Exploring the Relationship between Music Learning and Student Educational Performance

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Abstracts

Music education has long been linked to various cognitive and developmental benefits for students and enhances cognitive abilities, including concentration and academic achievement. The aim of this study examines the impact of music education on academic achievement, cognitive development, and overall classroom engagement. Specifically, it explores how music learning correlates with student educational performance. The study looks into a number of factors, including enhanced cognitive abilities, social-and emotional benefits, development of critical thinking skills, economic barriers, and time constraints.The study involved 150 students' data through an online survey, the framework includes hypothesis the development and statistical analysis employing through SPSS to perform statistical tests, including Pearson correlation and T-test. The result indicates a positive correlation between student educational performances in Group 1, with extensive music education, demonstrating higher proficiency and improved academics performance compared to Group 2. The study concludes that music education is a positive consequence on students' performance in academics that underscores the significant role of music education to enhance the integration into educational curriculum can lead to improved cognitive development.

Keywords: Music Learning, Educational Performance, Cognitive Skills, Academic Achievements.

Introduction

Music education has long been regarded as a valuable component of a well-rounded curriculum, with its roots deeply embedded in cultural traditions and contemporary educational practices [2]. Music learning beyond simple improvement of musical abilities is frequently used to support its inclusion in educational settings. Music learning impact on various student performance metrics such as social-emotional competencies and overall academic achievement has been the focus of research over time [15].

I. Musical development for social and emotional growth

Education through music not only improves cognitive abilities but also helps children's grow socially and emotionally [4]. Working as a team and practicing communication skills are promoted by involvement in group music activities like bands, responses, and ensembles [12]. Empathy and emotional expression are two skills that students can develop via music education that are important for social interaction. Students could learn to handle stress and develop resilience by participating emotionally in the process of generating music, through composition or performance. Fig.1 shows the comprehensive benefits of student development.

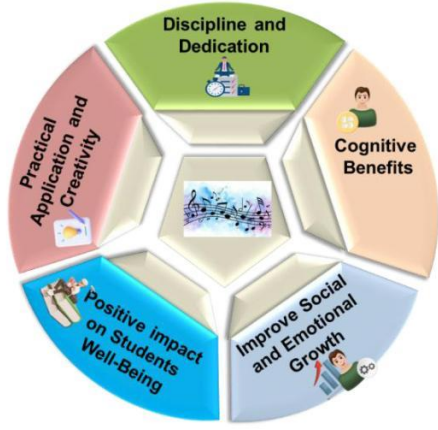

Fig 1 comprehensive benefits of student development

Music education also fosters emotional expression and regulation. The music students can explore and express their emotions, which is particularly beneficial for the struggle with verbal communication. Participating in music ensembles, such as choirs or bands, encourages collaboration and teamwork [13]. Interpersonal skills like empathy, cooperation, and communication are developed by the students through their social interactions are beneficial

throughout and outside of the classroom. Learning music has educational benefits which range beyond the cognitive and social-emotional domains [11]. Several studies have found correlations between music education and improved academic performance in subjects such as reading, mathematics, and science [14]. The skills developed through music learning, such as pattern recognition and auditory discrimination are transferable to other academic subjects. For instance, learning to read musical notation requires the recognition of patterns and symbols, similar to the skills used in reading and calculation [8]. The ability to recognize and manipulate patterns is essential for understanding mathematical concepts, such as geometry and algebra. Moreover, the auditory processing skills developed through music training can enhance language development, particularly in areas such as phonological awareness, reading fluency, and comprehension. The main objective is to investigate how music learning influences student educational performance by analyzing connections between musical engagement and academic achievements, aiming to identify potential benefits and impacts of music education on overall academic success and cognitive development.

Organization of this work

The work is organized into the following sections: Section 2 describes related work, Section 3 demonstrates hypothesis developments, Section 4 describes methods, Section 5 explains the result and Section 6 concludes the study.

Related work

This section analysis the existing research on music learning, highlighting studies on pedagogical approaches, technology integration and cognitive development. It identifies trends and gaps in music education methods to provide context and insight for the current investigation into effective learning strategies.

