



BARRIERS IN LEARNING BIOLOGICAL SCIENCE AT THE HIGHER SECONDARY (H.S) LEVEL IN ASSAM: A COMPARATIVE STUDY

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ABSTRACT

Biological Science at the H.S level is the initial stage for career development in medicine and other domains of Bioscience. However, students frequently encounter multifaceted barriers that delay learning. This cross-sectional study investigated the barriers perceived by H.S students in learning Biological Science, with a focus on institutional types, instructional language, regional, and gender-based differences. A sample size of 106 Class XII science stream students under the state educational board Assam Higher Secondary Education Council (A.H.S.E.C) from Kamrup Metropolitan and Kamrup Rural, Assam.. A 30-items scale the Barriers in Learning Biological Science Scale (BLBSS) was developed, validated, and administered. The data were collected from four different schools (two public, two private), the data collected was not included in the range of normality, therefore a non-parametric test was found to be statistically useful for the inquiry. Mann-Whitney U test was used to examine difference among the variables. The findings revealed that students from public institutions stated a higher learning barriers compared to their private school counterparts ($z(106) = -6.556$, $p = .000$). A significant disparity was seen among students from English medium and Assamese institutional language ($z(106) = -3.401$, $p = 0.001$). A substantial regional discrepancy was observed, with students from Kamrup Rural experiencing barriers in learning Biological Science than Kamrup Metropolitan ($z(106) = -5.271$, $p = 0.000$). The finding revealed that no gender difference was found ($z(106) = -.751$, $p = 0.452$). The findings underscore the urgent need for prior interventions in public and rural schools; meanwhile introduce English as an institutional language to teach biological science at higher secondary level to enhance biology learning outcomes.

KEYWORDS: Biological Science, Learning Barriers, Higher Secondary Students, Assam Higher Secondary Education Council (A.H.S.E.C), Assam

INTRODUCTION

Biological Science has its own identity; it functions as a separate scientific discipline at the H.S level that describes the complex life processes on the planet (Okwo & Tartiyus, 2004). Biology is the in-depth study of organisms, the adjacent real world and its surroundings (Abel, 2024; Amrianto et al., 2025). It provides an array of knowledge that develops critical thinking, scientific temper and problem-solving. It prepares one for a wider area of scientific knowledge, which has a wider range of domains like medicine, health care, and environmental conservation (Dogar et al., 2025). Hence, Biological science is a boon to mankind, which helps to get a deeper understanding of humans and its surrounding and provide cure for its suffering. In the educational scenario, the main problem that is of concern is the difficulty in learning (Durrani et al., 2025). It occupies a special position in the curriculum, despite the importance, its face many barriers like deficient infrastructural facilities, inadequate laboratory materials, problems with pedagogy, and limited scope for hands-on learning (Pathak et al., 2025). The educational problems act as a hindrance in the academic performance. Thus, the hindrance

develops a negative attitude towards the subject for future studies (Abel, 2024).

The educational system of Assam solely reflects a unique paradox, which is a blend of regional, socio-cultural, and infrastructural complexities that directly or indirectly hinder the learning experience of students (Devi, 2023). Disparities are seen between urban and rural areas with regard to educational facilities in Assam (Barman & Choudhary, 2025). The other stretch of problem is the scientific terminology, and deficit disclosure to experimentation often creates a hindrance in learning biological science. These imbalances are mainly noticeable in the contrasting educational scenario of Kamrup Metro and Kamrup Rural, the two districts that emerged as the splitting of the Kamrup district in 2003. The two districts had distinctive H.S institutions with diverse administrative and academic settings. It is surrounded by both public and privately monitored institutions with varying infrastructural settings and instructional support system. Therefore, a procedural analysis across the institutional scenario is needed to spot the varying levels of educational



facilities that hinder the learning outcomes among students. The present investigation within the Kamrup Metropolitan district and Kamrup Rural provides a distinctive insight into the accessibility of educational resources, the efficacy of instructional practices, and the relative learning difficulties of students in different academic settings. The result will help the educational planner and teacher educators to comprehend the specific problem and strengthen the Biological Science in H.S schools under A.H.S.E.C. It will help to lead the path to set up proper laboratory facilities, enhanced pedagogies, and simplify the content. Therefore, the study will enable the creation of an equitable and academically responsive biological science educational approach in Assam.

