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Multiple Intelligences Profiles of Biology Students at Islamabad Pakistan

Fahim Khatoon, Dr. Munazza Ambreen

Department of Secondary Teacher Education, Allama Iqbal Open University, Islamabad, Pakistan
*Corresponding author email: fahim.khatoon.phd@gmail.com

ABSTRACT
The study aimed to investigate the multiple intelligence profiles of biology students at Islamabad Model College for Girls I/8-4 in Pakistan. In this study, the "What Kind of Thinker Are You?" by B. Shearer (MIS interest survey) was used to determine the multiple intelligences profiles of secondary students of biology in Islamabad. A sample of 70 biology students was randomly selected from the population of ninth-grade students at Islamabad Pakistan. . Descriptive and inferential statistics were used to investigate the students' MI profiles. The study identified all eight types of intelligences possessed by students. The results showed that the students had high scores in natural intelligence and intrapersonal intelligence, followed by spatial, logical-mathematical, interpersonal, musical, linguistic, and kinesthetic intelligence.

KEY WORDS: *Multiple Intelligences Profiles, Biology Students*

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INTRODUCTION

In the field of education, the concept of multiple intelligences has gained widespread acceptance. Multiple intelligences theory, developed by Howard Gardner, proposes that individuals possess different types of intelligence, and that intelligence is not a single entity that can be measured through IQ tests (Gardner, 1983). According to Gardner's theory, there are eight types of intelligence: naturalistic, musical, logical-mathematical, linguistic, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. Each type of intelligence is associated with different cognitive abilities, and individuals may have a dominant or multiple intelligences, and these intelligences can be identified and nurtured to promote effective learning. Understanding the multiple intelligences profile of students can help educators design instruction that caters to their individual needs and preferences, leading to more effective learning outcomes. According to Nuri Emmiyati and colleagues (2014) No two individuals possess exactly the same profile of intelligences, and these profiles may influence their learning preferences, processes, and outcomes in educational settings. In their study, Armstrong and Miskovic (2018) found that identifying the multiple intelligences profiles of students can improve their academic performance and motivation. Similarly, Chen and Sun (2019) found that integrating multiple intelligences theory in the curriculum can enhance students' interest in learning and their critical thinking skills. Multiple intelligences profile helps educators to understand the diverse ways in which students learn. It considers the fact that not all students learn in the same way and that each student has unique strengths and weaknesses. By considering a student's multiple intelligences profile, teachers can design lessons and activities that cater to the individual needs and learning styles of each student, leading to more effective teaching and improved learning outcomes. Additionally, understanding a student's multiple intelligences profile can also help build their confidence and self-esteem as they realize their strengths and develop a better understanding of their own learning abilities.

Review of Related Literature

Previous studies have investigated the multiple intelligences profile of students in various contexts. Research has shown that students' multiple intelligences profiles can vary based on cultural and environmental factors. For example, a study conducted by Nartgun and colleagues (2019) found that Turkish students had the highest scores in linguistic, intrapersonal, and logical-mathematical intelligences. Another study conducted by Fakude and colleagues (2020) found that South African students had high scores in interpersonal and musical intelligences.

Studies on multiple intelligences profile among students in various regions have shown diverse results. Nofal (2008) examined the differences in multiple intelligences among first-year students in UNRWA institutions in Jordan. The study investigated eight types of intelligence and found that verbal intelligence was the highest progressing followed by social, bodily-kinesthetic, existential, visual, logical-mathematical, naturalistic, and musical intelligence, Aljarah and Rababah (2011) conducted a study on multiple intelligences and problem-solving ability in Jordanian private schools. The study examined seven types of intelligence, including self, social, logical, visual, natural, verbal, and musical intelligence. The study found that the order of the multiple intelligences was as follows: self, social, logical, visual, natural, verbal, and musical intelligence. The study also reported a positive correlation between multiple intelligences and problem-solving ability. . A study by Sharma and

Singh (2015) found that 9th-grade biology students in India had higher strengths in intrapersonal, interpersonal, and natural intelligences.In a study conducted in Iran, the dominant intelligence among high school students was linguistic, followed by logical-mathematical, visual-spatial, interpersonal, musical, bodily-kinesthetic, naturalist, and intrapersonal (Farjad, 2017). Another study conducted in India showed that students' dominant intelligence was logical-mathematical, followed by linguistic, naturalistic, intrapersonal, bodily-kinesthetic, spatial, interpersonal, and musical (Davoodi, 2018). A study by Ahmed and Jahan (2018) investigated the multiple intelligences profile of college students in Bangladesh and found that the linguistic intelligence was the most dominant among the students.

