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Multiple Intelligence and Learning Styles among Health Professional Students in an Academy of Nepal

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Abstract

Introduction: Every student has a different way of thinking and performs best when in an appropriate academic environment. Howard Gardner describes different types of intelligence, which include linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, naturalistic, interpersonal, and intrapersonal. The learning styles also vary among individuals, which include visual, auditory and kinesthetic. The type of intelligence and learning style affects academic performance among students. The present study aimed to analyze the type of intelligence and learning style among undergraduate health professional students in an academy of health sciences.

Methods: This was a cross-sectional and observational study, conducted from August, 2023 to August, 2024 among undergraduate students of Madan Bhandari Academy of Health Sciences. A Google Form that included socio-demographic details, Howard Gardner's Multiple Intelligence Questionnaire and a visual, auditory and kinesthetic learner style questionnaire was sent to the students. The students were recruited by a convenience sampling method after obtaining ethical clearance from the institutional review committee.

Results: Most of the students had a bodily-kinesthetic intelligence (24.5%) and a visual learning style (34.9%). Males had a more bodily-kinesthetic intelligence (38.6%), whereas females mostly had musical intelligence (25.8%). Male students predominantly had an auditory learning style (43.2%), whereas the female students had a visual learning style (41.9%). There was no significant difference among the types of intelligence and learning style with the common entrance examination (CEE) scores ($p > 0.05$).

Conclusion: The most common type of intelligence was bodily-kinesthetic, and the most common type of learning approach was visual.

Keywords: Health professional students, learning styles, multiple intelligences

1. Introduction

The educational system is transforming from a traditional teacher-centric approach to a student-centric learning approach¹. Adopting changes can be challenging². Leaving some things as they were (status quo bias) is one of the main factors that prevents traditional educators from changing. An educator may perceive change as a loss of what they used to do³. However, change cannot be avoided, but can be a

slow process. For a change to occur, one must identify the problem⁴.

Every individual's brain thinks uniquely; hence, each student has to be treated differently⁵. The ability to perform reasoning, learn and solve problems effectively in various situations varies among individuals⁶. There are different learning styles among students, and when the learning style matches the teaching approach, an optimal outcome is reached⁷. Every individual has particular intelligences and methods of application. Hence, multiple methods of evaluation should be

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considered to achieve the maximal potential of an individual⁸.

The theory of multiple intelligences was developed by Howard Gardner. He described how individuals have different types of intelligence that they use to solve problems, generate ideas, imagine, and innovate, among others. He listed eight types of intelligence (i) linguistic, which involves verbal and non-verbal language, (ii) logical-mathematical, relating to the ability of problem solving, use of numbers, comprehension of cause and effect and perceiving patterns, (iii) spatial/visual, referring to graphical understanding, painting, drawing, architecture, visual arts, mental image and navigation, (iv) musical intelligence, which refers to composition and performance of pitch, rhythm, music and melody, (v) bodily-kinesthetic, relating to the use of body in expression of feelings and ideas, use of hands to transform or generate things, (vi) naturalistic, referring to awareness of environment and nature, capability to categorize and recognize types of living beings, (vii) interpersonal, referring to one's ability to recognize and respond to other's perception, action, beliefs and impulses and (viii) intrapersonal referring to self-awareness or one's capability to comprehend one's fears, feelings and motivations⁹.

The visual, auditory, kinesthetic (VAK) model comprises of the mentioned three modalities of learning. Visual learners prefer learning with their eyes. They learn from observing how things are done. They respond better to diagrams, videos, PowerPoint presentations, handouts, flipcharts, and field trips. Auditory learners prefer listening. They prefer lectures, discussions, reading aloud, role-playing exercises, and structured sessions. Kinesthetic learners prefer learning through touching and moving. They learn from doing things¹⁰. Though these theories are widely used, literature also reveals they lack empirical evidence^{11,12}.

To produce competent health professionals, the educational training requires continuous improvement. As the multiple intelligences and learning styles of students may vary among individual students, these factors should be considered for a student-centric environment¹³.

The literature shows mixed results regarding multiple intelligences and learning styles across different student groups and regions¹⁴⁻¹⁶. However, there are limited studies conducted on this topic in Nepal. The Medical Education Commission of Nepal emphasizes a learner-based curriculum. However, there are limited studies conducted in this area¹⁷. Identifying the multiple intelligences and learning style profiles of students will provide an understanding of the preferences of the learners. This can help educators adopt a more student-centric teaching and learning approach to improve their students' performance. Therefore, this study aimed to elucidate the distribution of multiple intelligences and learning styles among the students of Madan Bhandari Academy of Health Sciences.

