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A Comparative Study of Generative AI-Assisted and Conventional Learning in a Degree College in Mumbai

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Abstract

The increasing use of generative artificial intelligence (AI) tools, such as ChatGPT, has transformed the ways undergraduate students search for information, prepare assignments, develop presentations, and study academic content. Although AI-assisted tools can improve the speed, organisation, and apparent quality of academic work, it remains important to establish whether these improvements correspond to genuine conceptual understanding, independent learning, and long-term knowledge retention.

The present study proposes to examine the relationship between AI-assisted assignment performance and independently demonstrated learning among undergraduate students in a selected degree college in Mumbai, Maharashtra. The study will employ a mixed-methods, quasi-experimental research design involving approximately 120 undergraduate students. Participants will be assigned, where feasible, to three instructional conditions: conventional learning without generative AI, AI-assisted learning without structured pedagogical guidance, and teacher-guided AI-assisted learning. The intervention will focus on a defined curriculum unit over six to eight weeks.

Data will be collected through a student questionnaire, curriculum-based pre-test and post-test, assignment assessment rubric, delayed retention test, and semi-structured interviews. Quantitative data will be analysed using descriptive statistics, analysis of covariance, appropriate group comparisons, correlation, and effect-size estimates. Qualitative responses will be analysed thematically.

The study seeks to determine whether higher assignment scores are associated with improved independent academic performance and knowledge retention, and whether teacher-guided AI use supports learning more effectively than unguided AI use. The findings may contribute to evidence-informed teaching practices, responsible AI integration, and assessment design in undergraduate education.

Keywords: Generative artificial intelligence, ChatGPT, undergraduate education, independent learning, knowledge retention, assignment performance, higher education, AI-assisted learning.

1. Introduction

Generative AI has become an increasingly accessible resource for undergraduate students. AI chatbots can explain difficult concepts, summarise readings, generate examples, assist with calculations, suggest essay structures, and provide feedback on written work. These capabilities offer opportunities to support personalised learning and academic engagement.

However, producing a high-quality assignment with AI assistance is not necessarily equivalent to mastering the subject matter. A student may submit a well-organised report generated with AI but struggle to explain the concepts, answer unfamiliar questions, or recall the information after several weeks.

This distinction is particularly important in degree colleges, where students are expected to develop independent thinking, analytical ability, problem-solving skills, subject knowledge, and academic integrity.

Research on generative AI in education has begun to examine the difference between immediate task performance and durable learning. For example, a randomised experiment involving secondary-school students found that combining note-taking with large language model use could support reading comprehension and retention more effectively than relying on the language model alone. Although the population differs from undergraduate students, this finding provides a useful rationale for examining how AI is integrated into learning activities.

The present study will investigate whether AI-assisted assignments are accompanied by improved independent performance and retained knowledge, and whether structured teacher guidance can help students use AI as a learning resource rather than merely as a tool for completing tasks.

2. Statement of the Problem

Undergraduate students increasingly use generative AI when preparing assignments and studying academic material. However, the quality of work submitted with AI assistance may not accurately reflect the student's own understanding.

The central problem is the lack of sufficient local evidence, in the selected degree-college setting, about the relationship between AI-assisted assignment performance, independent learning, and knowledge retention.

The study will therefore investigate whether AI-assisted learning produces measurable gains in students' independent academic performance and retained knowledge, compared with conventional instruction, and whether teacher-guided AI use is associated with better outcomes than unguided AI use.

3. Research Gap

The proposed research will examine four areas that require further investigation in the selected college context:

1. Assignment–learning discrepancy: Whether high-quality AI-assisted assignments correspond to higher scores on assessments completed independently.
2. Knowledge retention: Whether students retain information after a delay when AI tools are unavailable.
3. Role of teacher guidance: Whether structured AI use involving questioning, explanation, verification, and independent practice produces better outcomes than unguided AI use.
4. Local higher-education evidence: How these patterns appear among undergraduate students in the participating Mumbai college and the selected academic subject.

These constitute proposed research gaps, not established claims that the issues have never been studied. A systematic literature review should be conducted before finalising the research instruments and manuscript.

4. Objectives of the Study

1. To examine the relationship between AI-assisted assignment performance and independent learning among undergraduate students.
2. To compare the assignment scores of students using generative AI with those receiving conventional instruction.
3. To compare independent academic performance across conventional, unguided AI-assisted, and teacher-guided AI-assisted learning groups.
4. To assess differences in knowledge retention after a specified delay.
5. To investigate whether teacher-guided AI use supports better independent learning and retention than unguided AI use.
6. To examine the relationship between assignment scores, immediate post-test scores, and delayed retention scores.
7. To study students' perceptions of AI usefulness, independent learning, cognitive effort, and dependence on AI.
8. To recommend evidence-based strategies for responsible AI integration in undergraduate education.

