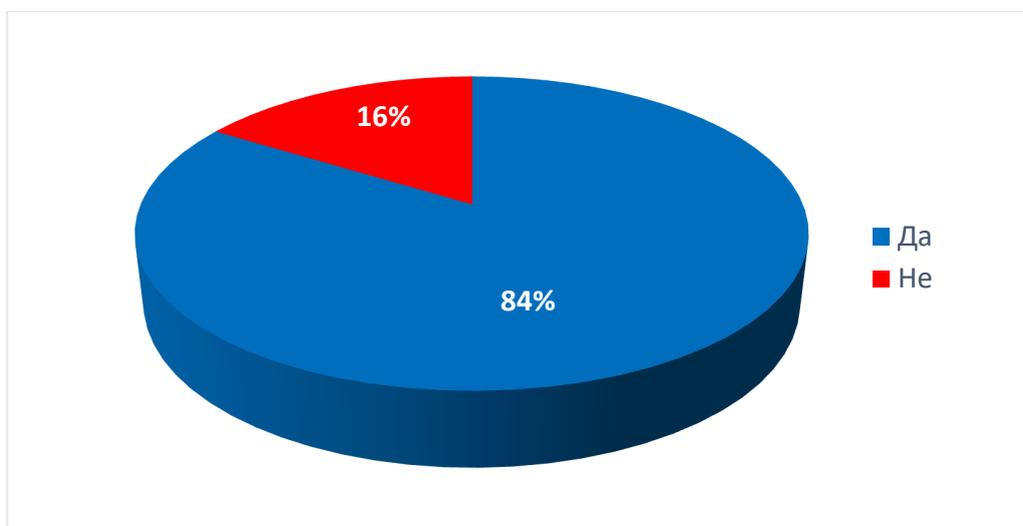
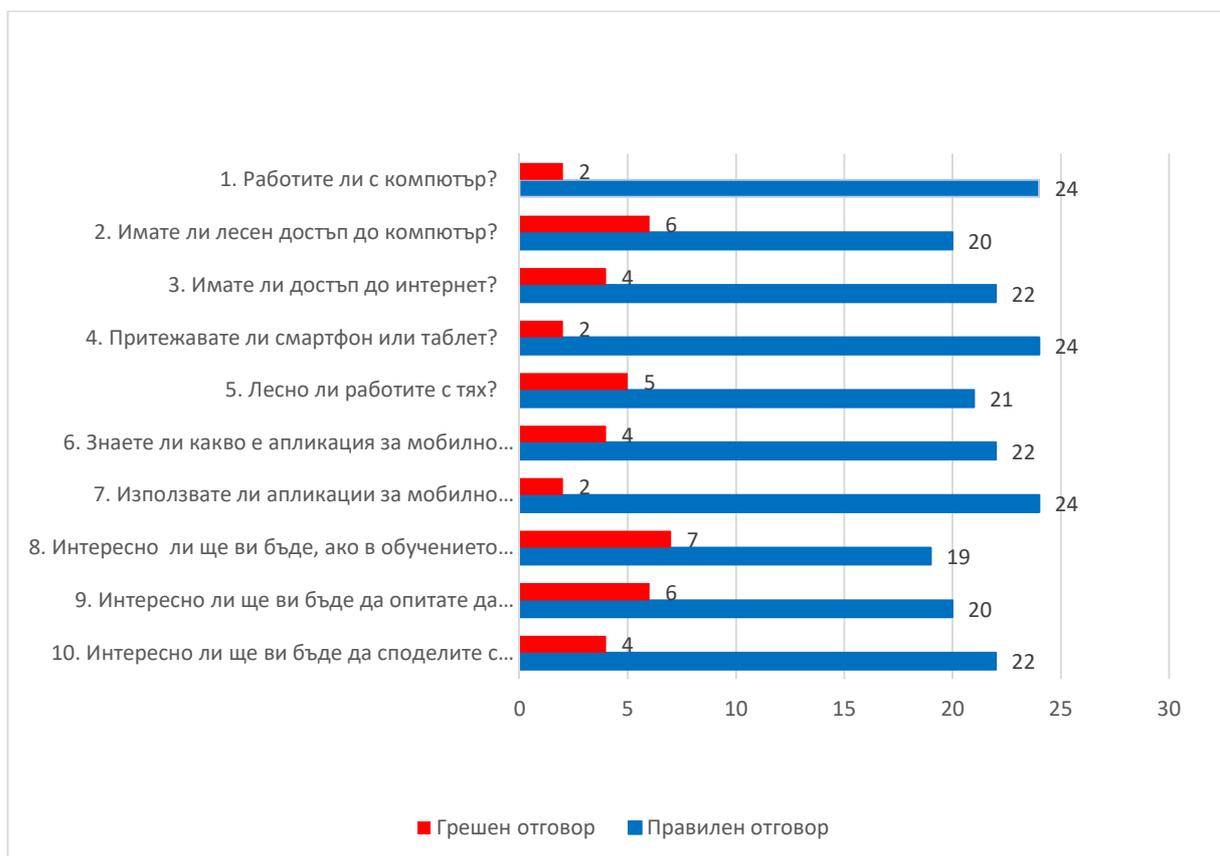
The following table shows the level of knowledge of a класV class trained in mobile and application work. Number of respondents - 23 people.



