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DEVELOPMENT OF STUDENTS' VOCAL SKILLS THROUGH METALLOPHONE PLAYING

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Abstract: The purpose of this research is to verify the studied phenomenon (playing and singing with the children's melodic musical instrument, the metallophone) and the effects it has on the development of students' vocal abilities through an experiment with parallel groups. As part of a wider study, only selected results have been used for this paper. The research sample consists of third grade primary school students, as musical literacy begins at this age. The aim of the research is to determine differences in vocal skills between the experimental and control groups, depending on whether the students play the metallophone or the recorder. Survey and test techniques were used, as well as a parallel group experiment and the descriptive method of theoretical analysis. The SPVS instrument (Scale for Assessing Vocal Abilities - Subtest I, Jeremić, 2011) was used to examine the effects of applying the methodological model. During data processing and analysis, mathematical-statistical procedures were applied - determination of frequency measures and percentages, as well as calculation of descriptive characteristics such as arithmetic mean. The obtained experimental results contribute to the implementation of lessons according to the applied model of song processing on the basis of sheet music, to greater student engagement, more intensive development of vocal abilities, musical performance skills and broader cognitive activity. In conclusion, the results highlight the need for the continued integration and development of musical activities in educational programmes in order to provide comprehensive support for students in realising their potential.

Keywords: music education, music performance, musical skills, playing, singing.
The field of the paper is Humanities.

1. INTRODUCTION

The field of music performance consists of two main subfields: music performance through singing and music performance through playing instruments. These activities are crucial for the development of students' musical experience, as they enable them to actively participate in musical processes and to experience and adopt the basic elements of music. "Music culture is a subject that deals with the development of students' musical abilities and skills, learning about the development of musical art through its historical development, as well as learning about the musical traditions of their own and other nations. Activities such as singing, playing, mastering the basics of musical literacy, listening to music and creating music contribute to the development of students' musical taste, creativity and ability to express themselves musically" (Cicović Sarajlić, et al. 2024: 178). In line with the nature of the subject, the central focus in music education is on listening to music and singing activities, which provide students with the opportunity not only to become familiar with musical genres but also to actively engage in music-making. Singing and playing various instruments, as well as combining these activities, allow students to develop their musical abilities in the context of both social and individual expression. Through competently guided activities, students build a foundation for the further development of their ability to aesthetically evaluate music (Radočaj-Jerković et al., 2018). By using their voice as an instrument, students master their vocal abilities. Even if these abilities do not develop to an exceptional level, they become a prerequisite for an active relationship with music in general (Ilić, 2020a).

Singing and playing, as the main forms of musical performance, represent an active engagement with music - active music-making - that directly influences the development of students' musical skills. In this way, students understand music not only as an abstract concept, but also experience it through their own expression. "If a child's environment is musically stimulating, the child will show musical talent or interest in musical activities at an earlier stage. When music is an integral part of the school, it becomes an integral part of the child's experience. Schools should provide opportunities for children to share their love of music, which will further foster a sense of togetherness within the school' (Ilić, 2020b: 94). Pupils

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in the lower primary grades acquire significant knowledge and skills through music performance, which is often linked to real-life situations experienced in practice. Music performance is therefore an important factor in the development of personal style and artistic expression, within the individual capabilities of the pupils. One of the research (Nikolaou & Agiopetritou, 2024) highlights the benefits of music improvisation activities in which 9-years-old students used various instruments, including metallophones. Music activities in primary education stimulate creativity, teamwork and musical understanding.

When discussing music education, we cannot overlook the fact that all theoretical knowledge must be experienced through practical performance. Singing and playing music become the means by which students transform theoretical knowledge into a real, emotional and creative experience. Such an approach not only enhances students' musical abilities, but also allows them to fully engage in the process of making music, thereby developing their personal, emotional and social skills.

Our focus in this study is on the subject area of musical culture - specifically, musical performance through singing and playing instruments, with particular emphasis on the importance of vocal performance and the impact of playing a melodic instrument, the metallophone, on the development of vocal skills in younger school-age students. By exploring these aspects, we aim to highlight the importance of integrating vocal and instrumental performance into the teaching process and its influence on the overall development of pupils.

