

MUSICAL INTELLIGENCE PROFILES OF BIOLOGY STUDENTS AND EFFECTS OF MULTIPLE INTELLIGENCES-BASED APPROACH: A CASE OF ISLAMABAD PAKISTAN

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ABSTRACT

This study aimed to investigate the musical intelligence profiles of biology students in Islamabad, Pakistan, and the effect of a Multiple Intelligences-Based Approach (MIA) on their musical intelligence. The study used the Multiple Intelligences Survey (MIS) by B. Sherear to assess the musical intelligence of 70 students. An experimental research design was then conducted to compare the musical intelligence scores of students in the experimental group, who were taught using the MIA, with those in the control group, who were taught using traditional methods. The results showed a significant difference in the musical intelligence scores of the experimental group as compared to the control group. The findings suggest that the MIA approach can have a positive effect on the musical intelligence of biology students. The study highlights the importance of incorporating MI-based teaching in the curriculum to accommodate the diverse learning needs of students.

Keywords: Musical Intelligence, Musical Intelligence Profile, Musical Intelligence Based Approach

Introduction:

Music is an integral part of our lives, beginning from the moment we are born. As humans, we use music to mark and enhance important events and activities. Even in our daily routines, we encounter situations that trigger memories of melodies and rhythms. This demonstrates that one does not need to be a professional musician to appreciate and engage with music; we all possess a form of musical intelligence. The development of this musical intelligence can be traced back to ancient times, supported by archaeological findings of musical instruments. Musical intelligence is one of the eight intelligences within Howard Gardner's Theory of Multiple Intelligences. It's crucial to bear in mind that Gardner defines intelligence as "the capacity to solve problems or create products that hold significance within a specific cultural or communal context." According to Gardner's theory, he identifies eight distinct intelligences that both collaborate and exist independently. Each of these intelligences possesses the potential for growth through exposure to stimuli. Musical intelligence is the capacity to perceive, differentiate, manipulate, and articulate sounds and musical structures. It empowers individuals to generate, convey, and decipher meaning through the medium of sound. This form of intelligence encompasses an awareness of the rhythmic patterns, melodies, and tonal elements within a musical composition. Children may exhibit early musical aptitude when they are exposed to musical education or are born into a family with a strong musical background. The extent of a child's exposure plays a pivotal role in the development of their musical intelligence. Music can serve as a way to capture feelings, insights about feelings, or insights into the forms of

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feelings; communicating them, thus, from the artist or creator to the attentive listener.”(Gardner, 1983).

The awareness, understanding, and exploration of a melodious sound structure, down to the best detail by the brain, is indubitably one of the most vital components of intelligence. Music and hearing are very closely associated. Primary, the existence of a vibrant body is essential to listen sound or music. Secondary, the ear has to perceive and transfer the vibration. Interpretation and Perception by the brain of the sound approaching to the ear are nuts and bolts to hear music (Çuhadar, 2017). The awareness and judgment of structured resonances by the brain is linked to intelligence as it encompasses interpretation, analysis and reasoning talents. Kaçmaz (2017) discovered that individuals with higher cognitive complexity tend to exhibit more intricate preferences, whereas those with lower cognitive complexity tend to demonstrate simpler preferences. According to Rentfrow and Gosling (2003), the theory of multiple intelligences proposes that individuals use a combination of eight intelligence profiles throughout their education, with the dominant types varying between individuals. Therefore, it is important to understand the distribution of intelligence profiles within music preferences and try to ascertain the dominant type of intelligence profile based on the clues provided by the genre of music to which they listen. This information can then be used to determine the most appropriate approaches and methods to be used in their education, as a single approach in education is not an efficient method for every student. The theory of multiple intelligences has been proposed for the consideration of new educational methods. The theory of multiple intelligences proposes that a single approach in education is not an efficient method for every student. Instead, it suggests that individuals use a combination of eight intelligence profiles throughout their education, with the dominant types varying between individuals. However, studies of schools have shown that only two types of intelligence (Verbal-linguistic intelligence and Logical-mathematical intelligence) were being used whilst the other types were used solely outside of school. This highlights the need to understand the distribution of intelligence profiles within music preferences and try to ascertain the dominant type of intelligence profile based on the clues provided by the genre of music to which they listen. This information can then be used to determine the most appropriate approaches and methods to be used in their education, as a single approach in education is not an efficient method for every student. The theory of multiple intelligences has been proposed for the consideration of new educational methods, and when implemented properly in the classroom, it can have very positive results, such as increased academic achievement and cooperative learning skills. However, accommodating so many different bits of intelligence within the classroom is difficult, and some intelligence may not lend themselves well to group learning situations. (Talu, 1999) Tailoring the educational approach to align with students' unique intelligence profiles can enhance the effectiveness of educational programs in achieving their goals successfully. Research on the influence of music interventions has revealed positive outcomes across various skill sets. Given the growing challenge that schools face in supporting the education and development of children with diverse behavioral issues, incorporating musical interventions could be an enticing option.