## Module 2

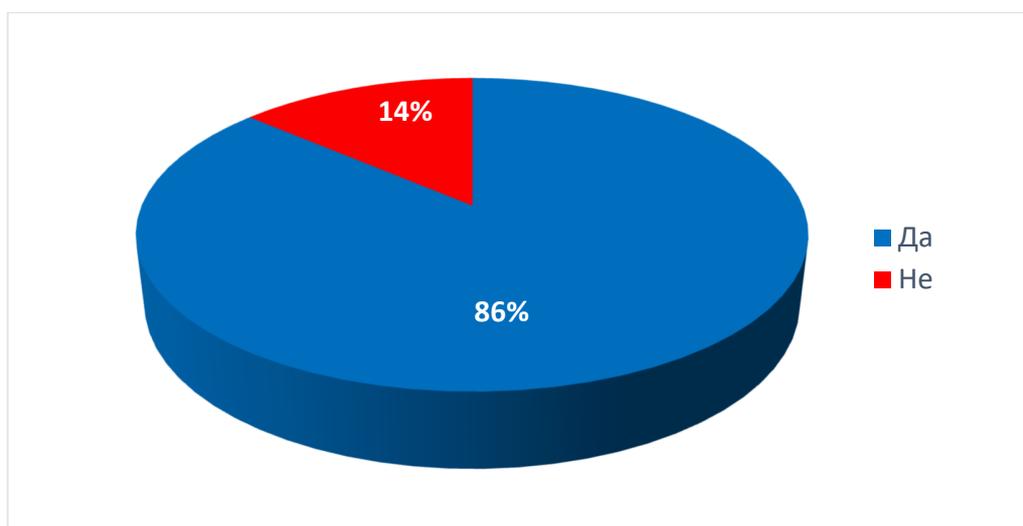
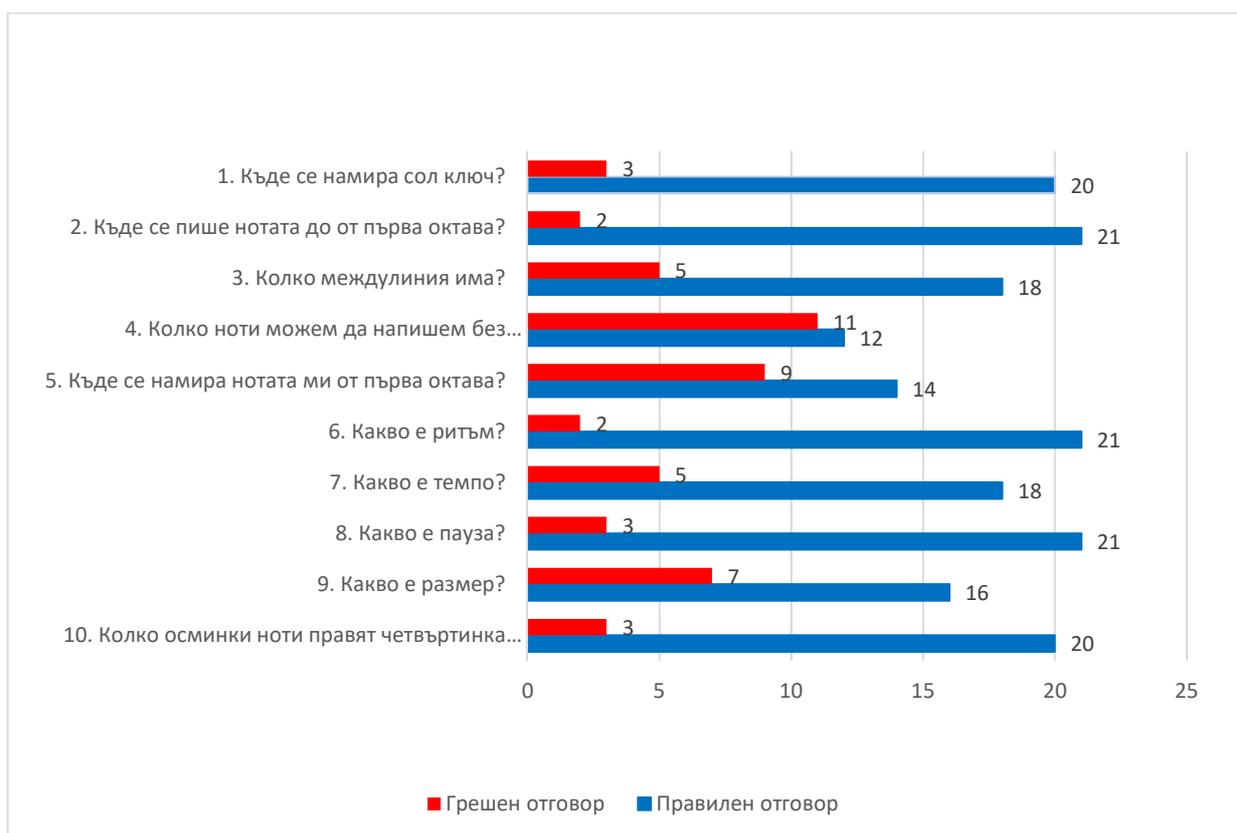
### Grade 3

Number of respondents - 26 people.



## Grade 4

Number of respondents - 24 people.



- **Second stage - Developing guidance**

The second stage of the research is the development of methodological recommendations on the use of new information technologies in the process of music training. The purpose of this phase is to determine the impact of mobile technology on the effectiveness of the music education process.

Tasks at the stage:

- developing guidelines for the use of mobile technologies in music teaching.

In order to conduct the study, a methodology was developed for training through the Mestro mobile application explaining the theoretical material from some parts of the music program.

- **Third stage - Control (comparative) experiment**

The third stage is a comparative experiment (experimental testing of the guidelines developed).

Determining the effectiveness of each method. The learning outcomes are measured either by test scores or by test scores as a percentage of the completed tasks.

The aim of the comparative experiment was to test the effectiveness of the use of new mobile technologies in music education in grades 3 - 4.

- **Description of the proposed methodology**

The methodological approach is aimed at communication between students and modern technologies, in particular their work with mobile devices at school. To achieve the methodical goals, we use free Android OS applications installed on students' personal devices.

The methodical model is applied in 5 lessons, in which the emphasis is on acquiring new knowledge related to technology, music literacy and instrumental knowledge in grades 3 - 4. The work model requires students to use a smartphone or tablet during class.

