Flipped Classroom Pedagogy and Cognitive Learning Outcomes in Undergraduate Business Education: A Quasi-Experimental Study Across Bloom's Taxonomy Levels in Jaipur

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ABSTRACT

The flipped classroom model, in which instructional content delivery is relocated to pre-class asynchronous formats freeing in-class time for active problem-solving, collaborative application, and higher-order cognitive activity, has attracted substantial interest as a curriculum innovation with potential to improve learning outcomes beyond the lower-order knowledge and comprehension levels characteristic of traditional lecture-centred pedagogy. This study employs a quasi-experimental pre-test/post-test design to compare learning outcome gains across three Bloom's taxonomy cognitive levels — lower-order (remember/understand), mid-order (apply/analyse), and higher-order (evaluate/create) — between 96 undergraduate Business Studies students assigned to a flipped classroom section and 90 students assigned to a matched traditional lecture section across two semesters at affiliated colleges in Jaipur. Both groups showed significant post-test gains at all three Bloom's levels, but the flipped classroom group demonstrated substantially larger gains at the mid-order and higher-order levels (difference-in-differences of +13.9 and +17.8 score points respectively), while gains at the lower-order level were comparable across groups (+3.4 points). Teacher workload, student readiness perceptions, and implementation fidelity were assessed as contextual moderators. These findings provide empirical support for the adoption of flipped classroom pedagogy as a curriculum innovation specifically targeting higher-order cognitive skill development in undergraduate business programmes.

KEYWORDS: *Flipped classroom, Active learning, Bloom's taxonomy, Learning outcomes, Curriculum innovation, Undergraduate business* *education, Quasi-experimental design, Higher-order thinking*

INTRODUCTION

Higher education pedagogy in India has historically been dominated by the traditional lecture model, in which faculty deliver instructional content to largely passive student audiences during class time, with application, practice, and assessment occurring primarily outside class through written assignments and examinations. While this model efficiently transmits factual and conceptual content to large student cohorts, it has been widely critiqued for its limited capacity to develop the higher-order cognitive competencies — critical analysis, synthesis, evaluation, and creative problem-solving — increasingly demanded by graduate employers and assessed by quality assurance frameworks such as the National Assessment and Accreditation Council's revised Binary Accreditation criteria, which give explicit weight to Programme Learning Outcomes and graduate attribute achievement (1). The disconnect between the predominantly lower-order cognitive engagement facilitated by lecture-based instruction and the higher-order outcome aspirations articulated in programme learning outcome frameworks has intensified interest among Indian higher education practitioners in active learning pedagogies that restructure the use of classroom contact time.

The flipped classroom model, first systematically articulated by Bergmann and Sams (2012) and subsequently extensively evaluated in international higher education research, inverts the conventional lecture-homework structure: lower-order instructional content is delivered asynchronously through pre-recorded video lectures, readings, or digital modules accessed by students before class, while in-class time is repurposed for higher-order activities including problem-solving, case discussion, peer teaching, and structured application exercises facilitated by the instructor (2). By concentrating lower-order content delivery outside the classroom, the flipped model theoretically creates space for substantially more in-class engagement with Bloom's higher cognitive taxonomy levels than the traditional lecture model permits, potentially generating larger learning outcome gains precisely at the higher-order levels where lecture-based instruction has been found most limited (3).

Despite growing international evidence on the flipped classroom's effectiveness, empirical studies situated specifically in the Indian undergraduate business education context — where class sizes, digital infrastructure conditions, student preparation norms, and curriculum structures differ materially from the North American and European contexts dominating the existing literature — remain limited. This study addresses that gap through a quasi-experimental comparison of learning outcome gains at three Bloom's taxonomy cognitive levels between flipped and traditional classroom sections in Jaipur, providing India-specific evidence on the cognitive-level specificity of the flipped-classroom learning advantage.

LITERATURE REVIEW

The empirical literature on flipped classroom effectiveness in higher education has grown substantially since 2012, with multiple meta-analyses now providing aggregated effect size estimates. Cheng, Ritzhaupt, and Antonenko (2019) conducted a meta-analysis of 55 experimental and quasi-experimental flipped classroom studies in higher education and found an overall positive effect on academic performance ($d = 0.42$), with notably larger effects in studies measuring higher-order cognitive outcomes relative to those measuring overall factual recall or test scores without cognitive-level disaggregation (4). O'Flaherty and Phillips (2015) reviewed forty published flipped classroom studies and found that the model's benefits were most consistently documented for critical thinking and clinical reasoning outcomes, rather than factual knowledge acquisition where traditional instruction showed comparable results (5).