2. Methods

This was a cross-sectional observational study conducted among undergraduate students in the Bachelor of Nursing (BSc Nursing), Bachelor of Pharmacy (B. Pharm), Bachelor of Medical Laboratory Technology (BMLT), and Bachelor of Public Health (BPH) programs at the Madan Bhandari Academy of Health Sciences. This is an established academy of health sciences and had only 365 students admitted at the time of the research. A census sampling approach was adopted. A Google Form was sent to all the participants. This included an informed consent form, sociodemographic information, common entrance examination (CEE) scores, Howard Gardner's Multiple Intelligences Questionnaire, and a VAK learner-style questionnaire. The original multiple intelligence profiling questionnaire was used, which had seven items, namely, linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. The questionnaire consisted of 28 items, each rated on a Likert scale from 1 (totally disagree) to 5 (totally agree). Additionally, the

questionnaire was also assessed by three experts to establish content validity.

Learning style was quantified using the VAK self-assessment questionnaire, which included 30 questions. Each question was rated on a three-point Likert scale. The scores were added separately for the three domains (visual, auditory and kinesthetic). The domain with the highest score was identified as the learning style¹⁸. This questionnaire has been found to exhibit acceptable reliability¹⁹.

The CEE is a standardized test administered by the Medical Education Commission of Nepal for enrollment of health professional students. The test consists of 200 multiple-choice questions (MCQ), comprising one mark for a correct answer and a negative 0.25 mark for an incorrect answer²⁰.

The Google Form was shared with the undergraduate students through email. Two reminder emails were sent to increase the participation rate. Interested participants were included after obtaining informed consent. Students above the age of 18 years currently enrolled in the ongoing courses of Madan Bhandari Academy of Health Sciences were included. Incomplete questionnaires were excluded from the study. A total of 106 responses were recorded from a total of 356 students, indicating a response rate of 29.8%. Among the 106 responses, only 94 reported their CEE scores, as some of the students could not recall their exact score and a few preferred not to say. Data were entered in a Microsoft Excel 2016 spreadsheet, and analyzed using IBM SPSS version 16. Categorical variables were expressed in frequency and percentage, and continuous variables were expressed in mean and standard deviation. The study was conducted from August, 2023 to August, 2024 after obtaining clearance from the Institutional Review Committee of Madan Bhandari Academy of Health Sciences (IRC-MBAHS Approval Number: IRC-039-079).

3. Results

Among the 106 respondents, most of the participants were female (58.5%). Most of the students were from B. Pharm (41.5%), and most of the participants were from the sixth semester (26.4%), followed by the third semester (25.5%). Most of the respondents were from the sub-metropolitan region (42.5%) (Table 1).

Table 1: General characteristics of participants

Category	n (%)
Gender	
Male	44 (41.5)
Female	62 (58.5)
Course	
BMLT	15 (14.2)
Nursing	27 (25.5)
B. Pharm	44 (41.5)
BPH	20 (18.9)
Residence	
Metro	31 (29.2)
Rural	30 (28.3)
Sub-metro	45 (42.5)

The mean age of the participants was 21.8±2.2 years (range: 18-33 years).

The participants mostly had a bodily-kinesthetic (24.5%) type of intelligence, followed by musical (20.8%) and logical-mathematical (13.2%). The visual type (34.9%) of learning style was the most predominant, followed by kinesthetic (33%) and auditory (32.1%). Only 94 students provided their CEE scores, ranging from 49 to 155, with a mean of 101.32±22.2 (Table 2).

The male participants predominantly had a bodily-kinesthetic type of intelligence, whereas the female participants mostly had a musical type of intelligence. In accordance with the course, the bodily-kinesthetic was the predominant type of intelligence among BMLT and B. Pharm students. Among nursing students, musical intelligence was predominant. Students from BPH had mostly logical-mathematical intelligence. Those residing in metropolitan and sub-metropolitan cities mostly had a bodily-kinesthetic type of intelligence, whereas those from rural regions mostly had musical and bodily-kinesthetic type of intelligence (Table 3).

Table 2: Multiple intelligence, learning style and CEE score

Category	n (%)
Multiple Intelligence	
Linguistic	12 (11.3)
Logical-mathematical	14 (13.2)
Musical	22 (20.8)
Bodily-kinesthetic	26 (24.5)
Spatial	11 (10.4)
Interpersonal	12 (11.3)
Intrapersonal	9 (8.5)
Learning Style	
Visual	37 (34.9)
Auditory	34 (32.1)
Kinesthetic	35 (33)
CEE score (mean $\pm$ SD)	101.32 $\pm$ 22.2

