

Intelligence and Learning Styles: A Comparative Study of High and Low Academic Achievers among High School Students

V. L. Sawmzeli*
Zokaitluangi**

Abstract

The study investigated whether a variability exists between High and Low Academic Achievers among High School students in Aizawl, Mizoram, regarding Intelligence, Visual, Auditory and Kinaesthetic learning styles. It also explored the relationship between the variables. 80 high academic achievers and 80 low academic achievers, ranging between 14 to 17 years of age, were sorted using simple random sampling from the target population. Data was collected using G.C. Ahuja Group Test of Intelligence (GGTI; Ahuja, 2009) and Learning Channel Preference (O'Brien, 1985). Results revealed that high academic achievers showed significant higher mean scores on intelligence, visual and kinaesthetic learning styles and a lower mean score on auditory learning style compared to low academic achievers; intelligence and the three learning styles had a significant positive relationship; there was also a significant predictability of intelligence on visual, auditory and kinaesthetic learning styles. The study suggests the need of adapting teaching methods suitable to students' learning style preferences for better academic outcomes while considering the influence of intelligence on these preferences.

Keywords: *high school, academic achievers, intelligence, learning styles, etc.*

Introduction

Academic achievement is one of the most important outcomes of formal educational experiences. The quest to identify factors influencing achievement have garnered significant attention from scholars and researchers. Academic Achievement is the extent to which a

*Ms. L. Sawmzeli, Ph.D. Scholar, Department of Psychology, Mizoram University. Email: somikhawlhing6@gmail.com

**Prof. Zokaitluangi, Professor, Department of Psychology, Mizoram University. Email: profzokaitluangi@gmail.com

student has attained their educational goals which is commonly measured through examinations or continuous assessments such as skills or declarative knowledge (Ward et al., 1996).

High academic achievers are individuals who consistently perform at or near the top of their class or in their educational pursuits (Sannakkanavar, 2017). On the other hand, low academic achievers are characterized by underperformance in exams which may restrict access to higher education but may excel in non-academic fields like trades, arts, and entrepreneurship. (Al-Zoubi & Bani Younes, 2015).

School education in India is divided into four stages: foundation building (ages 3-8), preparatory stage (ages 8-11), middle stage (ages 11-14) and secondary stage (ages 14 - 18) as per NEP 2024 – 2025 (Soumyadeep, 2024). Secondary education, thus, corresponds to adolescence, often considered the most crucial and formative phase of an individual's life.

From the perspective of psychologists, “intelligence is the capacity to understand the world, think rationally, and use resources effectively when faced with challenges.” More intelligent people are more superior to less intelligent people in utilizing the resources of their surroundings. Intelligence may vary from individual to individual. Not even identical twins or people who grew up in the same surroundings have the same mental capacity. At the same time, it may also vary within the same person across different developmental stages and contexts (Feldman, 2011).

In children, intelligence tends to increase as they grow older. Although the time of decline in mental development differs from person to person, stability can be observed after the age of ten and reaches maturity in adolescence. It is believed that these noticeable differences in intelligence are mostly influenced by environmental factors (Dandekar and Sanyagla, 2000; Rani & Prakash, 2015).

Rani and Prakash (2015) found that high school students generally score below average on intelligence tests. One explanation for this finding is that schools give more emphasis on students' grades rather than their deep conceptual understanding which promote rote memorization.

Early psychologists who focused on intelligence believed that it was shaped by a single, universal factor known as “g” or the g-factor. However, contemporary perspectives view intelligence as a multifaceted concept. Howard Gardner has proposed that intelligence comes in eight forms: musical, bodily-kinaesthetic, logical – mathematical, linguistic, spatial, interpersonal, intrapersonal, and naturalist. Every person possesses all these types of intelligence in varying degrees. Rather than functioning in isolation, these eight kinds of intelligence work together (Gardner, 1993).

Learning begins right from birth and it is a continuous, natural process. It entails changing behaviour by adopting new knowledge and habits through experience (Crow & Crow, 1973;

Mangal & Mangal, 2019). Grasha (1996) defines, “Learning style may be known as the collective experience of learning during the process of gaining knowledge.”