RESEARCH QUESTIONS

Understanding the barriers from grass root level is essential to differentiate among barriers that is of varied forms i.e. institutional types, instructional language, regions and gender that is targeted essential to root out the problems and to design targeted interventions. This study specifically addresses the following research questions:

- i. Is there a significant difference in learning barriers among the public and private school students?
- ii. Is there a significant difference in learning barriers between the institutional language, English and Assamese?
- iii. Is there a significant difference in learning barriers between Kamrup Metropolitan and Kamrup Rural students?
- iv. Is there a significant difference in learning barriers among boys and girls?

OBJECTIVES OF THE STUDY

- i. To determine the perceived learning barriers in Biological Science among public and private institutions students.
- ii. To examine whether learning barriers in biological science differed significantly among students studying in English and Assamese medium institutions.
- iii. To determine the perceived learning barriers in Biological Science among Kamrup Metropolitan and Kamrup Rural students.
- iv. To determine how learning barriers in Biological Science differ among girls and boys.

REVIEW OF RELATED LITERATURE

Several national and internationally describes a variety of barriers to science education and learning science at the secondary and H.S level. Devi (2022) document that there exist persistent the physical barrier which particularly involves infrastructure; laboratory amenities, the ICT tools. Barman & Choudhury stated the scenario in case of urban students is a bit different where they have ample facilities with better infrastructure and amenities with digital facilities which supports them to achieve better learning outcome. Kumar;2021, Sharma & Bairwa; 2021, Das;2017). Binwale et al. (2023) documented a different scenario which showed persistent difference in case of the public institution girls. The girls are seems to outperform and faced difficulty in learning science.

METHODOLOGY

A normative survey method was adopted for investigating the hierarchy of barriers affecting learning of Biological Science among H.S schools. The population comprises of all final-year students of science stream under A.H.S.E.C. of the selected districts. A sample size of 106 class XII students were selected using a purposive stratified random sampling from selected H.S schools offering the science stream, including two public and two private, which is sufficient to justify the study and provide meaningful statistical analysis. The data were collected using a researcher-developed tool to measure the desired purpose of the study. The responses were recorded in a three-point ordinal scale: always -3, sometimes -2, and never -1, where always scored the maximum as 3 and never scored the minimum as 1. The tool was validated through the expert opinion of the reviewer in the field, and reliability was ensured through Cronbach's alpha, indicating a satisfactory internal consistency.

The collected data does not satisfied the prerequisites of normal distribution, as the Shapiro-Wilk was found to be .000 ($p < 0.05$), so non-parametric methods were employed for analysis. The data were outlined using descriptive statistics, where the demographic breakdown is provide in terms of frequency. The Mann-Whitney U Test was used to compare learning barriers across urban and rural groups, institutional language, public and private institutions, and gender groups. The analysis was conducted using the statistical tool SPSS version 26.0.

ANALYSIS

Demographic Profile of Respondents: This section presented the demographic characteristics of the 106 H.S students who are the part of the research. The frequency distributions are shown in the Table 01



Table 01: Demographic Breakdown of the Respondents (N=106)

Variables	Categories	Number
Institutional types	Public	47
	Private	59
Institutional language	English	57
	Assamese	49
Locality	Kamrup Metropolitan	57
	Kamrup Rural	49
Gender	Girl	61
	Boy	45

Objective i: To determine the perceived learning barriers in Biological Science among public and private institutions students.