This study described the connection between primary students learning piano in a Spanish conservatorium and their interpersonal skills and musical abilities [5]. It indicated that raising emotional intelligence could improve performance and equilibrium in an individual. To ensembles playing exercises enhances to improved intrapersonal abilities and emphasizes how critical emotional growth was to the teaching of music. To builds on intrinsic motivation, and academic achievement particularly in [7] science, technology, engineering, and mathematics (STEM) education. The positive effects of blended learning on student motivation and performance, exclusively examine the effects within the context of level chemistry. Aligns with that highlighted effectiveness of relaxation techniques and music therapy in reducing academic stress and enhancing performance. Similar interventions, such as mindfulness and guided relaxation, had been shown to lower stress levels and improve focus in the music. The contributed progressive muscle relaxation [9] (PMR) and music therapy specifically for nursing students before exams. The article emphasized music education in fostering general and intercultural competence [10]. It highlighted how music lessons, through teacher-student interaction and peer collaboration, contribute to students' holistic development by nurturing their musical culture, skills, and broader intercultural understanding. Study aligned with the digital divides that impacts the student performance, focusing on information and communication

technology (ICT) [3] usage and digital skills. It highlighted the importance of digital literacy in enhancing academic outcomes and examined how ICT investment and innovative use influence academic successes.

The study examined the integration of technology in music education, particularly for future music teachers. It emphasized enhancing teachers' technological culture and applying innovative tools in vocal training [6]. This approach complemented existing frameworks that advocate for the incorporation of technological and creative methods in pedagogical practice. Research on factors influencing academic performance, highlighted the importance of a conducive learning environment [1] and effective teaching methods. The optimal environmental conditions and skilled, diverse teaching approaches positively impact student outcomes. It also provided data-driven insights for enhanced educational practices globally.

Hypothesis Development

The purpose of this study is to examine how participation in music learning influences student academic performance, assessing how music education impacts cognitive skills, academic achievement, and overall educational outcomes. The hypothesis developed evaluates the effects of disciplinary measures. The relationship between music learning and student educational performance is demonstrated by the five hypotheses. Fig.2 shows the developed hypothesis.

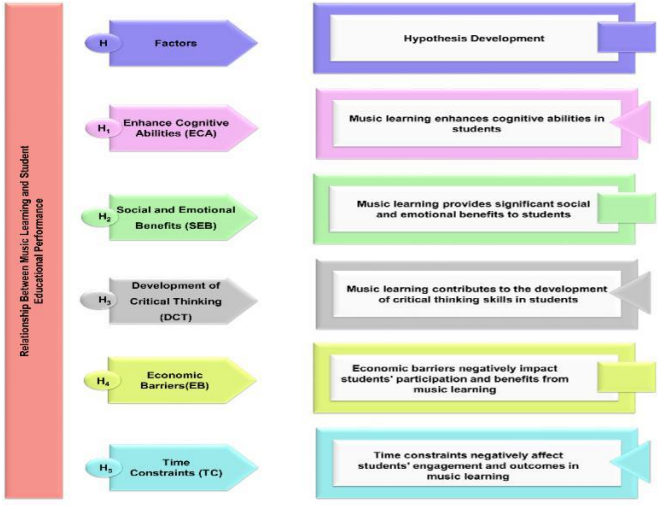

Fig 2 Developed hypothesis

Enhance Cognitive Abilities

The students who engage in music learning activities demonstrate significant improvements in cognitive abilities compared to those who do not participate in music education. Cognitive abilities could include skills such as memory, attention, problem-solving, and spatial reasoning. The rationale behind this is based on the idea that music training stimulates areas of the brain associated with cognitive functions, leading to measurable improvements in academic performance and cognitive skills.

H1: Music learning enhances cognitive abilities in students.

Social and Emotional Benefits

Students involved in music education experience enhanced social and emotional well-being compared to those who are not engaged in music learning. Social benefits could include improved teamwork, communication skills, and peer relationships, while emotional benefits could encompass increased self-esteem, emotional regulation, and stress relief. The underlying idea is that music education fosters a supportive community and provides a constructive outlet for emotional expression.