A study involving children with initially limited prosocial skills demonstrated that those enrolled in schools with an enhanced group music program exhibited greater increases in

sympathy and prosocial behavior compared to their counterparts in schools without such a program (Dumont et al., 2017). Moreover, within the same study, children in the music group displayed improved empathy scores on two out of three measures, outperforming children in the games group and the control group. In a three-year experimental investigation conducted by Rickard et al. (2013), it was observed that school-based music lessons prevented a decline in global self-esteem measures among both younger and older cohorts in the first year of the study when compared to a control group. Higher self-esteem in students can contribute to more adaptive behaviors, especially in uncomfortable situations.

Musical Intelligence and Attitude Toward Learning

Engaging in musical activities can elicit a range of emotional responses, potentially leading to changes in behavior. When individuals participate in musical pursuits, they perceive the emotional and psychological content conveyed by the music, allowing them to interpret the thoughts and feelings of others (Greenberg et al., 2015). In the process of engaging in music, children acquire both affective and cognitive abilities that are essential for developing empathic competencies. For instance, children with musical training tend to exhibit heightened sensitivity to the emotional expressions conveyed through music (Castro and Lima, 2014). This type of empathy and increased social awareness can aid students in managing their emotions, reducing the likelihood of acting out in a defiant manner. Furthermore, the positive effects of musical engagement persist into adulthood, as adults with professional musical training demonstrate an enhanced sensitivity to emotions conveyed in speech compared to non-musicians (Kraus and Chandrasekaran, 2010). Empathy plays a pivotal role in overall well-being and is indispensable in social interactions. Therefore, it is essential to develop strategies for enhancing empathy and prosocial behaviors. Arts classes have the potential to impact students who may otherwise be challenging to reach and can exert positive influences on their behavior. In an article titled "Benefits of Art Education" by Kimberly Lloyd, the collaborative efforts of researchers, as evident in the "Champions of Change," highlight how the arts can reach students who might not be reached through other means, connect students to themselves and their peers, transform the learning environment, and bridge learning experiences with the real world.

Musical Intelligence and Academic Achievement

In addition to enhancements in attitude, music can also have an effect on a student's academic achievements. According to Gardner's Multiple Intelligences theory, music is an individual intelligence as it does not rest on the physical world, like kinesthetic intelligences, and interactions, as do the intrapersonal intelligences. As Schellenberg (2004) suggests, the most probable explanation for the reported array of advantages stemming from music interventions is that musical training elevates individuals' overall intelligence, and this elevation correlates with a wide range of cognitive and academic skills. Participating in music training necessitates concentrated attention, the acquisition of intricate visual patterns, memory retention, and the development of fine motor skills. Engaging in such a challenging activity may, in turn, boost the overall cognitive abilities of children and young adolescents, potentially leading to an improvement in their academic performance (Sala, 2017). Recent research trends reveal

encouraging connections between music training and academic success. Studies have explored various academic subjects, including English, mathematics, natural science, history, and geography. In a longitudinal study conducted by Schellenberg in 2004, the results demonstrate experimental evidence indicating that just one year of music training can lead to modest enhancements in academic performance. According to Forgeard et al. (2008), there is a reported correlation between music discrimination ability and phonological processing skill in a sample of both typically developing and dyslexic children. This suggests that music has the potential to assist students who may face learning difficulties and disabilities. The research by Cheek and Smith (1999) reveals that students who had undergone private music lessons exhibited improved performance in the mathematics section of the Iowa Test of Basic Skills, as highlighted by Sala and Gobert in 2017. There appears to be a positive link between music proficiency and cognitive aptitude. Music training contributes to the enhancement of auditory skills, and this improvement in auditory skills has been found to positively impact linguistic abilities, as indicated by Roden, Kreutz, and Bongard in 2012. These enhanced linguistic skills may ultimately have a connection with academic achievement. Music has the ability to modulate both arousal and attention in the brain and can effectively activate various regions in the brains of individuals with neurological disorders (Koelsch, 2014). Numerous studies have revealed the presence of unique emotional and cognitive processes that underlie the impact of musical training on the development of empathy. Engaging in music practice equips children with the affective and cognitive skills essential for fostering empathic competencies. To illustrate, children with musical training often display heightened sensitivity to the emotional expressions conveyed through music (Castro & Lima, 2014). Intensive musical training is linked to structural changes in the brain, resulting in enhancements in auditory processing, sensory-motor abilities, and advanced cognitive functions (Wu & Lu, 2021). These neurological changes may underlie the higher academic performance of music students and could also offer benefits to other students. Structural changes associated with intensive musical training are manifested in improvements in auditory processing, sensory-motor skills, and high-order cognitive functions (Wu & Lu, 2021). These changes in the brain could be responsible for music students' higher academic achievement and could also be beneficial for students.

