

# Learning Styles and Gender Differences among Undergraduate Students of Gauhati University: A Study using the VARK Model

Pribilina Champramary<sup>1</sup>, Upasana Kalita<sup>2</sup> & Prof. Kaberi Saha<sup>3</sup>

<sup>1</sup>Research Scholar, Gauhati University, Mail ID: [pribichampramary@gmail.com](mailto:pribichampramary@gmail.com)

<sup>2</sup>Research Scholar, Gauhati University, Email ID- [upasanakalita10@gmail.com](mailto:upasanakalita10@gmail.com)

<sup>3</sup>Professor, Gauhati University, Email ID: [drsahakaberi@gauhati.ac.in](mailto:drsahakaberi@gauhati.ac.in)

## ABSTRACT:

*Learning styles refer to the characteristics of the ways individuals perceive, process, and retain information. Learning styles are a kind of learning method that students adopt in order to learn, acquire, and understand information or knowledge. In this study, the VARK model has been used to understand the types of learning styles among undergraduate students. This study aims to find the types of learning styles used and the gender difference in learning styles among undergraduate students. The investigators adopted the descriptive survey method, and 120 undergraduate students were selected as a sample using a simple random sampling technique for the study. The descriptive statistics, such as mean, standard deviation, and percentages, were used to find the types of learning styles used, and inferential statistics, such as a t-test, were calculated to find the gender differences in the learning styles between male and female undergraduate students. The findings of the study revealed that most of the students scored highest on visual learning styles and lowest on auditory learning styles. The mean difference shows that females scored higher than males and shows a  $p\text{-value} < 0.05$ , which indicates that there is a statistically significant difference in learning styles between male and female undergraduate students. These findings show the importance of adopting a balanced instructional approach that meets the diverse learning needs of the students within the classroom.*

**Keywords** – Learning styles, Gender, Gender difference, Undergraduate students, VARK Model

## 1. INTRODUCTION:

In present times, the focus of education has shifted from teacher-centred to student-centred education. Student-centric education focuses on students' active participation in the learning process, self-regulated, self-motivated, and self-directed learners, which creates student student-friendly environment (Loyens et al., 2008; O' Neill & Mc Mohon, 2005; Weimer, 2013). Therefore, the teacher, as a facilitator of learning, has to play several roles in order to make teaching and learning more interesting. Since each and every individual is unique in every aspect so learning styles are also different depending on person to person. It is crucial to recognise how student learns and intake information. It is possible that one individual might have a different learning style. Therefore, it is important to understand the preference of learning style of the students for the purpose of obtaining maximum learning outcomes from the teaching and learning process (Bazan & Sagado, 2005). Learning styles refer to ways individuals perceive, process, and retain information (Pashler et al., 2008). Learning styles are considered a kind of learning method that a student uses in order to learn, acquire, and

understand information or knowledge Fleming & Bawme, 2006). Knowledge about learning styles can help teachers in enhancing students' learning effectiveness and influence academic outcomes (Baykan & Nacar, 2007). Dunn (1978) gave the definition of learning style as "how each individual retains information or skills; regardless of how that process is described, it is different for each person". Laycock (1978) defined learning styles as "an individual's attribute way of responding to particular variables in the instructional environment". This means a student's learning style is the way in which he learns best. Fleming (2001) developed a learning style model. "This model is known as the VARK (Visual, Auditory, Read/Write, Kinaesthetic) that categorizes learners based on their sensory preferences". While other models, such as Kolb (1984) emphasised learning style as cognitive processes in learning. "This model identifies four stages: concrete experience and abstract conceptualization; these two are linked techniques to understand experience, and the other two are related to approaches of transforming experience: Active experimentation and reflective observation. In this model, learning occurs when students are engaged in all four stages in a continuous learning cycle. Exploring learning styles in this context helps educators design support mechanisms that increase the learning outcomes of the students".