2. MATERIALS AND METHODS

The research problem can be defined by the following question Are the vocal skills of younger primary school children better developed when they play the metallophone and sing at the same time, or when they play the recorder? The subject of this research is the impact and effects of the use of children's melodic musical instruments in the teaching of musical culture on the development of the vocal skills of lower primary school pupils. The aim of the research is to determine the differences in vocal skills between the experimental and control groups depending on whether the students play the metallophone or the recorder. Based on the research aim, specific research tasks were defined, which led to the formulation of the following hypotheses:

General hypothesis:

H_o - There are statistically significant differences in students' vocal abilities based on the assessment of vocal abilities between students playing the metallophone (E group) and those playing the recorder (K group), in favour of the experimental group playing the metallophone. Specific hypotheses:H_1 - It is assumed that the students in the experimental group will achieve statistically significant results in vocal skills compared to the students in the control group. H_2 - It is assumed that students will be interested in the subject areas of music performance through singing and music performance through playing instruments. Independent variable: Teaching students to play and sing on the children's melodic musical instrument - the metallophone, by learning songs from notes. Dependent variable: The level of development of the students' vocal skills, manifested through the singing of a familiar song (Subtest I). Control variables, include: Gender of the students; Overall academic achievement (provides insight into individual indicators of student performance); Achievement in Music Culture (provides data on students' success in this subject and indicates potential difficulties in mastering the curriculum).

In order to test the research hypotheses, we used the experimental method (causal) with parallel groups (E - experimental group and C - control group). The experiment in this area has the same basic characteristics and organisation as in other areas: measurement of the initial and final states, comparison of the results of the initial and final measurements in the E and C groups, calculation of the statistical significance of the differences, and comparison of the results of the initial and final knowledge tests in the E group (determination of the net effect of the experimental factor). Data collection techniques used Survey technique; Test technique.

Research instruments used:

- Vocal skills assessment scale - subtest I. The vocal skills assessment scale was applied in an equivalent form in both the initial and final tests (only the first subtest was used) (Jeremić, 2011).
- Student questionnaire.

Subtest I involves the assessment of students' melodic abilities and consists of two tasks:

- Reproducing a familiar song by ear.
- Sensitivity to pitch accuracy.

The song performed by the students was learned in order to ensure equal opportunities for all participants during the testing process. The students' task in this subtest was to sing the song, with the key adjusted individually for each student. In the final measurement, the students of both groups E and K

performed the song they had learnt during the course of the programme.

Description of the Experimental Programme

The experimental programme is designed to develop students' melodic hearing and vocal skills through the process of learning songs within the framework of music performance through singing and playing instruments.

The programme includes

- Methodical approach to the interpretation of children's songs and rhymes according to the curriculum (Službeni glasnik RS - Prosvetni glasnik, no. 10/2004, 20/2004, 1/2005, 3/2006, 15/2006, 2/2008).

- Encourage the cultivation and development of singing and playing skills, as well as musical abilities, with the aim of equipping pupils for a lifelong engagement with music, fostering creativity and stimulating interest in valuable musical works.

Structure of the lesson

The structure of the lesson is determined according to the methodological approach of working with songs based on musical notation and consists of several phases:

a) Motivational phase, which includes reviewing previously learned concepts of basic musical literacy, reinforcing knowledge and introducing the new unit.

b) Analysis of musical notation.

c) Reading notes using solmisation.

d) Rhythmic reading of notes - parlato technique.

e) Playing the song in melodic sections, singing at the same time using solmisation, and then performing it in its entirety.

f) Working with the literary text of the song.

g) Playing and singing the song with the text.

h) Consolidation of the learned song - group playing and singing (Jeremić & Stanković, 2019).

The song that students are asked to sing from the musical notation should not be used to introduce new musical concepts, but only to reinforce concepts previously covered in the musical literacy process. Pupils must have developed auditory representations that have already been consciously translated into musical notation through various forms of work, so that they can interpret and sing the song, first with the solmisation syllables and then with the literary text, without prior learning by ear.

Research sample

The sample was selected on the basis of the defined subject, objectives and tasks of the research. The primary statistical population - from which the statistical units for the research sample were selected - consisted of third grade students from general primary schools in the Municipality of Sombor. The research sample was purposive because the curriculum, among other recommendations, prescribes musical performance through singing and playing as key activities at this age, which serve as a basis for acquiring musical knowledge and promoting the development of students.

The total research sample consisted of four class sections: two in the experimental group and two in the control group. A total of 105 students participated in the initial measurement. Although the research was primarily conducted during the 2023/2024 school year, the number of participants in the final testing and survey did not vary significantly, ensuring the stability and reliability of the results. In the final measurement, the total sample of tested students from both the experimental (E) and control (K) groups was 98.

Structure of the experimental and control groups

The experimental group consisted of 49 participants (50%) and the control group also consisted of 49 participants (50%), for a total of 98 students. Gender distribution: 40 students (40.82%) were male, 58 students (59.18%) were female. Academic performance: The majority of participants achieved Excellent success (51.0%), Very good success (40.8%). The analysis of overall academic performance shows that the percentage difference between students with excellent performance is 4%, while the difference between those with very good performance is also 4%. These results suggest a correlation between overall academic performance and success in Music Culture. Analysis of the structure of the research sample shows that the experimental and control groups were homogeneous, with minor variations. The structure of the experimental and control groups is not significantly different in terms of gender distribution.