Problem of the study

The literature review highlights the significance of understanding students' musical intelligence profiles to inform teaching methods. However, despite the acknowledgment of this importance, there is a notable research gap in the context of Pakistan, as there is no prior study that has specifically examined the integration of musical intelligence into biology lesson plans through the presentation of topics in poetic form. This gap underscores the need for research to explore the effectiveness and implications of such an approach within the Pakistani educational setting. The subject of biology was selected for the experimental study on the effect of multiple intelligence-based approach on musical intelligence profile of secondary level students because it provides a unique opportunity to study the effect of music on brain activity, academic performance, and multiple intelligences in the context of biology. (Clark, Downey, & Warren, 2015; Kanduri et al., 2015; Munsey, 2006).

Objectives

The objectives of the study were to identify the musical intelligences profiles of biology students at Islamabad Pakistan and to investigate the effect of multiple intelligences approach on musical intelligences profiles of biology students in the same grade level.

Study Questions

This study attempted to answer the following questions:

- 1) What are musical intelligences profiles of biology students at Islamabad Pakistan?
- 2) What is the effect of multiple intelligences-based approach on musical intelligences profiles of biology students at Islamabad Pakistan?

Significance of Study

The importance of the current study lies in identifying the musical intelligence profiles of students in Islamabad, Pakistan. This information serves as a foundation for developing teaching practices that are tailored to the specific needs and strengths of these students. By comprehending the types of musical intelligence that students possess, teachers can design activities and instructional materials that align with their strengths and interests. This approach has the potential to enhance students' engagement, motivation, and achievement, thereby improving their overall learning experience.

Furthermore, this study can contribute to a better understanding of the diversity and complexity of intelligence and its role in education. By recognizing the various forms of intelligence that students possess, educators can create a more inclusive and equitable learning environment that values and respects the unique abilities and talents of each student. This study holds the potential to make a significant impact on education, both nationally and globally, by promoting a more student-centered, inclusive, and equitable approach to teaching and learning."

Methodology

The research method employed in this study was the true experimental research method. The approach utilized in this study is a quantitative research approach. The population of this study comprised all 9th-grade students who were enrolled in Islamabad Model College for Girls I-8/4 during the 2022-2023 academic session. The study sample was selected from the students of the 9th class who had opted for biology as an elective subject, and it included seventy participants. The "What Kind of Thinker Are You?" survey, also known as the MIS survey, was developed by B. Shearer as a tool to evaluate an individual's multiple intelligences profile. This survey comprises 27 questions, each of which presents the respondent with a set of five response options. These options are specifically designed to gauge the respondent's level of ability or preference for distinct types of intelligence and are assessed on a scale from 0 to 4, signifying a high ability or preference. The MIS survey is grounded in Howard Gardner's theory of multiple intelligences, which posits that individuals possess a range of intelligences, including linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and

naturalistic intelligences. The primary aim of the MIS survey is to assess a person's level of ability or preference within each of these eight intelligence categories (Shearer, 2004). The researcher has chosen three teaching units, namely unit: 7 bioenergetics Unit 8: Nutrition and Unit 9: Transport for the 9th-grade biology curriculum. Employing the principles of a multiple intelligences-based approach, the researcher has developed a lesson plan for each sub-topic within the selected units for study. Furthermore, the researcher has created and verified multiple intelligences-based lesson plans for various topics within Unit 7: Unit 8: Nutrition and Unit 9: Transport. This process involved communicating with B. Shearer, an expert in multiple intelligences-based lesson planning, who provided guidance and assistance via email. It is worth noting that the researcher has also obtained both basic and advanced certifications in multiple intelligence-based lesson planning through online courses. Out of the 136 secondary schools within the Federal Directorate of Education, one school was selected based upon the criteria of maximum of students in Biology subject for an in-depth study. This school stood out due to its remarkable feature of having the maximum number of students enrolled in the field of biology. There was total seventy students in biology class comprised the sample.