In contrast, a study by Khorshid and Mahfouz (2019) investigated the multiple intelligences profile of secondary school students in Saudi Arabia and found that the logical-mathematical intelligence was the most dominant among the students. Another study by Khalid and Hashmi (2019) examined the multiple intelligences profile of medical students in Pakistan and found that the students scored highest in logical-mathematical intelligence, followed by interpersonal intelligence and intrapersonal intelligence another study by Ibrahim et al. (2019) assessed the multiple intelligences profile of medical students in Malaysia and found that the students had high scores in logical-mathematical, spatial, and natural intelligence, Similarly, in the context of biology education, previous research has shown that biology students possess diverse multiple intelligences profiles. For example, a study by Jahan and Khatun (2017) found that 10th-grade biology students in Bangladesh had varying strengths in natural, musical, interpersonal, and logical-mathematical intelligences. Another study by Sharma and Singh (2015) found that 9th-grade biology students in India had higher strengths in intrapersonal, interpersonal, and natural intelligences. Alabdulkarim and Alhelew (2014) conducted a study on multiple intelligences among Saudi university students. The study investigated eight types of intelligence, including social, natural, bodily, verbal, visual, logical, musical, and self-intelligence. The study found that the pattern of intelligence among students was as follows: social intelligence was the most common, followed by natural intelligence, bodily intelligence, verbal intelligence, visual intelligence, logical intelligence, musical intelligence, and self-intelligence.

In Pakistan, several studies have investigated the multiple intelligences profile of students in different subjects. For example, a study by Bukhari and Zulfiqar (2018) found that the most dominant intelligence among 9th-grade students in mathematics was logical-mathematical intelligence, followed by spatial intelligence. Another study by Awan and colleagues (2019) found that the most dominant intelligence among medical students was logical-mathematical intelligence, followed by intrapersonal intelligence. However, there is a lack of research on the multiple intelligences profile of biology students in Pakistan. Therefore, this study aimed to address this gap by identifying the multiple intelligences profile of 9th-grade biology students in Islamabad.

The Problem of the Study

Several previous studies have identified the lack of awareness and implementation of teaching methods that cater to different types of intelligences as a problem in the global context. For example, in their study on multiple intelligences in primary education, Howard-Jones and colleagues (2017) noted that traditional teaching methods may not suit all students, and suggested that teachers need to adopt a more flexible and inclusive approach that caters to different intelligences. Similarly, McLeod and colleagues (2017) found that students who are not catered to in terms of their preferred intelligences may be disadvantaged in their learning experiences and suggested that teachers need to adopt a more flexible and inclusive approach that caters to different intelligences.

Overall, previous studies suggested that the problem of the lack of awareness and implementation of teaching methods that cater to different types of intelligences is a significant issue in both the global and Pakistani contexts, and that more inclusive and flexible approaches like multiple intelligences based approach to teaching are needed to address this problem.

Objectives

The objectives of the study were to identify the multiple intelligences profiles of biology students at Islamabad Pakistan and to determine the ranking of multiple intelligences among biology students in the same grade level.

Study Questions

This study attempted to answer the following questions:

1) What are multiple intelligences profiles of biology students at Islamabad Pakistan?

2) What is the ranking of multiple intelligences among biology students at Islamabad Pakistan?

Importance of the Study

The importance of the current study was identifying intelligences profiles of students in Islamabad, Pakistan, and to use this information to develop teaching practices that are tailored to the specific needs and strengths of these students. By understanding the different intelligence types of students, teachers can design activities and instructional materials that align with the students' strengths and interests. This approach can potentially increase students' engagement, motivation, and achievement as well as enhance their overall learning experience. Moreover, 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 has 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.