Bloom's Taxonomy as a Learning Outcome Framework

Bloom's revised taxonomy of educational objectives provides a hierarchically ordered framework of cognitive skill levels widely used in curriculum design, learning outcome specification, and assessment alignment across higher education quality assurance frameworks:

- Lower-order cognitive skills (remember and understand): the ability to recall, recognise, define, and explain concepts and information — skills well served by traditional lecture delivery and assessed by conventional knowledge-recall examinations.
- Mid-order cognitive skills (apply and analyse): the ability to use acquired knowledge to solve problems, interpret situations, and break complex phenomena into component parts — skills requiring active engagement beyond passive reception of information.
- Higher-order cognitive skills (evaluate and create): the ability to judge the quality and validity of arguments, synthesise information from multiple sources, and generate novel solutions or products — the skills most explicitly targeted by outcome-based education

- frameworks and most valued by graduate employers.

Anderson and Krathwohl (2001) revised Bloom's original taxonomy to emphasise the progressive and qualitatively distinct nature of these cognitive levels, arguing that curricular and pedagogical designs should explicitly scaffold progression from lower- to higher-order skill development rather than treating all learning objectives as equivalent in cognitive demand (6). The flipped classroom model maps directly onto this hierarchical framework: pre-class content delivery addresses lower-order skills, freeing in-class time for mid- and higher-order cognitive engagement — an alignment that provides the theoretical basis for expecting that any flipped-classroom learning advantage will be concentrated at the mid- and higher-order Bloom's levels rather than distributed uniformly (3, 4).

RESEARCH GAP

Existing flipped classroom research has predominantly reported aggregate assessment score improvements without systematically disaggregating gains by Bloom's cognitive level, making it difficult to confirm the theoretically predicted pattern of differential benefit at higher-order levels. Indian undergraduate business education contexts are particularly underrepresented in the published empirical literature, with most available studies situated in STEM disciplines, health professions education, or Western educational settings with markedly different student preparation norms and digital resource environments. This study directly addresses both gaps through a Bloom's-level-disaggregated quasi-experimental design within an Indian undergraduate business programme context.

OBJECTIVES

- To compare pre-test to post-test assessment score gains at three Bloom's taxonomy cognitive levels between flipped classroom and traditional lecture sections.
- To test whether any flipped-classroom learning advantage is concentrated at mid-order and higher-order cognitive levels rather than uniformly distributed.
- To assess teacher workload and student preparation readiness as implementation moderators of flipped classroom effectiveness.
- To derive curriculum design implications for undergraduate business programmes in the Indian higher education context.

METHODOLOGY

Participants and Design

A quasi-experimental pre-test/post-test non-equivalent groups design was implemented across two affiliated undergraduate business colleges in Jaipur over two consecutive semesters. One section of a core second-year Business Strategy course at each college was assigned to the flipped classroom condition (combined n = 96 students) and a matched section taught by a different instructor at the same college was assigned to the traditional lecture condition (combined n = 90 students). Assignment to condition was based on timetable allocation rather than random assignment; pre-test score equivalence was verified to confirm the absence of significant baseline differences between groups. All students followed the same prescribed syllabus, course learning outcomes, and summative assessment rubric.

Flipped Classroom Implementation

The flipped classroom intervention comprised: (i) pre-recorded video lectures of 12–18 minutes per topic uploaded weekly to a shared course portal, supplemented by structured reading guides; (ii) short pre-class comprehension quizzes (5 items, lower-order Bloom's level) to verify preparation completion; and (iii) restructured in-class sessions of 90 minutes focused on case discussion, structured problem-solving in groups of four, peer-to-peer teaching of selected sub-topics, and instructor-facilitated critical evaluation exercises targeting mid- and higher-order Bloom's skills. Traditional lecture sections followed the same syllabus through 75-minute faculty-led lectures with Q&A and standard tutorial sessions (7).