## **2. LITERATURE REVIEW:**

Pashler et al. (2008) systematically reviewed learning style theories and concluded there was a lack of evidence to support that matching instructional methods to students' learning styles highly improves learning outcomes. Huseyin (2012) conducted a study on primary school students' learning styles and their attitudes toward social studies. Results showed significant differences in attitudes among students with auditory, kinaesthetic, and tactile learning styles, but no notable differences among other styles. Kirschner and Van Merriënboer (2013) argued that focusing on learning styles can detract from evidence-based teaching practices, emphasizing cognitive load theory and instructional design over style-based tailoring. (Vincey, 2016) investigated a study on "A study on learning style and Academic Achievement of the student at the 11th standard level. The study used the survey research approach. The study's conclusions showed that there is no discernible difference in the learning styles of boys and girls in the eleventh standard. Geeta and Parveena (2017) conducted a study on learning styles and achievement in biological science among secondary school students, with a sample of 375 students, the study's findings revealed that there is a positive correlation between visual learning styles and their academic achievement in biological science. Leasa et.al. (2018) investigated a study on "the effect of learning styles on the critical thinking skills in natural science learning of elementary school students". In this study, they focused on gender differences and the prevalence of unimodal and multimodal learning styles. The study highlighted that a majority of the students had one particular learning style, while those with multimodal preference often showed a complex blend of learning styles.

## **3. THEORETICAL MODEL:**

The VARK model, developed by Neil Fleming, refers to the human physiological dimension, particularly the sensory modal aspect, where individuals prefer to acquire information through sensory modalities like Visual, Audio, Read, and kinaesthetic. The model categorized the students into four types of learners, i.e., Visual, Auditory, Read, and Kinaesthetic. Students

having only one type of learning style are called unimodal, and students having more than one type of learning style are called multimodal. VARK learning styles can be determined in students, and these preferences tend to remain fairly consistent (Fleming, 2001). In the model, the acronym VARK represents V for Visual, A for Auditory, R for Read/Write, and K for Kinaesthetic. The model was previously known as the VAK, which was later modified as VARK by Fleming in 2006.

1) Visual learning style: This type of learning style is divided into 2 categories - people who are oriented to images, graphs, and tables in obtaining information (V), and people who like textual forms (R). Visual learners find it easier to learn by demonstration and information presented in figures, images, and symbols such as graphs, charts, tables, flowcharts, and models.

2) Auditory Learning style: The auditory learners are more optimized for the sense of hearing in processing information. Rather than writing, auditory learners are proficient in learning by listening. Students with such type of learning style like to have discussions with classmates on the topic learned in the classroom in an attempt to clarify their understanding. The characteristics of auditory learners are that they can read quickly, speak fluently, easily write poetry, have a good vocabulary, and are capable of remembering facts or names.

3) Read/write learning style: In this type of learning style, learners like to acquire information in the form of text and print, such as lists, glossaries, textbooks, etc. In addition, they are good at taking or quoting notes from lectures.

4) Kinaesthetic learning style: The kinaesthetic learners are a reflection of the sensory blend of modalities. They learn directly by using experience and hands-on practice. Students with a kinaesthetic learning style have high energy and prefer to apply touch gestures and interaction with their environment.

Unlike other learning style models, VARK emphasizes the perceptual model, which focuses on the way in which a person manages and takes in information. Using the VARK model helps to identify the type of learners based on their learning style preferences. Knowing the learning styles of the students makes learning easier and more effective. In this study, the VARK model has been used to understand the types of learning styles among undergraduate students.

#### **4. SIGNIFICANCE OF THE STUDY:**

In previous research studies, learning styles in academic success have been widely recognized. Learning style influences the knowledge absorption and the processing of information of the students. Students who are aware of their learning styles are better set to adopt study methods that match with their strengths, enabling them to engage more effectively with learning materials (Felder & Silverman, 1988). Again, in the study by Dunn & Dunn (1993), educators who adapt their teaching style to go with the learning styles of their students can form a better educational environment, enhancing the performance of the learners. Determining the learning style preferences of the students not only helps students in achieving academic performance but also helps teachers in enhancing their teaching styles to meet varied needs. Therefore, it is

important to determine the learning styles of undergraduate students of Gauhati University. The purpose of this study is to identify the learning styles of undergraduate students and investigate gender-based differences in learning styles among undergraduate students of Gauhati University.

## 5. OBJECTIVES:

1. To find the type of learning styles used by the undergraduate students.
2. To find the difference in learning styles between male and female undergraduate students.

## 6. HYPOTHESIS:

*H<sub>0</sub>*: There is no significant difference in learning styles between male and female undergraduate students.

## 7. METHODOLOGY:

### 7.1 Materials and Methods:

In the present study, the investigators adopted the descriptive survey method. The population of the study is all the undergraduate students currently enrolled in the Five-year Integrated Masters Programme at Gauhati University, and 120 undergraduate students have been selected as a sample using a simple random sampling technique for the study.