Limitation of the Study

The study was limited to the 9th grade biology students at Islamabad model college for girls I -8/4 in the academic year 2022-2023. The current study was limited to the following eight intelligences: verbal, logical, visual, bodily, self, social, musical, and natural intelligence.

Research Design & Procedure

The research method used in this study is a survey research method. The approach used in this study is quantitative research approach.

Population and the Study Sample

The population of this study consisted of all 9th grade students who were enrolled in Islamabad Model College for Girls I-8/4 during the session 2021-2022 The sample of this study was selected from the students of 9th class who had chosen biology as an elective subject, and included seventy participants.

INSTRUMENTATION

The MIS survey by B. Shearer, also known as the "What Kind of Thinker Are You?" survey, is a tool used to assess an individual's multiple intelligences profile. The survey consists of 27 questions, each of which presents the respondent with a set of five response options. The options are designed to measure the respondent's level of ability or preference for a specific type of intelligence, and are scored on a scale from 0 to 4 indicating high ability or preference. The survey is based on the theory of multiple intelligences developed by Howard Gardner, which proposes that individuals possess multiple forms of intelligence, including linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic intelligences. The MIS survey is designed to assess a person's level of ability or preference in each of these eight intelligence categories.

Data Collection & Analysis Procedure

Prior to collecting data from Islamabad Model College for Girls I/8-4, special permission was obtained from the Federal Directorate of Education. A letter of authorization was presented to the principal of the college, and a survey was distributed to 70 biology students for the purpose of assessing their multiple intelligence profiles. The researchers personally visited the college and provided instructions to the students on how to participate in the study. To calculate a percentage score for each scale, the following steps were followed: firstly, the score for each question was written in the white block, with some scores repeated in a separate column. Secondly, the scores in each column were added up, and finally, the total score was divided by the designated amount at the bottom. It is important to note that all questions must be answered in order to calculate a score, and if any question is left unanswered, no score will be calculated. Each question consisted of 5 response choices that were scored from 0 to 4.To calculate a scale percentage score, the total response scores were divided by the total possible score for that scale. This calculation method requires a complete set of responses for all questions in the survey.

Data Analysis and Interpretation

The objectives of the study were to identify the multiple intelligences profiles of biology students of class 9th and the ranking of multiple intelligences among biology students at Islamabad Pakistan. To achieve the objectives the multiple intelligences profile of individual students is identified as shown in tables below.

Table 1 Linguistic Intelligence Profile of Biology Students

LIN Mean score	Minimum	Maximum	Std. Deviation	No of students	Percentage of students	LIN category
2.04	.00	4.00	.82	11	15.7	weak
				55	78.6	moderate
				4	5.7	strong
Total				70	100.0	

*Not*e.LIN=linguistic.

Table 1 indicates that the majority of students (78.6%) demonstrated a moderate level of linguistic intelligence, while 15.7% exhibited a weak level, and 5.7% displayed a strong level.

Table 2 Logical Mathematical Intelligence profile of Biology Students

LIM Mean Score	Minimum	Maximum	Std. Deviation	No Of Students	Percentage Of Students	LIM Category
	.50	3.75	.691	7	10.0	weak
				59	84.3	moderate
2.14				4	5.7	strong
Total				70	100.0	

Note.*LIM=Logical/Mathematical*.

Table 2 indicates that the majority of students (84.3%) demonstrated a moderate level of logical mathematical intelligence, while 10.0% exhibited a weak level, and 4% displayed a strong level.

Table 3 Intrapersonal Intelligence profile of students

ITA Mean score	Minimum	Maximum	Std. Deviation	No of students	Percentage of students	ITA category
	.75	4.50	.740	5	7.1	weak
				54	77.1	moderate
2.40				11	15.7	strong
Total				70	100.0	

Note.*ITA=Intrapersonal.*

Table 3 indicates that the majority of students (77.1%) demonstrated a moderate level of intrapersonal intelligence, while 7.1% exhibited a weak level, and 15 % displayed a strong level.