3. RESULTS

In terms of academic performance, the highest percentage of participants in both the experimental group (25 participants, 51.0%) and the control group (30 participants, 61.2%) have excellent grades. Very good grades are achieved by 20 participants (40.8%) in the experimental group and 13 participants (26.5%) in the control group. In the experimental group 2 participants (4.1%) have good grades compared to 5 participants (10.2%) in the control group. Satisfactory grades are given by 2 participants (4.1%) in the experimental group and 1 participant (2.0%) in the control group. None of the participants had an unsatisfactory grade. Regarding the success in the subject Music Culture, the majority of the participants achieved excellent results - 27 participants (55.1%) in the experimental group and 32 participants (65.3%) in the control group. Very good results were achieved by 18 participants (36.7%) in the experimental group and 13 participants (26.5%) in the control group. Good results were achieved by three participants (6.1%) in both the experimental and control groups. Satisfactory results were achieved by one participant (2.0%) in each group, while no participant received a failing grade in Music Culture.

Table 1: Results Between Two Measurements

Group	Measurement	Average Score	Standard Deviation
Experimental	Initial	3.2	.5
Experimental	Final	4.1	.4
Control	Initial	3.3	.6
Control	Final	3.5	.5

Source: The authors

Table 1 presents the results of vocal ability assessments conducted at two measurement points—initial and final. The findings suggest the following key conclusions:

- Experimental Group - The initial average score was 3.2, with a standard deviation of .5, while the final measurement shows an improvement to an average score of 4.1, with a standard deviation of .4. This indicates a noticeable enhancement in vocal abilities within the experimental group.
- Control Group - The initial average score was 3.3, with a standard deviation of .6, and the final score increased to 3.5, with a standard deviation of 0.5. Although there is a slight improvement, the change is not as pronounced as in the experimental group.

These results suggest that the experimental group experienced a greater improvement in vocal abilities compared to the control group, which indicates a potential effect of the intervention applied to the experimental group. The lower standard deviation in the final measurement of the experimental group also suggests a more consistent improvement across participants.

1. Improvement in the experimental group:

- The mean score of the experimental group increased from 3.2 to 4.1, indicating a significant improvement in vocal ability after the intervention (playing the metallophone).
- The standard deviation decreased from .5 to .4, indicating less variability within the group, i.e. the students achieved more consistent results in the final measurement.

2. Progress in the control group:

- The control group also showed improvement, but to a lesser extent - the mean score increased from 3.3 to 3.5, suggesting that the traditional approach (playing the recorder) has some effect on vocal ability, but to a lesser extent.
- The standard deviation remained relatively stable (from .6 to .5), suggesting similar variability in both measures.

3. Interaction between groups and measures:

- There is a clear difference between the experimental and control groups in the final measurement, suggesting that the method used in the experimental group was more effective.
- The relative difference between the initial and final measurements is significantly greater in the experimental group than in the control group, indicating a stronger effect of the intervention.

Based on the results, it can be concluded that the experimental programme, which included playing the metallophone along with singing, had a greater positive effect on the students' vocal abilities than the traditional approach (playing the recorder). The results suggest that the use of a melodic instrument such as the metallophone can significantly contribute to the improvement of intonation and overall vocal skills in young school-age children.

The comparison of initial and final measurements in the experimental group shows a t-statistic indicating a statistically significant difference ($p < .05$). This result suggests a significant improvement in vocal abilities following the intervention.

Similarly, the control group also demonstrated a statistically significant difference between the initial and final measurements, with a t-statistic p-value of .0. However, the observed improvement is smaller compared to the experimental group.

When comparing the final measurements of the experimental and control groups, the analysis yielded a t-statistic and a p-value, confirming a statistically significant difference between the groups. These findings suggest that the experimental method, which involved playing the metallophone, had a greater effect on students' vocal abilities. The p-value of .0 across all tests indicates a high statistical significance of the differences observed in all analyzed cases.

Table 2: Results of Vocal Ability Measurements

Group	Measurement	Mean Score	Standard Error	95% Confidence Interval (Lower Bound)	95% Confidence Interval (Upper Bound)
Experimental	Initial	3.5306	0.81910	3.2953	3.7653
Experimental	Final	4.0306	0.67243	3.8375	4.2238
Control	Initial	3.3061	0.73468	3.0951	3.5171
Control	Final	3.3776	0.64976	3.1909	3.5642

Source: The authors

An analysis of Table 2 shows that the experimental group at the initial measurement had a mean score of 3.5306, with a standard error of .81910, and a confidence interval ranging from 3.2953 to 3.7653. In the final measurement, the mean score increased to 4.0306, with a lower standard error of .67243, indicating an improvement in vocal abilities after the experimental intervention. The confidence interval shows tighter boundaries (3.8375 – 4.2238), which suggests greater measurement precision. The results for the control group show that the initial measurement had a mean score of 3.3061, with a standard error of.73468, and a confidence interval between 3.0951 and 3.5171. In the final measurement, there was a slight improvement to 3.3776, but with a similar standard error (.64976**) and relatively narrow confidence interval boundaries (3.1909 – 3.5642), indicating limited progress compared to the experimental group. In conclusion, the results demonstrate that the experimental group achieved a significantly greater improvement in vocal abilities compared to the control group. The lower standard error and narrower confidence intervals in the final measurement indicate greater reliability of the results within the experimental group.