H2: Music learning provides significant social and emotional benefits to students.

Development of Critical Thinking

Critical thinking skills include the ability to assess, and synthesize information benefits effectively. The grounded confidence that music education encourages complex cognitive processes is pattern recognition, creativity, and problem-solving, which are essential components of critical thinking.

H3: Music learning contributes to the development of critical thinking skills in students.

Economic Barriers

The economic constraints, such as the cost of music lessons, instruments, or materials, hinder students' ability to engage in music education. Students from economically lacking backgrounds could experience fewer benefits from music learning compared to their peers. Economic barriers can limit access to quality music programs and resources, which lead to disparities in social, emotional, and critical thinking benefits associated with music education. The foundation that financial limitations create obstacles to participation, thereby affects the overall impact of music learning on student development.

H4: Economic barriers negatively impact students' participation and benefits from music learning.

Time Constraints

The students facing time constraints, such as a demanding academic schedule, extracurricular commitments, have reduced engagement in music learning activities and, consequently, diminished benefits. Time constraints can limit the amount of time available for practice, instruction, and participation in music programs, potentially leading to less effective learning

experiences and fewer cognitive, social, emotional, and critical thinking gains. Balancing music learning with other responsibilities can be challenging, and insufficient time dedicated to music education could negatively impact its overall effectiveness.

H5: Time constraints negatively affect students' engagement and outcomes in music learning.

Methods and Materials

The study examines how music learning influences student educational performance by analyzing correlations between musical engagement and academic achievements. The first stage in the framework is hypotheses development. SPSS is employed to conduct various statistical tests on the obtained data and variables. Fig.3 illustrates the structure of the framework.

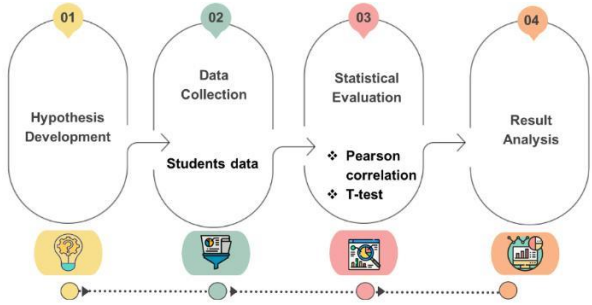

Fig 3 Framework Structure

Data collection

The study's aim is to analyze the influence of music education on academic achievement, cognitive skills, and overall classroom engagement in interactions that improve learning outcomes. The study gathers data from 150 school students through an online survey. The school students are separated into two groups: Group 1 and Group 2. Group 1 contains 100 individuals with at least 3 years of music education; the participants demonstrated a high level of proficiency and expertise in their musical performances. Group 2 consists of 50 participants who were not exposed to music learning, no significant learning outcomes were observed. Table I shows the demographic profile of the students.

Table I Demographic profile of the students

Demographic Variable	Group 1: Music Education (n=100)	Group 2: No Music Education (n=50)	Total (n=150)
Gender			
Male	60	25	85
Female	40	25	65
Age			
10-12 years	30	15	45

13-15 years	40	20	60
16-18 years	30	15	45
Grade Level			
Elementary (K-5)	50	25	75
Middle School (6-8)	30	15	45
High School (9-12)	20	10	30
Music Education Duration			
3-5 years	40	N/A	40
6-8 years	30	N/A	30
9+ years	30	N/A	30
Types of Music			
Classical	40	N/A	40
Jazz	30	N/A	30
Contemporary	30	N/A	30

Statistical analysis

To examine the surveyed data, statistical techniques were employed using SPSS for student educational performance. The study evaluates tests including the Pearson correlation and T-test. The linear relationship between two continuous variables is measured using Pearson correlation to determine its strength and direction. T-test is used to determine the significant differences between the means of two groups. This study calculates the relationship between positive variables (cognitive abilities, social and emotional benefits, development of critical thinking) and negative variables (economic barriers, time constraints).

