



## IMPACT OF VERTICAL INTEGRATION OF ANATOMY OF BREAST WITH SURGERY ON LEARNING OUTCOMES IN MBBS PHASE I: A MIXED-METHODS STUDY

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### ABSTRACT

**Background:** Traditional compartmentalized teaching of anatomy often limits its clinical application. Vertical integration with clinical subjects like surgery may enhance meaningful learning.

**Objective:** To evaluate the impact of vertical integration on students' perceptions, learning outcomes, and reflective capacity.

**Methods:** This prospective interventional mixed-methods study involved 120 MBBS Phase I students at Dr. Radhakrishnan Government Medical College (Dr. RKGMC), Hamirpur. Quantitative data were collected via Likert-scale questionnaires (1–5 scale) and MCQ assessments. Qualitative data came from reflective writing, analyzed using the REFLECT rubric. Results: 92% of students reported improved motivation, 95% noted better integration, and 89% experienced enhanced critical thinking. Over 75% scored >60% on MCQs. Thematic analysis revealed improved conceptual clarity, clinical relevance, and engagement. Feedback from faculty was also positive. **Conclusion:** Vertical integration significantly improves cognitive and affective learning domains, supporting its inclusion in undergraduate medical curricula.

**KEYWORDS :** Vertical integration, anatomy education, mixed-methods, medical education, reflective learning.

### INTRODUCTION

Medical education has shifted from discipline-based teaching to integrated curricula to enhance clinical applicability. Studies show that integration improves knowledge retention and application in clinical settings <sup>(1)</sup>. Vertical integration bridges basic sciences with clinical practice, fostering contextual and meaningful learning. Rikers et al. <sup>(2)</sup> demonstrated that biomedical knowledge enhances clinical reasoning through lexical decision processes, with contextual activation being most impactful. Despite these benefits, Anatomy is often taught in isolation, hindering clinical application in later years. This study evaluates whether integrating Anatomy with Surgery improves understanding, application, and student engagement among MBBS Phase I students.

### Methods:

This prospective interventional mixed-methods study involved 120 MBBS Phase I students at Dr. Radhakrishnan Government Medical College Hamirpur, H.P., India in department of Anatomy. Consent from Ethical Committee and Research Advisory committee of the institute was taken. Prior consent was taken from participating students and faculty members. Quantitative data were collected via Likert-scale questionnaires (1–5 scale) both from students and faculty. Immediate assessments of students was done by a 10 MCQ's test by the end of session. Another assessment was done after 3 months as a scenario based question in upcoming Part Completion Test. Qualitative data came from reflective writing from Rolfe's model of reflection- what happened? So what? What next? Reflection was analyzed using the REFLECT rubric.

**Study Design:** Prospective interventional mixed-methods study.

**Setting:** Department of Anatomy, Dr. Radhakrishnan Government Medical College, Hamirpur, H.P., India.

**Participants:** 120 MBBS Phase I students and faculty from Anatomy and Surgery departments in year 2023-24.

**Intervention:** Vertical integration of breast anatomy with surgical applications in two phases: AN 9.1- Breast : clinical applied

• Phase 1 (P1): Traditional anatomy teaching.

• Phase 2 (P2): Clinical/surgical correlation session.

### Data Collection:

- Likert-scale questionnaire (1–5 scale) on perceptions of motivation, integration, critical thinking, and utility.
- 10 MCQ-based assessment.
- Reflective writing, scored using the REFLECT rubric <sup>(4)</sup>.

**Data Analysis:** Descriptive statistics (means, percentages) for quantitative data; thematic analysis (coding categorization theme generation) for qualitative data.

**Ethics:** Institutional ethics approval was obtained; informed consent was secured from participants.

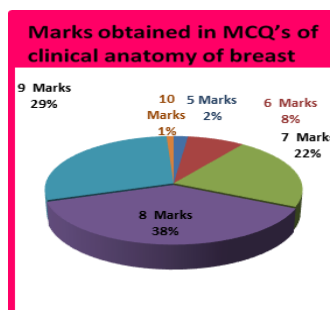
### RESULTS

#### Quantitative Findings

**Student Perceptions (Likert Scale):** Of 120 students, 92% reported improved motivation, 95% agreed on better integration of concepts, 89% noted enhanced critical thinking, and 89% found the method useful (mean scores >4/5 across items).