Assessment Instrument and Analysis

A common pre-test and post-test instrument was administered to both groups at the start and end of each semester. The instrument comprised 60 items mapped explicitly to three Bloom's cognitive tiers: 20 items at the lower-order level (recall and comprehension of key concepts), 20 items at the mid-order level (application and analysis scenarios requiring use of course concepts in novel business situations), and 20 items at the higher-order level (evaluation and synthesis tasks requiring students to critique strategies and propose justified alternatives). All items were reviewed by two subject experts for Bloom's level alignment prior to administration. Difference-in-differences estimates were calculated for each cognitive tier, comparing pre-to-post score gains between the two groups (4, 6).

Table 1: Sample Characteristics and Pre-Test Score Equivalence

Characteristic	Flipped (n = 96)	Traditional (n = 90)	p-value (balance)
Mean age (years)	19.8	20.1	0.412
Female (%)	54.2	51.1	0.664
Pre-test: Lower-order (out of 20)	9.64	9.56	0.782
Pre-test: Mid-order (out of 20)	8.32	8.42	0.814
Pre-test: Higher-order (out of 20)	6.96	7.04	0.866
Pre-test: Total score (out of 60)	24.92	25.02	0.894

RESULTS AND FINDINGS

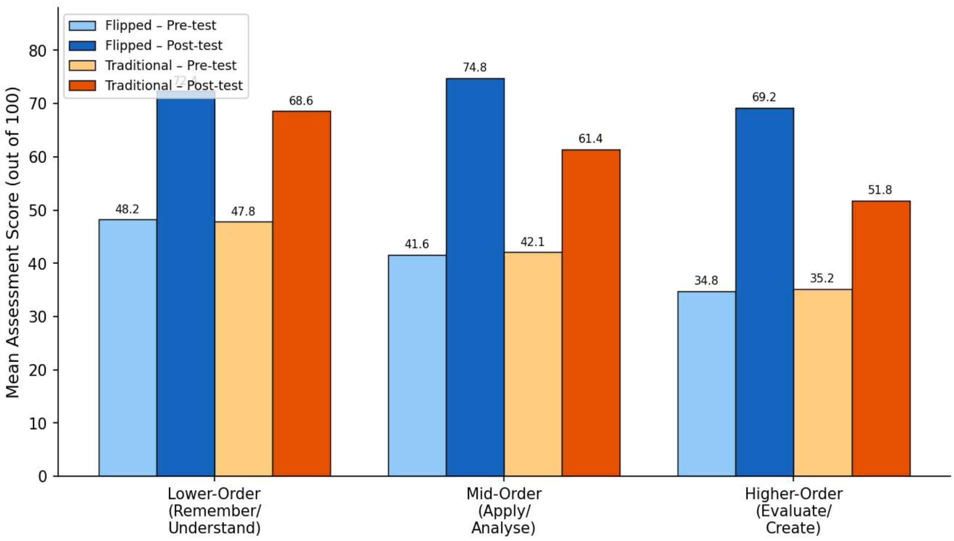

Figure 1. Pre-test and post-test assessment scores by Bloom's taxonomy level for flipped classroom and traditional pedagogy groups (n = 186)

Figure 1 presents pre-test and post-test mean scores at each Bloom's taxonomy level for both groups. Both groups showed significant post-test gains at all three levels, confirming that learning occurred under both pedagogical conditions. However, the magnitude of gains differed substantially between groups in a pattern consistent with the theoretical prediction of differential flipped-classroom advantage at higher cognitive levels.

At the lower-order (remember/understand) level both groups showed comparable gains: the flipped group improved from 48.2 to 72.4 points (+24.2) while the traditional group improved from 47.8 to 68.6 (+20.8). The difference-in-differences estimate of +3.4 points was statistically significant ($p = 0.038$) but small in absolute magnitude, indicating that both pedagogies are broadly effective at developing foundational knowledge and comprehension. At the mid-order (apply/analyse) level the flipped group showed a substantially larger gain (+33.2 points, from 41.6 to 74.8) compared with the traditional group (+19.3 points, from 42.1 to 61.4), a difference-in-differences of +13.9 points ($p < 0.001$). The largest differential was at the higher-order (evaluate/create) level: the flipped group gained +34.4 points (from 34.8 to 69.2) against the traditional group's +16.6 points (from 35.2 to 51.8), a difference-in-differences of +17.8 points ($p < 0.001$).