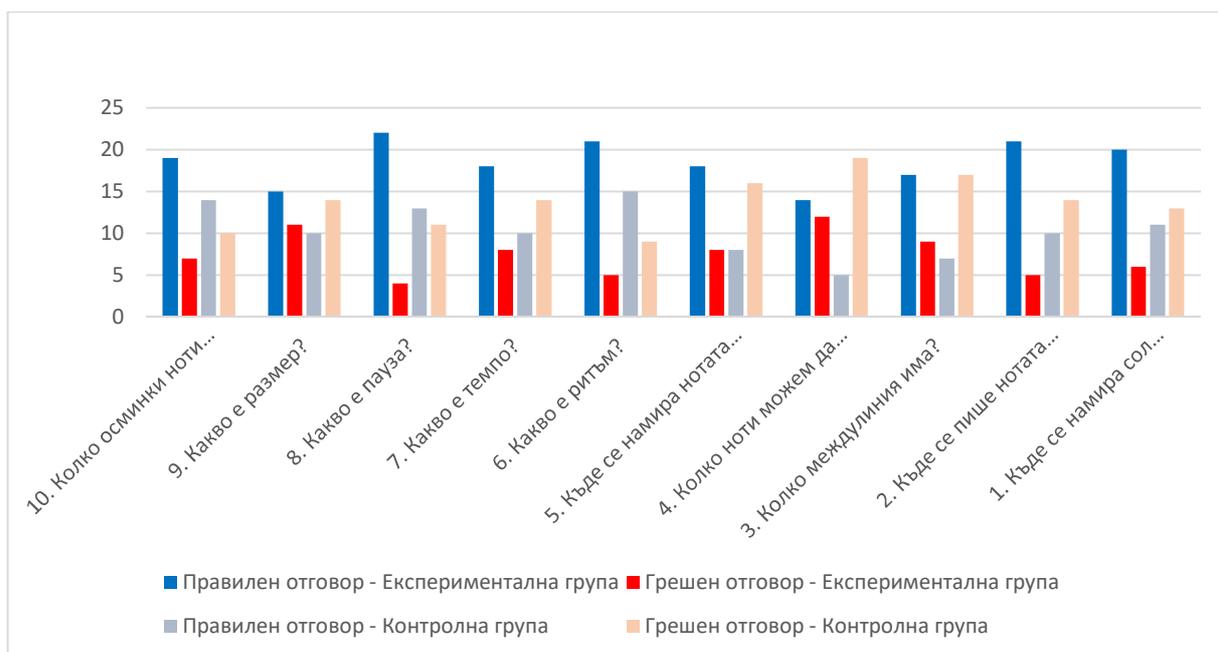
- **Analysis and conclusions of the experimental work**

In order to determine the effectiveness of the teaching process in secondary education through mobile technologies, an empirical study