Table 02: Comparing Learning Barriers in Biological Science by the Institutional types using Mann-Whitney U Test

Variable	Category	N	Mean Rank	z-value	p value
Institutional Types	Public	47	75.43	-6.556	.000
	Private	59	36.03		
	Total	106			

From the Table 02, it is shown that a Mann-Whitney U test was conducted to administer the disparities that persist among the public and private schools. The result clearly reflects that the value for public institutions (mean rank=75.43) were substantially diverse from those for private institutions (mean rank=36.03), where $p=.000$ where $p<0.05$. This suggested that

public institutions are substantially differs from private institutions.

Objective ii: To examine whether learning barriers in biological science differed significantly among students studying in English and Assamese medium institutions.

Table 03: Result of Mann-Whitney U Test Comparing Learning Barriers in Biological Science by Institutional language

Variable	Category	N	Mean Rank	z-value	p value
Institutional language	English	59	44.44	-3.401	.001
	Assamese	47	64.87		
	Total	106			

From the Table 03, it is shown that a Mann-Whitney U test was administered to test the disparity among institutional language. The result clearly reflects that the value for English medium (mean rank=44.44) where substantial difference were seen for Assamese medium (mean rank=64.87), where $p=.001$ where $p<0.05$. This suggested that institutional language is of great

importance, particularly English to derive scientific knowledge to overcome the fear of scientific terminology..

Objective iii: To determine the perceived learning barriers in Biological Science among Kamrup Metropolitan and Kamrup Rural students.

Table 04: Comparing Learning Barriers in Biological Science by Region using Mann-Whitney U Test

Variable	Category	N	Mean Rank	z-value	p value
Locality	Kamrup Metropolitan	57	38.91	-5.271	.000
	Kamrup Rural	49	70.47		
	Total	106			

From the Table 04, it is shown that a Mann-Whitney U test was administer to test the disparity between Kamrup Metropolitan and Kamrup Rural using Mann-Whitney U test. The outcome clearly reflects the value for Kamrup Metropolitan (mean rank=38.91) were substantial differed for Kamrup Rural (mean rank=70.47),

where $p=.000$ where $p<0.05$. This suggested that Kamrup Metropolitan substantially differed from Kamrup Rural.

Objective iv: To determine how learning barriers in Biological Science differ among girls and boys.



Table 05: Comparing Learning Barriers in Biological Science by Gender using the Mann-Whitney U Test

Variable	Category	N	Mean Rank	z-value	p value
Gender	Girls	61	51.57	-.751	.452
	Boys	45	56.11		
	Total	106			

From the Table 05, it is shown that a Mann-Whitney U test was administered to test the disparity between girls and boys. The outcome clearly throws light that for the girls (mean rank=51.57) were not substantially diverse from that of boys (mean rank=56.11), where $p=.452$ where $p>0.05$. This, suggested that gender is imperersistent and does not impact the learning in Biological Science

Findings

1. There is a substantial disparity between public and private H.S schools under A.H.S.E.C about the learning barriers in Biological Science.
2. There is a substantial difference between English and Assamese medium H.S schools under A.H.S.E.C in relation to learning barriers in Biological Science.
3. There is a substantial difference between Kamrup Metropolitan and Kamrup Rural higher secondary schools under A.H.S.E.C about the learning barriers in Biological Science.
4. There is no substantial difference among girls and boys in relation to learning in Biological Science.

CONCLUSION

The study revealed a starkly unequal landscape of Biological Science learning opportunities in Assam's H.S educational system which clearly reflects the disparity in scores among the institutional types. This disparity can be attributed to systemic underfunding of the scenario persistent in the public schools which results in obsolete and vanquished laboratory equipment. In many public institutions students don't have basic laboratory amenities to perform experiments. Biological Science is loaded with scientific terminology and attributes which act as a barrier in case of students from vernacular medium i.e. basically is of great concern in case of Assamese medium students. The significant regional disparity between Kamrup Metro and Kamrup Rural reflects the concentration of educational resources in urban areas with better educational facilities. A rural school seems to have poorer infrastructure and meanwhile struggle to attract and retain qualified teachers in most of the cases. The absence of gender stereotypes, as seen to be narrowed down, which particularly proposed that interventions should not be gender-specific but should address the more prevalent factors that affect the students.

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