Table 2: Pre-test to Post-test Score Gains and Difference-in-Differences by Bloom's Level

Bloom's Level	Flipped Gain	Traditional Gain	DiD Estimate	p-value
Lower-order (Remember / Understand)	+24.2 pts	+20.8 pts	+3.4 pts	0.038
Mid-order (Apply / Analyse)	+33.2 pts	+19.3 pts	+13.9 pts	< 0.001
Higher-order (Evaluate / Create)	+34.4 pts	+16.6 pts	+17.8 pts	< 0.001
Total (out of 100)	+30.5 pts	+19.2 pts	+11.3 pts	< 0.001

The pattern is strikingly consistent with theoretical prediction: the flipped classroom's differential benefit increases monotonically across the Bloom's hierarchy, from a modest +3.4 points at the lower-order level to +17.8 points at the higher-order level — a five-fold difference in the magnitude of advantage across the cognitive spectrum. This confirms that the model's reallocation of in-class time toward application and synthesis activity generates its primary learning benefit precisely at the cognitive levels that reallocation most directly targets (3, 4).

Table 3: Implementation Fidelity, Teacher Workload, and Student Readiness Measures

Measure	Flipped Group	Traditional Group
Pre-class video completion rate (mean)	76.4%	N/A
Pre-class quiz mean score (out of 5)	3.62	N/A
Faculty weekly preparation time (hours)	6.8	3.4
Students reporting adequate pre-class prep (%)	68.8%	N/A
Student satisfaction (1–5 scale)	4.12	3.68

DISCUSSION

The consistent and substantial differential gains at mid-order and higher-order Bloom's levels in the flipped classroom group provide strong empirical support for adopting this model as a curriculum innovation specifically when the priority objective is developing higher-order cognitive competencies beyond the foundational knowledge and comprehension that traditional lecture instruction develops comparably efficiently (3, 5). The cognitive-level specificity of the finding is itself an important contribution to the flipped classroom literature, where aggregate outcome comparisons without Bloom's level disaggregation have sometimes yielded mixed results — variation that may in part reflect differences in the cognitive-level composition of outcome measures across studies (4).

Several implementation considerations warrant attention from practitioners contemplating adoption. The nearly doubled faculty preparation time reported by flipped classroom instructors (6.8 versus 3.4 hours per week) reflects the substantial upfront investment in content production and in-class activity design that the model requires — a barrier to initial adoption that diminishes as video content is reused but remains significant without institutional digital production support (7, 8). The pre-class completion rate of 76.4%, while indicating reasonable student engagement, implies that approximately one quarter of students arrived at in-class sessions without completing preparatory content — a readiness gap requiring active instructor management to avoid disadvantaging under-prepared students during in-class higher-order tasks (2, 9).

CONCLUSION

This quasi-experimental study provides evidence that the flipped classroom model generates substantially larger learning outcome gains at mid-order and higher-order Bloom's taxonomy cognitive levels compared with traditional lecture instruction in an undergraduate business education setting in Jaipur. The differential benefit is concentrated precisely at the cognitive levels — application, analysis, evaluation, and synthesis — most explicitly targeted by outcome-based education frameworks and most valued by graduate employers, while both pedagogies develop lower-order knowledge and comprehension comparably. These findings support the adoption of flipped classroom pedagogy as a curriculum innovation for undergraduate business programmes where higher-order skill development is a primary learning outcome priority, subject to institutional investment in faculty preparation time and digital content infrastructure.

LIMITATIONS

- Quasi-experimental design with timetable-based rather than random group assignment limits causal inference despite verified pre-test equivalence.
- The study was conducted within a single course (Business Strategy); generalisability to other subject areas with different content structures requires further research.
- Pre-class video completion was cross-checked against portal access logs, which may not fully capture quality of engagement with preparatory materials.
- Longer-term retention of higher-order skill gains was not assessed; a delayed post-test would provide evidence on the durability of flipped-classroom gains beyond the immediate post-semester assessment.

FUTURE SCOPE

- Randomised controlled trial design in future cohorts to strengthen causal identification beyond the current quasi-experimental approach.
- Delayed post-test at three and six months post-completion to assess long-term retention of higher-order cognitive gains.

- Extension of the Bloom's-level-disaggregated design to STEM, Social Science, and Humanities programmes to assess generalisability across disciplines.
- Moderator analysis examining whether student digital literacy, self-directed learning disposition, and class size interact with flipped classroom effectiveness.
- Instructional design study optimising pre-class content formats and in-class activity structures to further maximise higher-order outcome gains and reduce faculty preparation burden.

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