Table 4 Interpersonal Intelligence profile of students

ITE Mean score	Minimum	Maximum	Std. Deviation	No of students	Percentage of students	ITE category
	.25	6.00	.98	9	12.9	weak
				54	77.1	moderate
2.11				7	10	strong
Total				70	100.0	

Note.*ITE=interpersonal*

Table 4 indicates that the majority of students (77.1%) demonstrated a moderate level of interpersonal intelligence, while 12. 9% exhibited a weak level, and 7% displayed a strong level.

Table 5 Spatial Intelligence profile of students

SP Mean score	Minimum	Maximum	Std. Deviation	No of students	Percentage of students	SP category
	.00	3.67	.78	8	11.4	weak
2.18				57	81.4	moderate
				5	7.1	strong
Total				70	100.0	

Note.*SP= Spatial*

Table 5 indicates that the majority of students (81.4%) demonstrated a moderate level of spatial intelligence, while 11.4% exhibited a weak level, and 7.1% displayed a strong level.

Table 6 Musical Intelligence profile of students

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

2.11	.20	3.80	.99	16	22.9	weak
				38	54.3	moderate
				16	22.9	strong
Total				70	100.0	

Note.*MU=Musical*

Table 6 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 7 Kinesthetic Intelligence profile of students

KIN Mean score	Minimum	Maximum	Std. Deviation	No of students	Percentage of students	KIN category
1.71	.00	3.25	.77	15	21.4	weak
				53	75.7	moderate
				2	2.9	strong
Total				70	100.0	

Note.*KIN=Kinesthetic*

Table 7 indicates that the majority of students (75.7%) demonstrated a moderate level of kinesthetic intelligence, while 21.4% exhibited a weak level, and 2.9% displayed a strong level.

Table 8 Natural Intelligence profile of students

NAT Mean score	Minimum	Maximum	Std. Deviation	No of students	Percentage of students	NAT category
2.4381	.33	4.00	.85417	5	7.1	weak
				50	71.4	moderate
				15	21.4	strong
Total				70	100.0	

Note.*NAT=Natural*

Table 8 indicates that the majority of students (71.4%) demonstrated a moderate level of natural intelligence, while 7.1% exhibited a weak level, and 21.4% displayed a strong level.

Table 9 Ranking of multiple intelligences profile

Multiple Intelligences	Minimum	Maximum	Mean	Std. Deviation	Ranking
LIN	.00	4.00	2.03	.81	7
LM	.50	3.75	2.14	.69	4
ITA	.75	4.50	2.40	.74	2
ITE	.25	6.00	2.11	.98	5
SP	.00	3.67	2.17	.78	3
MU	.20	3.80	2.11	.99	6
KIN	.00	3.25	1.71	.77	8
NAT	.33	4.00	2.43	.85	1

Table 4.9 depicts the ranking of different intelligence profiles, with naturalistic intelligence (NAT) showing the highest rank, indicated by a mean of 2.4381 (M = 2.4381, SD = 0.85417). Interpersonal intelligence (ITA) closely follows with a mean of 2.4000 (M = 2.4000, SD = 0.74015). Conversely, linguistic intelligence (LIN) is ranked seventh, displaying a mean of 2.0381 (M = 2.0381, SD = 0.81757), while kinesthetic intelligence (KIN) receives the lowest rank, demonstrating a mean of 1.7143 (M = 1.7143, SD = 0.77118).

FINDINGS

The findings of this study suggest that the seventy students who participated in the study showed variations in their multiple intelligence profiles. Natural intelligence was found to be the most prominent intelligence type, with the students

scoring the highest in this category. This indicates that the students were more sensitive to the natural world and were able to identify patterns and relationships in nature. The intrapersonal intelligence category was the second highest, suggesting that the students were more aware of their own emotions, thoughts, and beliefs. In contrast, the students' scores were lowest in the kinesthetic intelligence category, indicating that they were less skilled in using their bodies effectively and coordinating their movements. This could imply that the students might need more physical activity and hands-on experiences to develop their kinesthetic intelligence. Furthermore, the standard deviation values showed that the students' scores varied significantly across different types of intelligence. This suggests that there is a high level of individual variability in students' multiple intelligence profiles, and that educators should consider this diversity when designing educational strategies and activities. Overall, this study highlights the importance of acknowledging and nurturing different types of intelligence in students, as this can lead to more effective and inclusive educational practices.