One of the most popular models of learning style is Fleming’s VAK/ VARK Model, introduced by Neil Fleming. The former version of this model includes ‘*Visual, Auditory and Kinesthetic (VAK) learning styles*’ while the newer version contains an additional learning style – ‘*Read/ Write learning style*’ which upgrades it to ‘*VARK*’ learning style. While visual learners prefer using their sense of vision in acquiring knowledge or skills, auditory learners show preference for sense of hearing and kinaesthetic learners are more inclined towards sense of touch or movement in learning (Mangal & Mangal, 2019).

Some scholars have argued that high achievement and intelligence are essentially the same concepts. While Hasan (2008) found no significant differences in fluid intelligence among high and low achievers, Primi and colleagues (2010) reported significant differences in students’ grades based on their distinct intelligence capabilities.

Research indicated that students with higher academic achievements showed a stronger preference for visual and kinaesthetic learning methods compared to their lower-achieving counterparts (Park, 1997) while low achievers tended to favour auditory and kinaesthetic learning styles (Khan, Arif & Yousuf, 2019). Contrasting finding shows no significant disparity between high and low achievers regarding their use of different learning styles (Ishtiaq, Mahbool & Rasool, 2023).

Gifted individuals tend to prefer visual and kinaesthetic learning modalities compared to their non-gifted peers (Altun & Yaizci, 2010). Ahanbor and Sadighi (2014) as well as Keskin, Köse2 & Gülođlu (2021) found that there is a statistically significant relationship between students’ learning styles and multiple intelligences. In contrast, Zainun and colleagues (2019) have come up with the finding that there is no correlation between multiple intelligences and learning styles.

While both intelligence and learning styles have been studied extensively, the interplay between these two factors remains poorly understood. Most research has focused on intelligence or learning styles separately and this leaves a gap in knowledge regarding how these elements might interact to influence learning outcomes. An understanding of the relationship between intelligence and learning styles can provide implications for developing personalized educational strategies that optimize learning for students based on their unique cognitive profiles.

Objectives

Based on the available research, the following objectives will be attempted for the present study:

1. To study the difference between high and low academic achievers on Intelligence, Visual, Auditory and Kinaesthetic Learning Styles.
2. To study the relationship between intelligence, Visual, Auditory and Kinaesthetic Learning Styles among the samples.
3. To examine the predictability of Intelligence on Visual, Auditory and Kinaesthetic Learning Styles among the samples.

Hypotheses

The following hypotheses were framed based on available literature and the objectives of the study:

1. It is expected that high academic achievers will have higher intelligence with higher preference for visual and kinaesthetic learning styles than low academic achievers while low academic achievers will prefer auditory learning styles.
2. It is expected that a significant positive relationship will exist between intelligence, visual, auditory and kinaesthetic learning styles.
3. It is expected that intelligence will significantly predict visual, auditory and kinaesthetic learning styles among the samples.

Methodology

Sample

Data was collected from 5 different High Schools in Aizawl, enrolled under the Department of School Education, Government of Mizoram. Using simple random sampling, 160 students {80 high achievers (40 male and 40 female) and 80 low achievers (40 male and 40 female)} were selected to ensure equal representation of gender and socio-demographic profiles to control extraneous variables. High academic achievers and low academic achievers were classified based on Mean ± 1.5 SD of GPA in their last examination.

Inclusion Criteria:

Students admitted to High Schools in Aizawl.
Male or female gender among the high school students.
High school students between the age of 14-17 years.
High school students meeting the criteria for high and low academic achievers.
High school students who have given consent or willingly participate in the study.

Exclusion Criteria:

Students admitted to high schools in Aizawl.
High school students beyond the age of 14-17 years.

High school students who are not meeting the criteria for high and low academic achievers.
High school students who have not given their consent and are unwilling to participate in the study.