Looking at Table 2, we can see that the experimental group was the first to be measured. An examination of the descriptive statistics for vocal ability presented in Table 3 shows that the experimental group performed better than the control group on both measures. Subtest I - Assessment of Participants' Vocal Ability included the reproduction by ear of a familiar song and the participants' sensitivity to accurate intonation. In a relatively short period of time, the participants in the experimental group improved their accuracy in melody reproduction and intonation accuracy, achieving higher scores. These results confirm the specific hypothesis H1 that students in the experimental group would achieve statistically significant results in vocal skills compared to students in the control group.

4. DISCUSSIONS

In view of the above findings, it is safe to say that the development of vocal skills is of vital importance in music education. The use of children's melodic musical instruments has a positive influence on the development of vocal skills, improving students' accuracy in singing melodies and intonation stability. Therefore, it is essential for students to play a melodic musical instrument while singing. In order to investigate the students' interest in the teaching area of performing music by singing/playing, a survey questionnaire was designed. The results identified areas in which students were willing and able to participate. The analysis of the survey confirms that students from both the experimental and control groups are highly interested in these teaching areas, thus confirming Hypothesis H2, which states that students are interested in Performing Music by Singing and Performing Music by Playing Instruments. Their interest is best reflected in the high percentage (93%) of respondents from both groups who expressed a positive attitude towards playing instruments. In this context, singing and playing are considered the most important activities for the development of all musical skills, especially vocal skills, in

the first to fourth years of primary school. Involving students in active singing and playing promotes their overall development - intellectually, physically, socially, emotionally and aesthetically. Education through music fosters flexibility in the workplace, emotional maturity, the development of social and emotional intelligence, and criteria for aesthetic appreciation (Atanasov Piljek & Jurkić Sviben, 2016).

Based on these statements, it can be concluded that the general hypothesis H0 is also confirmed - there are statistically significant differences in students' vocal abilities based on the assessment of vocal skills between students who play the metallophone while singing (experimental group) and those who play the recorder (control group), with the advantage observed in the experimental group who play the metallophone while singing.

5. CONCLUSION

The analysis and synthesis of the statistical data obtained shows that the participants in the experimental group (E group) achieved better results than those in the control group (C group) in all the parameters measured. These results confirm the validity of the experimental programme, which prioritised the development of vocal skills. Vocal and instrumental performance, as key aspects of music education, have a profound impact on students' cognitive, emotional, social and motor development. These activities contribute not only to musical skills, but also to the overall development of the student's personality.

Vocal and instrumental performance, as integral components of music education, play a crucial role in the development of children's cognitive, emotional, social and motor skills. Based on the analysis of the results obtained, it is concluded that the experimental (independent) variable not only positively influenced the development of vocal and other individual musical skills, but also stimulated the overall musical culture of the pupils. Singing is also a part of general music education, which promotes the improvement of students' overall cognitive, emotional, social, physical and musical-aesthetic development (Radočaj-Jerković et al., 2018).

Playing instruments and singing at the same time helps to improve concentration, memory and problem-solving skills. Music is one of the most expressive forms of emotional expression. Singing allows students to articulate their emotions and develop better self-reflection (Jeremić & Stanković, 2020), while playing in a group promotes cooperation, team spirit and empathy. These activities not only improve interpersonal relationships among students, but also strengthen their self-confidence. In addition to the positive effects of playing on the children's overall personality, the efficiency of playing is reflected in the special concentration of the pupils, in attentive and active work, in observing and learning from mistakes, in practical activity, in a better understanding of the learning content and in the application of the acquired knowledge. In musical terms, students play the melody by notes, play the melody and harmonic accompaniment, play what they hear, create and perform songs (Vidulin, 2018). Vocal and instrumental performances serve as important tools for the overall development of pupils. Their contribution encompasses all aspects of children's development - cognitive, emotional, social and physical. It is therefore essential that singing and instrumental playing become an integral part of the school curriculum, providing a foundation for children's healthy and successful development. The study demonstrated the importance of the experimental programme, which contributed to the musical maturation of the participants and significantly improved their ability to understand music. This research confirms that vocal and instrumental performance are not only educational activities, but also crucial factors influencing the holistic development of pupils.

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