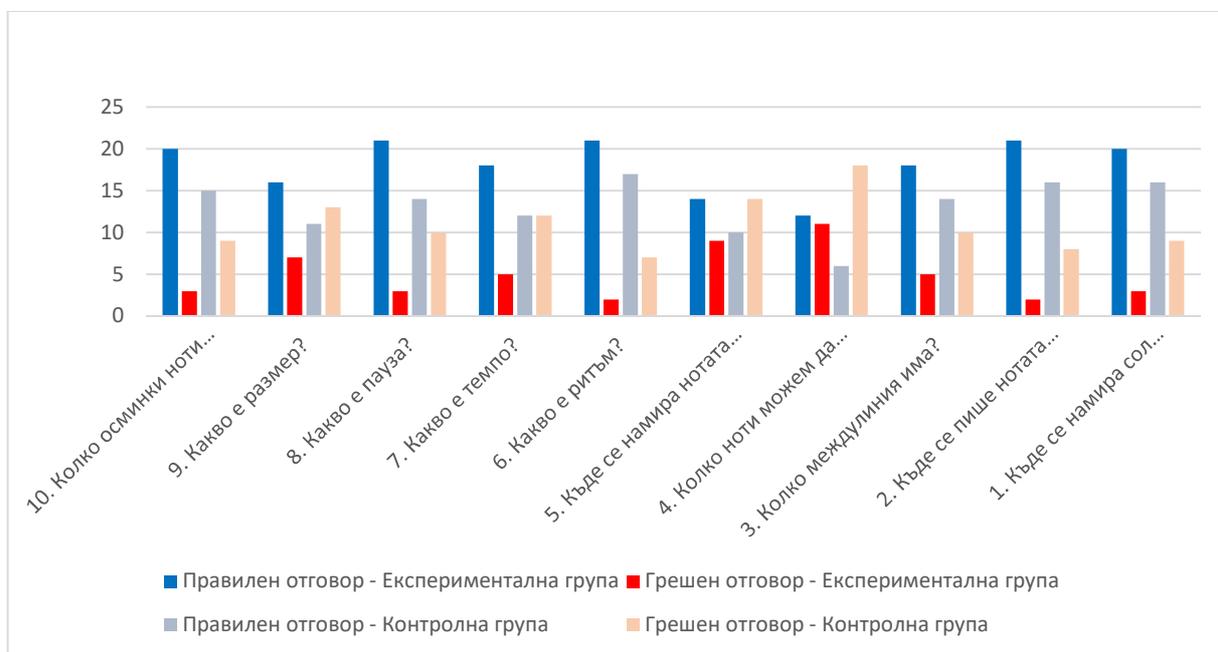
was conducted at the 51st Secondary School - Sofia. In the control and experimental groups, a test (questionnaire) system was used. The average result obtained for solving test problems can be taken as an indicator of the degree of effectiveness of music training with and without the use of mobile technologies.

Module 1 results indicate that the majority of students in the Grade 3 and 4 experimental groups respond with correct answers. These are the classes that have studied music literacy with mobile devices. From these results it can be concluded that the effectiveness of the proposed methodological model is higher than that of the students in the group who studied music literacy with traditional methods.

### Grade 3



## Grade 4

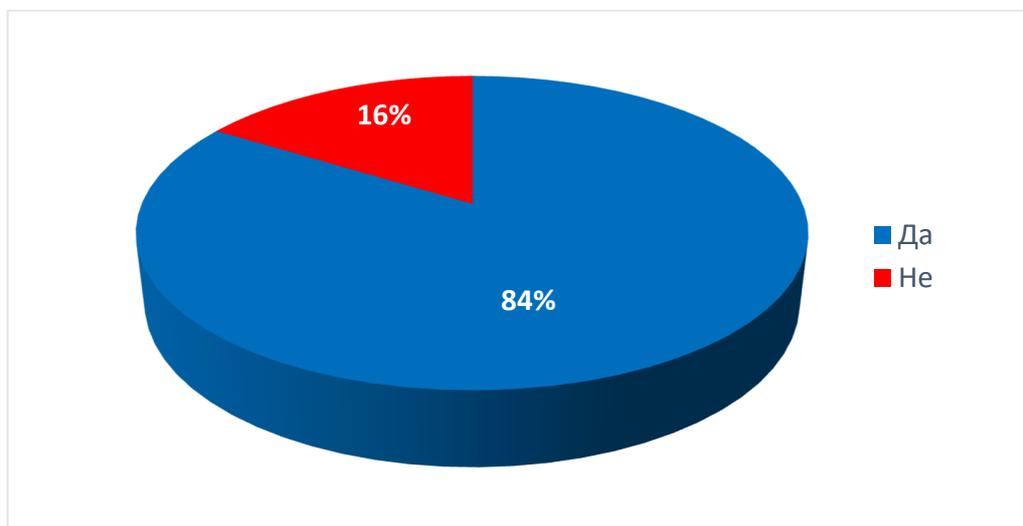


The results of the experiment are presented in the form of a diagram. The diagram clearly shows that in the control group the correct answers are less than in the study of the same type of knowledge in the experimental group