Table 1. *Sample in detail*

Students in Experimental Group	Students in Control Group	Total Students
35	35	70

In the experimental group, the instructions were provided directly by the researcher herself. However, in the control group, the instructions were delivered by a biology teacher who possessed a master's degree in philosophy (M.Phil.) and a master's degree in education (M.Ed.)

The researcher administered the "Multiple Intelligences Interest Survey: What Kind of Thinker Are You?" to both the experimental and control groups of students. The survey aimed to determine the students' multiple intelligences profiles. The scores obtained by the students on the survey were recorded and organized using descriptive statistics.

Data Analysis and Interpretation

The objectives of the study were to identify the musical intelligences profiles of biology students at Islamabad Pakistan and to investigate the effect of multiple intelligences approach on musical intelligences profiles of biology students in the same grade level. To achieve the objectives the musical intelligences profile of biology students is identified as shown in tables below:

Table 2. Musical intelligence profile of students

MU			Std.	No of	Percentage	MU
Mean	Minimum	Maximum	Deviation	students	of students	category
score						

				16	23	weak
2.11	.20	3.80	0.99	38	55	moderate
				16	22	strong
Total				70	100	

Note. MU= *Musical Intelligence*

Table 2 indicates that the majority of students (54.3%) demonstrated a moderate level of musical intelligence, while 22.9% exhibited a weak level, and 22.9% displayed a strong level. Table 3. *Effect of Treatment on Musical Intelligence Score*

MIU	N	Mean	Std. Deviation	Std. Error Mean	M.D	t	Df	Sig. (2- tailed)
Pre-test	35	2.045	0.990	0.167	-0.440	-2.188	68	.032
Post-test	35	2.485	0.658	0.111				

Table 3 presents the effect of MIA on musical intelligence score. The pre-test group had a mean musical intelligence score of 2.045 (SD = 0.990), while the post-test group had a mean score of 2.485 (SD = 0.658). The mean difference between the pre-test and post-test was -0.440, with a t-value of -2.188 and 68 degrees of freedom. The p-value for the t-test was .032, indicating that the difference between the pre-test and post-test scores was statistically significant.

Findings

The findings of this study suggested that the Musical Intelligence profile of students was examined, with a mean score of 2.11, a minimum score of .20, and a maximum score of 3.80. The standard deviation is .99193, and there are 70 students in total. The majority of students (54.3%) fall into the moderate category, with 22.9% in the strong category and 22.9% in the weak category. The effect of treatment on musical Intelligence was assessed. The pre-test group had a mean musical intelligence score of 2.045 (SD = 0.990), while the post-test group had a mean score of 2.485 (SD = 0.658). The mean difference between the pre-test and post-test was -0.440, with a t-value of -2.188 and 68 degrees of freedom. The p-value for the t-test was .032, indicating that the difference between the pre-test and post-test scores was statistically significant. Results of the study are consistent with several previous studies Schellenberg (2006) found long-term positive associations between music lessons and IQ, suggesting a positive relationship between musical training and cognitive functions, Bonetti and Costa (2017) showed associations between fluid intelligence and music tasks in children aged 4-6 years old with no previous musical training, suggesting a possible innate connection between some musical skills

and intelligence that could potentially lead to a higher probability of engaging in musical studies for children with higher Chan et al. (1998), Gromko and Poorman (1998), and Cheek and Smith (1999) found associations between musical training and intelligence measures IQ.

Conclusion

It is concluded that the majority of students possess a moderate level of Musical Intelligence with a smaller proportion falling under the strong or weak categories it is also concluded that a noteworthy variation was found between the pre-test and post-test in the musical intelligence outcomes of students who received instruction through the MIA when compared to those taught using the traditional approach. These results suggest that the MIA had a substantial and positive effect on the development of Musical Intelligence of biology students

Recommendations for Further Research

1. Future studies may examine the musical intelligences profiles of students in other fields, such as physics, chemistry, and mathematics, to compare and contrast the findings with those of the present study.
2. Future studies may explore the relationship between musical intelligences and academic achievement among biology students in Islamabad, Pakistan, to further understand the impact of multiple intelligences on learning outcomes.
3. Future studies may investigate the effectiveness of multiple intelligences-based approach on students' attitudes towards learning and motivation to learn, as previous studies have shown positive results in this regard.
4. Future studies may examine the relationship between musical intelligences and teaching practices, to identify the most effective teaching methods that cater to the diverse intelligences of students.
5. Future studies may examine the musical intelligences profiles of students from different regions of Pakistan, to identify any regional differences in the distribution of multiple intelligences

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