Table 3: Multiple intelligence by gender, course and residence

Category	L n (%)	LM n (%)	M n (%)	BK n (%)	S n (%)	Inter n (%)	Intra n (%)
Gender							
Male	1 (2.3)	12 (27.3)	6 (13.6)	17 (38.6)	1 (2.3)	4 (9.1)	3 (6.8)
Female	11 (17.7)	2 (3.2)	16 (25.8)	9 (14.5)	10 (16.1)	8 (12.9)	6 (9.7)
Course							
BMLT	0 (0)	1 (6.7)	4 (26.7)	8 (53.3)	0 (0)	1 (6.7)	1 (6.7)
Nursing	2 (7.4)	2 (7.4)	8 (29.6)	5 (18.5)	4 (14.8)	5 (18.5)	1 (3.7)
B. Pharm	8 (18.2)	6 (13.6)	8 (18.2)	9 (20.5)	5 (11.4)	3 (6.8)	5 (11.4)
BPH	2 (10)	5 (25)	2 (10)	4 (20)	2 (10)	3 (15)	2 (10)
Residence							
Metro	3 (9.8)	2 (6.5)	8 (25.8)	10 (32.3)	2 (6.5)	0 (0)	6 (19.4)
Rural	4 (13.3)	5 (16.7)	6 (20)	6 (20)	3 (10)	4 (13.3)	2 (6.7)
Sub-metro	5 (11.1)	7 (15.6)	8 (17.8)	10 (22.2)	6 (13.3)	8 (17.8)	1 (2.2)

L: linguistic; LM: logical-mathematical; M: musical; BK: bodily-kinesthetic; S: spatial; Inter: interpersonal; Intra: intrapersonal

The male participants mostly had an auditory learning style, whereas the females had a more visual type of learning style. Participants from BMLT and B. Pharm mostly had an auditory learning style, while participants from B.Sc. Nursing mostly had a kinesthetic learning style, and those from BPH mostly had a visual learning style. Those residing in metropolitan areas predominantly had a kinesthetic learning style, those from rural areas mostly had a visual type of learning style, and those from sub-metropolitan areas mostly had an auditory learning style (Table 4).

No significant differences were observed in the means of CEE scores across the categories of multiple intelligences and learning styles when ANOVA was applied (Table 5).

Multiple linear regression analysis was applied to explore the association of CEE scores with the learning style and dominant multiple intelligence, adjusting for gender, course and semester of the students. CEE scores were significantly associated with multiple intelligences, course, and semester (Table 6).

Table 4: Learning style by gender, course and residence

Category	Visual n (%)	Auditory n (%)	Kinesthetic n (%)
Gender			
Male	11 (25)	19 (43.2)	14 (31.8)
Female	26 (41.9)	15 (24.2)	21 (33.9)
Course			
BMLT	4 (26.7)	7 (46.7)	4 (26.7)
Nursing	10 (37)	6 (22.2)	11 (40.7)
B. Pharm	13 (29.5)	17 (38.6)	14 (31.8)
BPH	10 (50)	4 (20)	6 (30)
Residence			
Metro	10 (32.3)	7 (22.6)	14 (45.2)
Rural	12 (40)	8 (26.7)	10 (33.3)
Sub-metro	15 (33.3)	19 (42.2)	11 (24.4)

Table 5: CEE score among multiple intelligence and learning style

Category	CEE Score (Mean ± SD)	F (p-value)
Multiple Intelligence		
Linguistic	92.1 ± 17.6	1.47 (0.2)
Logical-mathematical	101.1 ± 23.7	
Musical	98.4 ± 23.6	
Bodily-kinesthetic	102.9 ± 19.5	
Spatial	108 ± 23	
Interpersonal	98.2 ± 26.5	
Intrapersonal	102.3 ± 22.1	
Learning Style		
Visual	99 ± 24	0.48 (0.67)
Auditory	103.6 ± 22.5	
Kinesthetic	104.2 ± 19.7	

Table 6: Multiple linear regression analysis of characteristics associated with CEE scores

Category	Adjusted B (95% CI)	p-value
Learning style	1.52 (-3.87–6.94)	0.57
Dominant multiple intelligence	2.71 (0.03–5.39)	0.04*
Gender	5.82 (-2.96–14.61)	0.19
Course	4.70 (0.19–9.21)	0.04*
Semester	2.59 (0.09–5.08)	0.04*

*Significant at $p < 0.05$

4. Discussion

Most participants had a bodily-kinesthetic type of intelligence, and the most common learning style was visual. In contrast, a study conducted in five schools of Mexico observed interpersonal intelligence as the most common intelligence (39.68 $\pm$ 6.41) among their participants. Boys (40.32 $\pm$ 5.73) and girls (38.89 $\pm$ 7.15) both had higher mean interpersonal intelligence. However, the study was conducted among elementary

school students¹⁴. Similarly, a study conducted among 527 medical students in Brazil observed intrapersonal intelligence (71 ± 10.5) followed by logical-mathematical intelligence (69.3 ± 14) as the most observed intelligences. Multi-modal (42.3%), followed by visual learning (21.3%) approach was the most preferred among medical students enrolled in the study¹⁵.