The intelligence profiles of students from various academic disciplines consistently indicated that intrapersonal intelligence was the highest-ranked intelligence, closely followed by naturalistic intelligence (Abdelkarim, Hassan, & Abuiyada, 2018; Abdelkarim, Hassan, & Abuiyada, 2018).

Result of this study are consistent with Several previous studies conducted in Pakistan have reported that intrapersonal intelligence is one of the highest-ranked intelligences among university students (Sabir, Hussain, & Anwar, 2019; Bakhsh & Tariq, 2015; Kausar & Fatima, 2017) kinesthetic intelligence tends to be lower ranked among university students in Pakistan (Riaz, Raza, & Khan, 2014; Saeed & Anjum, 2016) Previous research has reported moderate levels of interpersonal intelligence among Pakistani university students (Shehzad & Zia, 2017), moderate levels of musical intelligence among university students in Pakistan (Saeed & Anjum, 2016), and moderate levels of spatial intelligence among university students in Malaysia (Yusoff et al., 2010). The results of the MI profile in other cultural contexts have also shown similar patterns of strengths and weaknesses across different types of intelligence. For example, in Western cultures, the logical intelligence category tends to be a strength, whereas interpersonal intelligence is often a strength in East Asian cultures.

Research has shown that there is significant variability in the distribution of different types of intelligence among individuals. In a study conducted by Salovey and Mayer (1990), they found that intrapersonal intelligence, which involves self-awareness and understanding of one's own emotions and motivations, was positively associated with emotional intelligence. This finding is consistent with current study ranking of intrapersonal intelligence as your top strength, research has also found that natural intelligence, which involves an understanding and appreciation of the natural world, is positively associated with cognitive development and creativity. A study by Wolfe and colleagues (2013) found that naturalistic intelligence was positively correlated with scores on a measure of creative thinking. This finding supports your ranking of natural intelligence as your second highest strength.

CONCLUSION

Based on the results of the MIS survey administered to the students, it is evident that the students' multiple intelligences profile varied across different categories of intelligence. The highest average score was obtained in the natural intelligence category, which suggests that the the students were more sensitive to the natural world and were able to identify patterns and relationships in nature. On the other hand, the lowest average score was obtained in the kinesthetic intelligence category, which suggests that the students may have less physical coordination and dexterity than other types of intelligence. This finding could have implications for teaching strategies, as educators may need to consider incorporating more hands-on and experiential learning activities to help students develop their kinesthetic skills. In terms of ranking, the results suggest that the students performed the best in the intrapersonal intelligence category, followed by the naturalistic and logical intelligence categories. These findings indicate that the students may have a strong sense of self-awareness and an appreciation for nature, as well as the ability to reason and solve problems using logic and critical thinking skills. Overall, the results of the study highlight the importance of considering students' multiple intelligences profiles when designing teaching strategies and activities. By understanding the strengths and weaknesses of their students, educators can create a more inclusive and effective learning environment that caters to the diverse needs and abilities of their students. These findings also suggest that the MIS survey is a useful tool for assessing students' multiple intelligences profiles, and could be used in future research to explore the relationship between different types of intelligence and academic performance.

RECOMMENDATIONS FOR FURTHER RESEARCH

1. Replication of the study: The study was conducted in Islamabad, Pakistan, with a sample size of class 9th biology students. It would be interesting to replicate the study with a larger sample size and in different regions of Pakistan to examine if the findings are consistent across different contexts.
2. Comparison with other countries: It would be interesting to compare the MI profiles of Pakistani students with those from other countries to see if there are any cultural differences in the preferences for different types of intelligence.

3. Comparison across different subject areas: It would be interesting to compare MI profiles across different subject areas to examine if there are any subject-specific preferences for different types of intelligence. This could help educators tailor their teaching strategies to the specific needs of students in different subject areas.

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