Table 1. Distribution of the participants in terms of Gender

Gender	f	Percentage
Female	60	50%
Male	60	50%
Total	120	100

*Table 1. shows the frequency (f) and percentage (%) of the participants*

The Learning Style scale (LSS-BAMP) by Dr. Balhara and Mittal (2023) has been adapted and modified for collecting data from undergraduate students. The scale originally contained 40 items, having dimensions- visual learning with 11 items, auditory learning with 9 items, reading and writing with 10 items, and kinaesthetic learning with 10 items. The validity of the modified scale was checked through experts, and after the experts' suggestions, 8 items were excluded, and a total of 32 items were included for collecting data for the present study. The Cronbach's Alpha was calculated, and the value found was 0.852.

The collected data were entered, and analyses were processed using JAMOV 2.6.19 software. The descriptive data for the learning styles- visual, auditory, read/ write, and kinaesthetic were calculated using means, standard deviations, and percentages. A t-test was

calculated to find the gender differences in learning styles between male and female undergraduate students.

## 7.2 Analysis:

Objective 1: To find the type of learning styles used by the undergraduate students.

Descriptive statistics of Mean and Standard Deviation related to the learning styles are shown in Table 2. of the undergraduate students.

Table 2. Mean and Standard Deviation of the Undergraduate Students' learning styles

Learning Styles	$\bar{X}$	sd
	150	17.8

From the above table, the data presented shows the mean ( $\bar{X} = 150$ ) and standard deviation ( $sd=17.8$ ) of the undergraduate students' learning styles.

Table 3. Mean, Standard Deviation, and Percentage of the types of learning styles of the undergraduate students.

Types of Learning Styles	$\bar{X}$	sd	%
Visual	42.1	5.68	28.06%
Auditory	33.5	4.80	22.37%
Read/Write	36.8	6.02	24.57%
Kinaesthetic	37.5	5.69	24.98%

The data in Table 3. presents the mean ( $\bar{X}$ ), standard deviation (sd), and percentage (%) of the learning styles of undergraduate students. The table shows the highest scores ( $\bar{X} = 42.1$ ,  $sd = 5.68$ , and 28.06 %) of undergraduate students with visual learning styles. Followed by scores of ( $\bar{X} = 36.8$ ,  $sd = 6.02$ , and 24.57 %) of the undergraduate students having read/write learning styles. Again, the scores of kinaesthetic learning styles show ( $\bar{X} = 37.5$ ,  $sd = 5.69$ , and 24.98 %) of the undergraduate students. The lowest scores are ( $\bar{X} = 33.5$ ,  $sd = 4.80$ , and 22.37 %) that fall under the auditory learning styles of the undergraduate students.

Objective 2. To find the difference in learning styles between male and female undergraduate students.

Ho: There is no significant difference in learning styles between male and female undergraduate students.

Descriptive statistics of Mean and Standard Deviation related to the learning styles are shown in Table 4. of the male and female undergraduate students.

Table 4. Mean and Standard Deviation of Male and Female Undergraduate Students' learning styles.

	Male		Female	
	$\bar{X}$	sd	$\bar{X}$	sd
Learning styles	146	14.6	154	19.7

The data in Table 4. shows the Mean and Standard Deviation of male and female undergraduate students and their types of learning styles. The learning style scores for males are ( $\bar{X} = 146$ ,  $sd = 14.6$ ), and for females, they are ( $\bar{X} = 154$ ,  $sd = 19.7$ ).

Table 5. Analysis of the Independent samples t-test on the difference in learning styles between male and female undergraduate students.

Gender	$\bar{X}$	sd	t-value	df	Mean Difference	P-value
Male	146	14.6	-2.56	118	-8.1667	.012
Female	154	19.7				

Table 5. shows the calculated data of an independent samples t-test to find the difference in learning styles between male and female undergraduate students. The result indicated a significant difference between males (  $M=146$ ,  $sd=14.6$ ) and females ( $M=154$ ,  $sd=19.7$ ); and the calculated t-value is ( $t= -2.56$  ),  $df= 118$ , mean difference =  $-8.1667$  and p-value =  $.012$ . The mean difference shows that females scored higher than males and shows a p-value  $< 0.05$ , which indicates that there is a statistically significant difference in learning styles between male and female undergraduate students. Thus, the null hypothesis ( $H_0$ ) stating there is no significant difference in learning styles between male and female undergraduate students is rejected.