Result analysis

This study determines the potential effects of music education on general academic success and cognitive development by examining correlations between musical engagement and academic achievements, by examining how music learning affects student educational performance. Pearson correlations calculate the relationships between positive variables such as enhancing cognitive abilities, social and emotional benefits and the development of critical thinking, and also negative variables such as economic barriers, time constraints. The linear link between two continuous variables is measured using the Pearson correlation. The music education and student academic achievement is assessed using the Pearson correlation coefficient. It is possible to determine how music education could affect students' participation in the learning process and overall academic success by measuring the intensity and direction of association. When comparing student academic performance across different levels of involvement in music learning, t-test is used to determine the variance among the average of two groups, assuming that the data has a normal distribution.

I. Pearson coefficient Analysis

To assess the degree of association between student academic accomplishment and music learning, Pearson's coefficient is an effective instrument. If a student's Pearson coefficient is positive, learning music will improve their academic performance. Ranging from -1 to 1 it

quantifies the strength and direction of their association, with 0 indicating no correlation. Table II shows the Pearson coefficient Analysis.

Table II outcomes of Pearson coefficient analysis

	Enhance Cognitive Abilities	Social and Emotional Benefits	Development of Critical Thinking	Economic Barriers	Time Constraints
Enhance Cognitive Abilities	1.00	0.75	0.80	−0.50	−0.45
Social and Emotional Benefits	0.75	1.00	0.85	−0.55	−0.50
Development of Critical Thinking	0.80	0.85	1.00	−0.60	−0.55
Economic Barriers	−0.50	−0.55	−0.60	1.00	0.65
Time Constraints	−0.45	−0.50	−0.55	0.65	1.00

Positive values indicate a positive linear relationship between the variable, coefficient of 0.75 between social and emotional benefits and enhance cognitive abilities a strong positive relationship. Negative values indicate a negative linear relationship, coefficient of −0.50 between economic barriers and enhance cognitive abilities suggests an inverse relationship, where enhances the cognitive abilities are associated with less economic barriers at the coefficient of -0.50. Diagonal values are 1.00as each variable is perfectly correlated.

II. T-test

A statistical test called the t-test is performed to examine a substantial variance among the average of two groups, used to compare the average academic performance of students who do engage in music education who do not take part in the context of examining the connection between music education and academic achievement. The t-test assists in determining music instruction has a statistically significant effect on academic outcomes by examining the variations in their performance scores, music learning on performance outcomes. Table III shows the T-test for factors.

Table III T-test of for factors

Variables	Group 1		Group 2		t-value	p-value
	Mean	SD	Mean	SD		
Enhance Cognitive Abilities	85.5	10.2	80.3	11.1	2.34	0.02
Social and Emotional Benefits	78.7	9.8	74.1	10.5	1.95	0.05
Development of Critical Thinking	82.4	8.7	76.9	9.3	3.21	0.001
Economic Barriers	73.9	11.4	81.5	10.8	-2.56	0.01
Time Constraints	80.2	9.6	78.5	10.1	1.37	0.17

The analysis of t-test significant difference between two groups across several variables, such as t-values enhancing cognitive abilities at 2.34%, social and emotional benefits at 1.95%, development of critical thinking at 3.21%, economic barriers at -2.56%, and time constraints at 1.37%. The Pearson correlation analysis reveals strong positive relationships between musical engagement and cognitive and emotional benefits, suggesting that music education enhances cognitive abilities and critical thinking while reducing economic barriers. The t-test results indicate significant academic performance improvements for students involved in music, particularly in cognitive abilities and critical thinking, with p-values below 0.05. However, time

constraints did not show a significant impact. Findings show the music learning has a positive impact on academic performance and cognitive growth.

Conclusion

The study concluded that student achievement improved as a consequence of receiving music education. The research findings indicated a significant association between a comprehensive music education curriculum and improved academic performance. Students in Group 1, received more extensive music education, exhibited higher proficiency and better academic performance compared to those in Group 2. The findings underscored the significant role of music education in enhancing cognitive development and suggested that integrating music education into the curriculum could lead to improved academic outcomes. Future research could explore long-term effects and how different types of music education influence various cognitive and emotional aspects across diverse student populations.

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