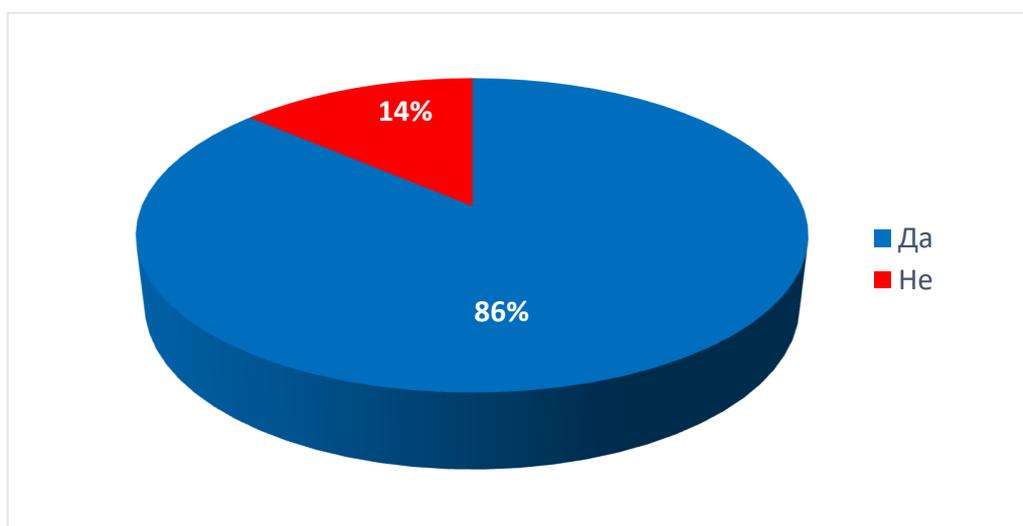
The analysis of the responses from Module 2 revealed a very high overall level of digital competence, demonstrating students' willingness to work with the proposed methodological model, as well as the promising future application of mobile and smart technologies in music education.

In percentage, the answers to the second module of questions were distributed as follows:

### Grade 3



### Grade 4



From the research we can conclude that the integration of new mobile and smart technologies in the educational process would lead to an increase in the quality of training in music lessons.

- **Recommendations**

The mobile music teaching methodology could be used by any teacher with the necessary digital competence

Based on the findings of the dissertation, it is recommended that the proposed methodological model be applied in the "Optional Classes" section (Ordinance No. 4 of November 30, 2015 for the curriculum in force since December 4, 2015), as these classes offer more personalization and flexibility. These are optional and are held as supplementary hours to the compulsory general education of students.

The results of the study show that there is considerable interest and enthusiasm among students regarding smart technology teaching.

- **Conclusions**

After the analysis of the obtained data from the research, the hypothesis was proved: If mobile technologies are applied purposefully and appropriately in the educational process in the initial educational stage, then they can be used to increase the activity of the students in the educational work, through the fuller engaging attention and motivating them to carry out the teacher's planned activity.

The purpose of mobile learning is to teach students to manipulate knowledge and to combine its various forms and components. Just as a multimedia mobile product is made up of multiple and diverse interacting elements, students must be taught to combine diverse information such as combinations of concepts, concepts, ideas and whole mental circuits in their own minds, to be able to combine them properly and to use them effectively in many learning and life situations. Technology training allows students to explore the many activities related to the fields of human knowledge. Mobile technologies help these activities to materialize, to present themselves in real life, to students. For this reason, they can be considered a new force in teaching. They transform the information - from static to dynamic, from purely textual to affecting all senses, through image, sound, picture and action. They allow us to transfer the processes from our environment into the classroom, and manage to motivate and stimulate the learning activity by presenting to the students the

material world, in its entirety and completeness. Thus, through multisensory perception, the child reinvents the surrounding world and forms his or her original cognitive outlook

When more and different sensor systems are used to process information, the problem-solving process is facilitated, accelerated and most of all diversified. The multi-sensory principle is effectively used in teaching - through it the teacher seeks directly or indirectly to activate all the sensory systems of his students. The more sources from our environment are the "providers", the more effective are the intellectual perceptions and hence the quality of the training. Their type is determined by the different types of activities that provoke different sensor systems. They depend on the behavioral strategies and the different levels of cognitive and creative activity of the students.