Tools used

- (i) *Socio-demographic Profile*: This was constructed by the researcher and includes name, sex, age, permanent address, family type (nuclear/joint), family size, birth order, family monthly income, etc.
- (ii) *Informed consent and assent form*: They contain purposes and procedures of the test and a request for the participant's consent to take part in the research, culminating in the participant's signature for informed consent form and guardians/ parents' signature for informed assent form.
- (iii) *G.C. Ahuja Group Test of Intelligence (13 to 17+ years) (GGTI; Ahuja, 2009)*: This standardized intelligence test is a battery for measuring the intelligence of the students (13 to 17+ years), and has total 8 sub-tests: Following Directions (Additional test), Classification, Analogies, Arithmetic Reasoning, Vocabulary, Comprehension, Series and Best Answers. It has reliability coefficient was $.951 \pm .004$ (Ahuja, 2009).
- (iv) *Learning Channel Preference (O'Brien, 1985)*: It contains three subscales – Visual learning style, auditory learning style and kinaesthetic learning style, and has 30 items for each subscale. The maximum score in any section is 30 and the minimum score is 10. The higher the score, the stronger the preference.

Design

This study uses a correlation design that compares two levels of academic achievers (80 high academic achievers and 80 low academic achievers) on intelligence, visual, auditory and kinaesthetic learning styles.

Procedures

The appropriate procedure was used for evaluating the psychological functions of the high school students. Informed consent forms and sociodemographic forms were constructed by the researcher, and the applicability of various tools used was checked with a pilot study. The list of high schools in Aizawl was obtained from the Aizawl District Education Office and 5 schools were randomly selected. Then, the required sample as per the objective of the study was randomly selected from the list of students maintained by each school. The necessary permission from the authorities was taken for psychological scales and from school authorities along with the participants. All selected participants were informed about the study and assured confidentiality on their personal information, and then their participation was requested. Only those students whose parents/ guardian gave their assent as well as

their own consent were entertained for psychological evaluation. Both the intelligence test and psychological scales were administered in classrooms and all queries and doubts were made clear to the participants. After completion, the scales were collected after the researcher made sure that all the necessary responses have been given.

Result

Psychometric adequacy check:

The test scales were constructed for other cultures and its applicability to the target population has to be checked. The normality, reliability and homogeneity were checked as presented in Table-1.

Table 1: Psychometric property check- Normality (Mean, SD, Skewness, and Kurtosis), Reliability (Cronbach alpha) and Homogeneity (Levene statistics) for intelligence, visual, auditory and kinaesthetic learning styles among the samples.

Statistics	Intelligence	Learning Styles		
		Verbal	Auditory	Kinaesthetic
Normality	Mean	110.62	25.37	23.37
	SD	14.82	4.71	4.45
	Kurtosis	-0.91	-0.74	-0.87
	Skewness	0.89	0.73	-0.76
Reliability coefficient		0.76	0.74	0.72
Test of homogeneity (Levene's F statistics)		0.31	0.28	0.21
				0.14

The Mean, SD, Kurtosis and skewness showed the normality of the variances. The reliability of the tool used was estimated using Cronbach's alpha among the target population for all three measures which fell between .72 to .79, and the Levene statistics showed the homogeneity of the variance which explained the trustworthiness of the psychological scales and the appropriateness of using parametric statistics for further analysis.

Objective 1: To study the difference between high and low academic achievers on Intelligence, Visual, Auditory and Kinaesthetic Learning Styles.

The descriptive and independent t-tests were employed to study the significant difference between the high and low academic achievers on Intelligence, Visual, Auditory and Kinaesthetic Learning Styles as presented in Tables 1 & 2.

Table 2: Descriptive Statistics for intelligence, visual, auditory and kinaesthetic learning styles for high and low academic achievers

Groups	Statistics	Intelligence	Learning Styles		
			Visual	Auditory	Kinaesthetic
High Academic Achievers	Mean	116.74	27.25	21.25	26.78
	SD	13.794	5.316	5.316	5.29
	Kurtosis	-0.91	-0.77	-0.67	-0.84
	Skewness	0.88	-0.86	-0.76	0.89
Low Academic Achievers	Mean	104.51	23.48	25.48	21.53
	SD	13.82	5.86	5.86	5.81
	Kurtosis	0.81	-0.78	-0.58	-0.79
	Skewness	0.83	-0.89	-0.89	0.74
Independent t-test for High and Low academic achievers		3.93**	4.37**	4.43**	5.89**

** = Significant at .01 level

Table 2 shows the descriptive statistics on intelligence, visual, auditory and kinaesthetic learning styles for high and low academic achievers along with Skewness and Kurtosis statistics. The skewness and kurtosis statistics showed that the distribution for both groups on all three scales approximates normal distribution.