**Academic Performance (MCQ):** 86 students were assessed; 75% scored >60%.

**Faculty Perceptions:** 100% of faculty (n=6) agreed on improved student motivation, integration, and critical thinking; 66.6% noted higher engagement and high feasibility.



| S.No | VALUE | Likert's Scale (%age of students) |          |         |       |                |
|------|-------|-----------------------------------|----------|---------|-------|----------------|
|      |       | Strongly disagree                 | Disagree | Neutral | Agree | Strongly agree |
|      |       |                                   |          |         |       |                |

|   |                                                                          |         |    |    |     |       |       |
|---|--------------------------------------------------------------------------|---------|----|----|-----|-------|-------|
| 1 | Will it motivate the student to study and understand the topic better    | STUDENT | 0% | 0% | 8%  | 54%   | 39%   |
|   |                                                                          | FACULTY | 0% | 0% | 0%  | 0%    | 100%  |
| 2 | Will it help students to integrate basic Sciences with clinical subjects | STUDENT | 0% | 0% | 6%  | 28%   | 67%   |
|   |                                                                          | FACULTY | 0% | 0% | 0%  | 0%    | 100%  |
| 3 | Will it Improve concepts, reasoning and critical thinking skill          | STUDENT | 0% | 2% | 10% | 31%   | 58%   |
|   |                                                                          | FACULTY | 0% | 0% | 0%  | 0%    | 100%  |
| 4 | Does it engage students more and decreases monotony                      | STUDENT | 0% | 2% | 19% | 49%   | 31%   |
|   |                                                                          | FACULTY | 0% | 0% | 0%  | 33.3% | 66.6% |
| 5 | Is it a useful Teaching-Learning Method                                  | STUDENT | 0  | 0  | 11% | 31%   | 59%   |
|   |                                                                          | FACULTY | 0% | 0% | 0%  | 33.3% | 66.6% |
| 6 | Is it feasible to implement                                              | FACULTY | 0% | 0% | 0%  | 66.6% | 33.3% |
| 7 | Is it worthy of time used for preparation and implementation             | FACULTY | 0% | 0% | 0%  | 66.6% | 33.3% |

**Qualitative Findings (Thematic Analysis):** Five themes emerged from reflective writings (n = 120):

- Enhanced Conceptual Understanding: Clearer grasp of anatomy when linked to surgical cases.
- Clinical Relevance: Appreciation of real-life applications bridging theory and practice.
- Increased Engagement: Reduced monotony and heightened curiosity.

Development of Critical Thinking: Improved reasoning beyond rote knowledge.

- Motivation for Self-Directed Learning: Encouragement for deeper independent exploration.

## DISCUSSION

The particular topic was taken during Breast Cancer awareness in October 2023 highlighting the theme "Keeping Her In The Picture" to engage students. It was observed that a lot of students approached Surgery OPD with the females in their family for Ca Breast screening in General Surgery OPD.

This study demonstrates that vertical integration of anatomy with surgery significantly enhances both cognitive and affective learning domains. Quantitatively, 75% of students scored >60% on MCQs post-intervention, surpassing typical Phase I benchmarks in isolated anatomy teaching (typically

50–60% in similar Indian cohorts). High Likert-scale agreement (89–95%) on motivation, integration, and critical thinking aligns with biomedical knowledge activation in reasoning, boosting retention (3). Faculty's unanimous endorsement (100%) further validates feasibility in resource-constrained settings like government medical colleges.

Qualitatively, themes of conceptual clarity and clinical relevance reflect schema theory: surgical contexts activated prior anatomical knowledge, forming interconnected mental models for better recall and application (5). For instance, linking breast anatomy to mastectomy procedures transformed abstract structures (e.g., Cooper's ligaments) into clinically actionable insights, reducing "siloed" learning pitfalls. The spread of Ca from one breast to another highlighted the significance of communication between the lymphatics of both sides of breast. Increased engagement and self-directed motivation echo reflective practice models (4, 6), where real-world hooks combat monotony in preclinical years—critical amid rising student burnout (7). These findings converge with global evidence: McBride & Drake (1) reported integration needs in anatomy, while dual-coding supports retention (2).

Mechanistically, vertical integration leverages dual-coding theory—combining verbal (anatomy lectures) and visual-spatial (surgical demos) inputs for deeper encoding (2). In CBME frameworks, this fosters competencies like "integrator" roles (NMC 2019 guidelines), preparing students for clerkships.

**Strengths:** Robust mixed-methods triangulation, pragmatic classroom intervention, faculty-student perspectives, and alignment with CBME.

**Limitations:** Single-center design limits generalisability; short-term outcomes omit longitudinal retention; self-reported biases possible despite REFLECT validation.

Overall, these results advocate scaling vertical integration in Indian MBBS curricula to bridge preclinical-clinical gaps.

## CONCLUSION

Vertical integration of anatomy with surgery significantly boosts conceptual clarity, clinical application, engagement, and critical thinking. It merits adoption as a core strategy in Competency-Based Medical Education (CBME).

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