The analysis of the study showed that through appropriate and well-organized mobile content, we can cover the learning processes with ease. By looking at the results of the survey and the opinion of the teachers, we can summarize that working with mobile devices offers opportunities to concentrate, motivate and activate students' cognitive abilities. Used as a learning tool, thanks to its diversity, it opens up new horizons for impacting students. By using the opportunities of the mobile environment, the principles of multisensory learning are realized, and the most complete and complete influence on the senses of the students is realized.

Multisensory presentation creates a dialogical environment in which the learner and technology communicate with each other. Always what can be seen in practice is better than what can be explained in theory. Especially when the subjects of education are young students who still have more pronounced visual thinking. With multimedia technology, the abstractness of a concept can be conveyed in a way that makes it easier for them to understand - by not only revealing themselves in nature, but by changing the direction of impact of information about them.

In conclusion, we can say that through multimedia expression, information can not only inform - it can motivate and activate a

student if presented to him or her in an appropriate form. This is also our main task - to find out the most appropriate situations for this kind of interaction.

Based on theoretical studies and empirical experiment using quantitative and qualitative analysis of the results led to the following conclusions:

- It has been experimentally demonstrated that the effectiveness of music learning using mobile technologies activates students' creative activity.

- The experiment confirmed that the forms and methods of presenting educational information have an impact on improving the effectiveness of training.

- It has been found that computer programs can significantly improve the development of musical hearing and creative thinking. Understanding the elements of musical language happens with visual representations and has a more specific, simple and dynamic perception nature than verbal communication capabilities.

- The results of the pilot test showed sufficient effectiveness of training using mobile technologies. In the experimental group of students, the objective results are higher than in the control group.

- It is also found that the use of new technologies promotes qualitative changes in students' knowledge

These data confirm the assumption of the feasibility of introducing new mobile technologies in the educational process.

The analysis of the experimental work performed revealed the methodological principles of adaptation of the technical means of presentation, the forms of activity of the student with mobile technologies.

In general, the principles of mobile-based education are:

- the organization of creative educational activities using the media takes the form of local thematic projects;

- educational complex based on basic media technology, which must guarantee the variability of representative means and openness of technology for the creative process;

- when preparing an educational project using a tablet or smartphone, it must be possible to combine work with several

programs and integrate the results using one basic program into one project;

- it is advisable to master mobile applications in direct relation to specific project tasks, rather than general ones.

Experiment analysis allowed the following generalizations:

Mobile technologies, due to the variety of possible combinations and integrative properties, make it possible to embody common thematic content in different design forms, giving students greater creative freedom. The diversity of individual realizations within a local, local educational project over time and in content testifies to the effectiveness of our approach.

The experimental work demonstrates the possibilities of the method of combining in one project work with several mobile applications and integrating their results in a single structure, using a limited number of basic programs.

**• Scientific contributions to the thesis**

- A model for upgrading music training based on mobile / smart technologies is offered. A curriculum for music training based on mobile technologies has been developed, as well as additional modules for the Maestro and Walkbend programs
- A research toolkit related to the application of mobile technologies in music training has been researched and tested.
- The question of introducing music teaching using mobile technologies (mobile and devices and applications) has been raised.
- Mobile technologies are not interpreted in their technical parameters but as an innovative educational practice.
- It has been empirically proven that integrating new mobile and smart technologies into the educational process would lead to improved quality of training in music lessons
- A methodology for integrating smart technologies in teaching music is proposed
- The methodological contribution of the scientific development has been proven experimentally and is based on the research.

- **Publications**

"Mobile Technologies in Music Education", monography, i.k. August, Sofia. ISBN: 978-954-9688-71-9