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Original Research Article

## Educational outcome of inquiry-based teaching learning method versus traditional learning among second phase medical students in pharmacology

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### ABSTRACT

**Background:** Pharmacology is a core discipline in medical education, bridging basic and clinical sciences. Traditional lecture-based teaching promotes factual recall but may not sufficiently develop analytical and problem-solving skills. Inquiry-based teaching-learning (IBTL) emphasizes critical thinking, active participation, and self-directed learning.

**Methods:** A prospective, cross-sectional educational intervention was conducted among 92 phase-II MBBS students of Nagaon Medical College, Assam. Students were divided into group A (IBTL) and group B, traditional teaching method (TLM). Identical topics were taught in both groups. Assessment included pre- and post-tests, student feedback, and faculty perception. Data were analyzed using paired and unpaired t tests (SPSS v21).

**Results:** IBTL produced significant improvement in post-test scores ( $p < 0.001$ ) and led to higher student engagement and satisfaction. Faculty feedback reflected 100% agreement that IBTL enhanced conceptual understanding and critical thinking. Although traditional teaching yielded higher factual recall for the topic “vitamins” ( $p = 0.004$ ), IBTL supported better long-term retention, motivation, and deeper understanding.

**Conclusions:** IBTL is more effective than traditional methods in promoting active learning, conceptual clarity, and critical thinking. A blended model combining both approaches is recommended for optimal pharmacology education.

**Keywords:** Inquiry-based learning, Active learning, Medical education, Pharmacology, Teaching methodology

### INTRODUCTION

Pharmacology plays a crucial role in medical education by enabling students to understand drug mechanisms, therapeutic uses, and clinical applications. Effective teaching strategies are essential to promote retention and higher-order cognitive skills. Traditionally, the lecture method (TLM) has been the most widely used teaching approach in medical colleges due to its simplicity and ability to deliver large volumes of content.<sup>5</sup>

However, several studies have reported that passive learning limits student engagement and critical thinking.<sup>1,6</sup>

IBTL shifts the focus from teacher-centered instruction to student-centered exploration, allowing learners to question, investigate, and apply concepts.<sup>2</sup> Clinically reported studies suggest that IBTL enhances analytical thinking, problem-solving abilities, and long-term retention.<sup>6,11</sup> Few studies in India have evaluated IBTL in pharmacology education, although such approaches align

well with competency-based medical education (CBME) goals.<sup>12</sup>

Given the need for innovative, student-centered pedagogies in pharmacology, this study aims to compare IBTL and TLM in terms of learning outcomes and student satisfaction.

### **Objectives**

#### *General objective*

General objective was to compare the effectiveness of IBTL and TLM in teaching pharmacology among undergraduate medical students.

#### *Specific objective*

Specific objective was to assess and compare pre- and post-test scores of students taught using IBTL and TLM and to analyze student feedback regarding both teaching methods.

## **METHODS**

### **Study setting**

The study was carried out at Department of Pharmacology, NMCH, Nagaon.

### **Study duration**

The study was conducted for 6 months from March 2025 to July 2025.

### **Study design**

It was prospective cross sectional educational intervention.

### **Study sample**

Out of 100 eligible students, 92 participated-the remaining were excluded due to exam failure/year back. This was documented in the Methods section as required.

### **Study participants**

Phase II MBBS students of 2023 batch appearing for exam in August 2025.

### **Sampling method**

Purposive/ convenient sampling method was used.

### **Inclusion criteria**

Students were included if they were regularly attending pharmacology classes, belonged to the Phase II MBBS cohort, provided written consent for participation, and

were willing to complete all assessments and feedback surveys.

### **Exclusion criteria**

Students were excluded if they had attendance shortages at the time of recruitment, declined to participate, were absent during the teaching intervention or evaluation sessions, or had previously received structured training in inquiry-based methods.

### **Grouping**

IBTL group-inquiry-based sessions and TLM group-traditional lecture sessions.

### **Teaching topics**

Teaching topics were anti-thyroid drugs and vitamins, assessment tools, pre-test MCQ questionnaire, post-test MCQ questionnaire and the student feedback form (Likert scale).

### **Data analysis**

Paired t-test for within-group comparisons, unpaired t-test for between-group comparisons and SPSS version 22 was used.<sup>9</sup>

## **RESULTS**

### **Section I: Faculty feedback, (n=10)**

It summarizes faculty perceptions of IBTL implementation.