## 8. FINDINGS AND DISCUSSION:

The analysis of objective 1, which examined the type of learning styles among undergraduate students, revealed that most of the students scored highest on visual learning styles and lowest on auditory learning styles. The findings indicate that the majority of undergraduate students prefer visual learning styles, consistent with the findings of the study by Dm (2019) revealed



that the visual and kinaesthetic learning styles are the most preferred learning styles among IX standard students, and in unimodal learning styles, visual learners are predominant (Soundariya et al., 2017). In addition, Subagja & Rubini (2023) found that the kinaesthetic and visual learning styles are the most dominant learning styles among students in science subjects, followed by auditory and read/write learners. In the present study, the findings depicted that most students have visual and kinaesthetic learning styles among the undergraduate students. In the study by Shuib & Azizan (2015) have pointed out that it is debatable among researchers that the preference of students' learning styles is affected due to gender differences. The objective 2, which was to find the difference in learning styles between male and female undergraduate students, revealed that there is a significant difference in learning styles between male and female undergraduate students, with females having higher mean scores than males. Marantika, J.E.R. (2022) found that there is a difference in learning styles between male and female students, with female students having preferences for kinaesthetic learning and male students having preferences for auditory learning styles. Again, in the study by Wehrwein et al. (2006) found that there exists a significant difference between male and female undergraduate physiology students, where male students preferred all four modes of learning styles (VARK), whereas females preferred a single mode of learning styles. This study agrees with the findings of the studies by Choudhary et al. (2011) and TAR & Priyadharsini (2018), which have reported that male and female students have different learning style preferences. Another study by Saleem, Z. et al. (2021) has observed that there exists a gender difference in both the VAK learning style model and academic performance. In case of unimodal learning styles, it has been found that there is a statistically significant difference between male and female undergraduate medical students; in contrast, in multimodal learning styles, there is no statistically significant difference between male and female undergraduate medical students (Shete et al., 2016). Compared to the female counterpart, a significant proportion of male medical students have preferences for bimodal learning styles (Ramanathan, R. et al., 2022). The findings of learning styles and gender differences among university students showed that both genders, male and female, have preferences for multimodal learning styles (Andini & Prastiyowati, 2021). There exists a variation in the preference for learning styles, with multimodal being the dominant learning style preference among styles, and regarding unimodal learning style, males have preferences for aural and kinaesthetic learning styles compared to females (Nuzrat et al., 2013). The gender of the student has a significant relationship with single-model learning styles; females preferred using aural learning styles, and males preferred using kinaesthetic learning styles (Sarabi-Asiabar A et al., 2015). Learning styles has a significant association and dependent on the gender of the students (Mohammadi et al., 2015). But, in contrary to the findings of the present study, the majority of studies have found that there is no significant difference in preferences in the learning styles between male and female students (Eid et al., 2021; Senthil Ganesh P Kannappan et al., 2025; Dini et al., 2019; Sirishi A et al., 2025; Kannappan et al., 2025). Some studies have reported that it has no significant relationship between preferences in learning styles and the gender of the students (Kausar et al., 2019; Buowari et al., 2025; Gholami & Bagheri, 2013). The results of the present study help in understanding that gender plays a significant factor in learning styles among undergraduate students.

**9. EDUCATIONAL IMPLICATION:**

The findings of the present study hold a very significant educational implication for a practical educational approach. Firstly, in the study, the predominant type of learning style among the students is the visual learning style. These findings highlight the importance of inculcating visual aids, such as creative pictures, graphs, maps, workbooks, chalkboards, and visual presentations in the classroom. This can enhance the engagement in learning of the undergraduate students. Secondly, the study also disclosed that there is a significant difference between male and female undergraduate students. Showing a stronger preference towards kinaesthetic and visual learning styles among females, while males predominantly prefer auditory learning styles. These findings show the importance of adopting a balanced instructional approach that meets the diverse learning needs of the students within the classroom.

**10. CONCLUSION:**

In the study, the highest number of students had a visual learning style. The reason behind the maximum students having a visual learning style because when students are learning with the help of creative pictures, graphs, maps, workbooks, chalkboards, and visual presentations, it helps learners to have a better understanding of the concepts and generate ideas and information more effectively than through verbal explanations. Followed by, the students having a kinaesthetic learning style that has better understanding through hands-on experience. Statistically significant difference has been observed between male and female undergraduate students in regards to their learning styles. Thus, learning styles should be studied to understand students' learning styles and inculcate teaching styles according to their learning style preferences. Thus, it is important for both teachers and students to understand learning styles.

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