The variations in the multiple intelligence profile and learning styles in different studies may be due to the different sample populations that were recruited in the studies. Madan Bhandari Academy of Health Sciences follows a competency-based curriculum, which focuses on the ability to do something efficiently²¹. Bodily-kinesthetic intelligence relates to the use of the body to express and generate things⁹. The focus on a more outcome-based learning-teaching method among the students may have influenced the development of bodily-kinesthetic intelligence. Like most South Asian countries, the use of gestures is an integral part of the Nepalese community²². This may have also influenced the development of bodily-kinesthetic intelligence among the students.

Similarly, visual learning style was reported as predominant among medical students of a teaching hospital in Kathmandu. However, the study used a self-developed tool in contrast to the current study²³.

A study conducted in India observed that the kinesthetic learning style was the most preferred learning style among 421 medical students. The students with a kinesthetic learning style included mostly those who performed well academically⁷. In contrast to the present study, a study conducted among 247 male students in Saudi Arabia observed that most of the students preferred an auditory learning style (4.09 ± 0.68).

Students use approaches like notes from seniors, flash cards and past questions for faster and easier learning²⁴. Visual learning style predominance may be due to the use of similar techniques by our students for preparing for the CEEs. In this study, the CEE scores showed an association with multiple intelligence, course and semester with multiple linear regression analysis. However, mean academic scores were not significantly different in the subcategories of multiple intelligences and learning styles.

Similar to the present study, a cross-sectional study among 88 dental students reported that there were no significant differences in the mean scores among the different learning styles²⁵. However, in contrast to the present study, a cross-sectional study among 158 students reported that the highest scores were among those with logical-mathematical intelligence (67%). However, the study was conducted on seventh-grade students²⁶.

Factors like nutrition, physical development and health affect the learning process of students. The environment in which the student is learning also affects the student's learning style²⁷. The variation in the types of intelligence and the learning style may be due to the varying backgrounds the students come from. Proficiency in English, interest in the course, age, gender, prior academic performance and attendance are some established factors that affect a student's academic performance²⁸. Along with the above factors, the present study had a small sample size, which may have affected the findings.

Most of the participants had bodily-kinesthetic intelligence, which is interpreted as an ability to come up with solutions by using their bodies. They are skilled with spatial awareness, motor control, and the use of objects as demanded²⁹. Individualization of teaching methodologies and evaluation can help produce a better health professional³⁰. Though a student-centric approach is important, it faces challenges like outdated curricula, pressure from institutions, and assessment methods that are inadequate. There is a requirement for improvement in curriculum, assessment methods and training for faculty³¹.

The varying types of intelligence and learning styles among students suggest that facilitators should be aware of the students they are training for a beneficial outcome. Institutions should encourage innovative, student-centric teaching and evaluation methods that prepare students for their professional lives. However, there was no significant difference in academic performance among different learning styles. Educators should acknowledge different multiple intelligences and learning styles but also use teaching and learning methods that are inclusive of the diverse set of students. There are very few studies conducted on this topic among medical students in Nepal. A future prospective, multicentric study with a larger sample size may provide more generalizable findings.

5. Limitations of the Study

Although all students were invited to participate in this study, the response rate was low. This may have led to a non-response bias. More motivated students may have participated, and respondents in this study may not have represented the total student population of Madan Bhandari Academy of Health Sciences. The findings of this study cannot be generalized to the overall student population, and the low response rate may have reduced the statistical power to assess the differences between the sub-categories. This is a cross-sectional study, so cause and effect cannot be determined. The study was conducted in a single institution, which may reduce the generalizability of the findings. Self-administered questionnaires were used, which may have caused possible recall and social desirability bias. Though theories on multiple intelligences and learning styles have been used extensively, previous literature reveals a lack of empirical evidence, which may question the validity of models used in this study.

6. Conclusion

The findings of the present study suggest that undergraduate health professional students have a diverse multiple intelligence and learning style profile, among which the bodily-kinesthetic type of intelligence and a visual learning style were predominant. There were no differences in academic performance among the different learning styles and multiple intelligences. This suggests that educators should not only be aware of the different types of multiple intelligence and learning styles among their students, but also incorporate teaching and learning methods that address all types of students.

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Conflict of Interest

The authors declare no conflict of interest.

Disclosure of AI Use

Grammarly (free version) was used to minimize grammatical errors.

Authors' Contributions

SG conceptualized and designed the study. He also performed literature search, data acquisition, data analysis, and statistical analysis. He also prepared the manuscript and acted as a guarantor. NB was involved in designing the study and defining the intellectual content. She also contributed to literature search, statistical analysis, and preparation, editing and reviewing of the manuscript. She also acted as a guarantor. SM carried out the literature search, data acquisition and analysis, as well as manuscript editing. KPB was involved in designing

the study and defining the intellectual content, as well as data acquisition, data analysis, and manuscript preparation.

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