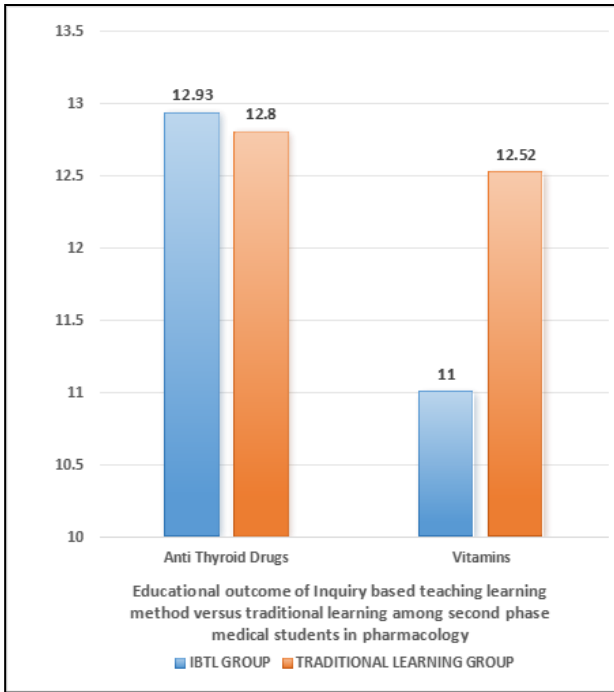
Key findings were 100% faculty agreed IBTL improved conceptual understanding, 100% agreed IBTL promoted critical thinking, 80% found IBTL easy to implement, 70% felt traditional lectures covered content more efficiently and 50% believed IBTL improved retention more than traditional teaching.

### **Section II: Student feedback, (n=92)**

Major observations were 87% were satisfied with IBTL, 88% reported higher engagement, 90% reported better conceptual clarity, 74% believed IBTL improved long-term retention and group activities increased motivation in 64% students.

### **Section III: Educational outcomes**

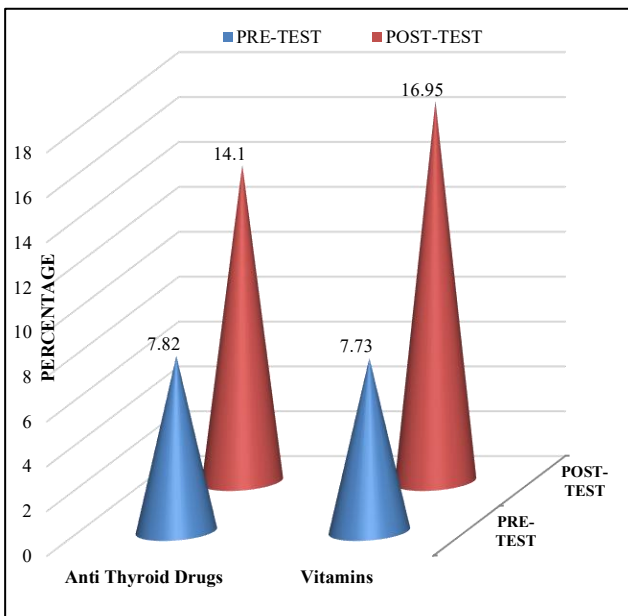
Figure 1 compares the mean post test scores for anti-thyroid drugs and vitamins between students taught using the IBTL method and those taught through the traditional method. IBTL yielded slightly higher scores for anti-thyroid drugs, while traditional teaching showed a marginal advantage in the vitamin's topic.



**Figure 1: Comparison of post test scores between IBTL and traditional groups.**

**Pre-test and post-test comparison**

Both topics showed significant improvement after IBTL.



**Figure 2: Second phase medical students in pharmacology.**

**Student feedback**

Students in the IBTL group reported better understanding of concepts, higher involvement in learning and greater satisfaction with the teaching process.

**Faculty feedback**

IBTL required more preparation time but promoted deeper learning.

**DISCUSSION**

This study demonstrates that both IBTL and TLM significantly improve students’ knowledge; however, the magnitude of improvement varies according to the topic and comparison with previous studies

**Learning outcomes**

The greater improvement in IBTL for concept-based topics aligns with findings by Minhas et al who reported better performance with active learning strategies.<sup>6</sup> Gogoi et al also found that interactive, case-based strategies enhance understanding of complex subjects.<sup>1</sup>

**Student engagement**

Our results show higher engagement in the IBTL group, consistent with studies showing that inquiry-based methods promote motivation and participation.<sup>2,11</sup>

**Topic-specific performance**

For vitamins (a factual topic), TLM yielded slightly better results, similar to the observations of Sumera A., who noted that lecture methods are efficient for content-heavy subjects.<sup>5</sup>

**Faculty feedback and feasibility**

Devi et al reported that active learning demands more faculty preparation time, matching our findings.<sup>3</sup>

**Interpretation of the present study**

IBTL is superior for analytical, reasoning-based topics. TLM remains efficient for factual content that requires structured delivery. Students appreciate interactive learning despite initial discomfort.

A blended model may offer the best learning outcomes.

**Strengths**

Strengths were to real classroom comparison of two pedagogy methods, learner-centered assessment tools.

**Limitations**

Limitations were single-center study, short duration, no long-term retention assessment, recommendations for future studies, multi-center studies to validate findings, long-term follow-up tests and use of OSCE-type assessments.

## CONCLUSION

IBTL is more effective than TLM in promoting conceptual learning, engagement, and analytical thinking in pharmacology. TLM remains useful for factual topics. A blended teaching model integrating both strategies is recommended for optimal student learning outcomes.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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