Results revealed that high academic achievers scored higher than low academic achievers on Intelligence ($M=116.74$; 104.51 ; $t=3.93$; $p>.01$), Visual ($M=27.25$; 23.48 ; $t=4.37$; $p>.01$), Kinaesthetic ($M=26.78$; 21.53 ; $t=5.89$; $p>.01$) learning styles, which are all significant at the .01 level. High academic achievers scored lower than low academic achievers on auditory learning style ($M=21.25$; 25.48 ; $t=4.43$; $p>.01$) which is also significant at the .01 level. Thus, we can accept hypothesis 1.

Primi and colleagues (2010) have also reported significant differences in students' grades based on their distinct intelligence capabilities. Another supporting research has also shown that students with higher academic achievements showed a stronger preference for visual and kinaesthetic learning methods compared to their lower-achieving counterparts (Park, 1997) while low achievers tended to favour auditory and kinaesthetic learning styles (Khan, Arif & Yousuf, 2019).

Objective 2: To study the relationship between Intelligence, Visual, Auditory and Kinaesthetic Learning Styles for High School Students

Pearson's Correlations were calculated to depict any significant relationship between intelligence, visual, auditory and kinaesthetic learning styles among the samples and presented in Table-3.

Table 3: Correlation between intelligence, visual, auditory and kinaesthetic learning styles

Variables	Intelligence	Visual learning style	Auditory learning style	Kinaesthetic learning style
Intelligence	1	.35**	.28**	.32**
Visual learning style		1	.19**	.31**
Auditory learning style			1	.26**

** Significant at .01 level

The correlation between the variables was estimated using the Pearson correlation coefficient. A significant positive relationship was found between intelligence and visual ($r^2 = .35^{**}$; $p < .01$), auditory ($r^2 = .28^{**}$; $p < .01$) as well as kinaesthetic learning styles ($r^2 = .32^{**}$; $p < .01$). In addition, Visual Learning Style had a positive significant correlation with Auditory learning style ($r^2 = .19^{**}$; $p < .01$) and Kinaesthetic Learning Style ($r^2 = .31^{**}$; $p < .01$) at .01 significant level, and Auditory Learning Style also had a positive significant relationship ($r^2 = .26^{**}$; $p < .01$) with Kinaesthetic Learning Style at a .01 significant level. Thus, hypothesis 2 can be accepted.

To support our findings, Sadeghi (2014) as well as Keskin, Köse2 and Gülođlu (2021) have found that there is a statistically significant relationship between students' learning styles and multiple intelligences.

Objective 3: To examine the predictability of Intelligence on Visual, Auditory and Kinaesthetic Learning Styles among students

The linear simple regression was employed to examine the prediction of intelligence on visual, auditory and kinaesthetic learning styles among students and presented in Table-4.

Table 4: Predictability of Intelligence on visual, auditory and kinaesthetic learning styles among students.

Predictor	Criterion	R ²
Intelligence	Visual learning styles	0.31
	Auditory learning styles	0.27
	Kinaesthetic learning styles	0.29

Regression analysis revealed that Intelligence predicted 31% of visual learning styles, 27% on Audio learning styles, and 29% on kinaesthetic learning styles among the samples. Therefore, hypothesis 3 can be accepted. There is dearth of literature on the predictability of intelligence on learning styles although some literature show correlation of intelligence and learning styles.

Discussion and Conclusion

In-depth statistical analysis was conducted to discern significant differences among high and low academic achievers and the relationship between the variables were also examined along with predictability of Intelligence on the different learning styles.

Hypothesis 1: It is expected that high academic achievers will have higher intelligence with higher preference for visual and kinaesthetic learning styles than low academic achievers while low academic achievers will prefer auditory learning styles.

The results of the study clearly showed that there is a significant difference between High and Low Academic Achievers based on their Intelligence and their preference for different learning styles. Observation of descriptive statistics with significant results highlights that high academic achievers have higher means on Intelligence, Visual learning style and Kinaesthetic learning style than low academic achievers. On the other hand, they show lower means than low academic achievers on Auditory learning style. Thus, we can say that high academic achievers have higher intelligence and they prefer using their sense of vision and their sense of touch while low academic achievers may benefit more from using their sense of hearing in the learning process.

The finding that high achievers have higher intelligence is not surprising as they can be expected to have better cognitive abilities like problem-solving, reasoning, and memory which is extremely crucial for good academic performance. Some scholars have even argued that high achievement and intelligence are essentially the same concepts. Past experiences, such as the sorts of learning settings to which students are exposed and how they are taught, affect their learning style preferences.

Hypothesis 2: It is expected that a significant positive relationship will exist between intelligence, visual, auditory and kinaesthetic learning styles.

Correlation analysis was conducted which has revealed the existence of a significant moderate positive correlation between intelligence and visual, auditory and kinaesthetic learning styles. This indicates that individuals with high intelligence are not confined to one specific learning style but may also benefit from different learning styles. This further shows that intelligent individuals can easily adapt to different learning situations.

Furthermore, a significant positive relationship has been established among the learning styles. The results imply that individuals who prefer visual learning style also tend to prefer auditory learning and kinaesthetic learning style to some extent. Moreover, those who prefer auditory learning style may also prefer kinaesthetic learning style. The relationship found between the learning styles points to the complementary existence of the different learning styles. This implies that learning styles complement each other rather than compete, and that people may naturally blend multiple types to improve their learning process.

Hypothesis 3: It is expected that intelligence will significantly predict visual, auditory and kinaesthetic learning styles among the samples.

Based on the results of the correlation analysis, regression analysis was conducted to find out the predictability of Intelligence on Visual, Auditory and Kinaesthetic learning styles. The result implies that intelligence significantly predict each of the different learning styles. Thus, not only does intelligence correlate with learning styles, but it may also help determine whether a person prefers visual, auditory, or kinaesthetic learning. This gives a more in-depth knowledge of how intelligence impacts the preference for different learning methods, allowing us to have a better grasp of the extent to which cognitive abilities (such as IQ) contribute to learning preferences.

Limitation

The study is based on a relatively small sample size, which may limit its ability to be generalized to a broader and more diverse population. Additionally, only high schools from Aizawl district were included, and factors such as the type of school (government, private, or deficit) were not considered. For classifying high achievers and low achievers, only one examination result was taken into consideration. Exploring other aspects, such as teaching methods, gender differences, and socio-demographic factors like age and economic status, would provide valuable insights. However, due to time constraints, these variables were not included in the current study.

Suggestion

For further studies, it would be valuable to increase the sample size to make the findings more generalizable to the population. A comparison of different high schools in Mizoram can be done, by incorporating schools from different districts in Mizoram. It will be interesting if type of school (government, private, deficit) is included as a variable in further studies. Methods of teaching, gender difference and other socio-demographic variables can be considered and a qualitative aspect can also be included in order to provide a more in-depth understanding of the topic under study.

Significance of the study

Although this research work has limitations, the findings highlight the importance of understanding how intelligence influences learning preferences of high and low academic achievers among high school students. It suggests that while intelligent students may be more adaptable in their learning approaches, less intelligent students may have difficulty with their non-preferred learning approaches. Thus, this emphasizes the need for personalized teaching strategies that cater to diverse learning styles and cognitive abilities. The study also opens opportunities for further research on factors like socio-demographics, gender, and teaching

methods to better understand their role in academic achievement. Overall, it emphasizes the need of incorporating a variety of teaching strategies to increase engagement and learning outcomes for both high and poor achievers.

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