5. Research Questions

- Do AI-assisted assignments receive higher scores than assignments prepared through conventional learning?

- Do higher assignment scores correspond to better independent performance in assessments completed without AI?
- Is there a significant difference in knowledge retention among the three instructional groups?
- Does teacher-guided AI use lead to better learning outcomes than unguided AI use?
- What relationship exists between assignment performance and delayed retention?
- How do undergraduate students perceive the role of AI in their learning process?

6. Hypotheses of the Study

The following null hypotheses will be tested at the 5% significance level.

Code	Null hypothesis
H_{01}	There is no significant difference in assignment scores among the three instructional groups.
H_{02}	There is no significant difference in independent post-test scores among the three groups after controlling for pre-test performance.
H_{03}	There is no significant difference in delayed knowledge-retention scores among the three groups after controlling for baseline performance.
H_{04}	There is no significant difference in independent learning outcomes between students receiving teacher-guided AI assistance and those receiving unguided AI assistance.
H_{05}	There is no significant association between assignment scores and delayed retention scores.

These hypotheses are testable using the proposed data. Statistical significance, effect sizes, and confidence intervals will be considered when interpreting results.

7. Variables of the Study

Type	Variables
Independent variable	Instructional condition: conventional, unguided AI-assisted, or teacher-guided AI-assisted learning
Primary dependent variables	Assignment quality, independent post-test score, delayed retention score
Secondary dependent variables	Conceptual understanding, perceived cognitive effort, self-reported AI dependence
Covariates	Pre-test score and previous academic performance, where available
Contextual variables	Degree programme, year of study, prior AI experience, and digital access

Operational definition: Independent learning will be measured by performance on a curriculum-based assessment completed without AI assistance. Knowledge retention will be measured through a delayed assessment administered approximately three weeks after the immediate post-test.

8. Research Methodology

8.1 Research design

The study will use a mixed-methods, three-group quasi-experimental design. Quantitative data will measure assignment performance and learning outcomes, while qualitative interviews will help explain students' learning experiences.

Research design at a glance

Baseline assessment

Pre-test, previous achievement, and AI-use experience

Group A

Conventional learning

No generative AI

Group B

Unguided AI-assisted learning

AI use within study rules

Group C

Teacher-guided AI learning

Questioning, verification, practice

Outcome assessment

Assignment evaluation → supervised post-test without AI → delayed retention test without AI

Where practical, eligible students will be randomly allocated to groups. If intact classes are used, the design will be treated as quasi-experimental, and the analysis will account for baseline differences and classroom clustering.

8.2 Population

The target population will be undergraduate students enrolled in a selected degree college in Mumbai, Maharashtra.

The study may include students from B.Com., B.A., B.Sc., BMS, or another undergraduate programme. However, the primary learning intervention should focus on one defined subject or curriculum unit so that the groups can be assessed fairly.

8.3 Sample size and sampling technique

The proposed sample is 120 undergraduate students.

Group	Instructional condition	Proposed sample
A	Conventional learning	40
B	Unguided AI-assisted learning	40
C	Teacher-guided AI-assisted learning	40
Total		120

A feasible approach is to select the participating college purposively and recruit eligible students through a transparent process. Random allocation should be used where feasible.

The final sample size should be confirmed through an a priori power analysis using the primary outcome, expected effect size, statistical power, significance level, and anticipated attrition. If the project is limited to one small class, a smaller exploratory study may be appropriate, but its limitations must be acknowledged.

8.4 Inclusion criteria

Participants should:

- Be enrolled in the selected undergraduate programme.
- Study the chosen curriculum unit during the research period.
- Provide informed consent.
- Agree to complete the baseline, post-test, and delayed assessment.

Participation should not depend on prior experience with AI. That experience should instead be recorded as a contextual variable.

8.5 Subject selection

The selected subject should be based on the researcher's teaching access and the availability of measurable learning outcomes.

Suitable possibilities include:

- Commerce: Accounting concepts, business law, or management principles.
- Science: A defined unit in Physics, Mathematics, or another science subject.
- Arts: A selected unit involving conceptual understanding, reading, or analytical writing.
- Education: Learning theories, educational psychology, or teaching-learning strategies.

Students across different programmes should not be compared using an identical subject test unless the test is genuinely appropriate to all participants. For a stronger study, select one programme or use equivalent subject-specific assessments and analyse the groups separately.

8.6 Intervention duration

The intervention will run for six to eight weeks. All groups should study the same learning objectives for approximately equal amounts of time.

- Group A: Receives conventional teaching, prescribed readings, class activities, and independent practice without generative AI.
- Group B: Uses an approved generative AI tool to support learning and assignment preparation, without a prescribed prompting or reflection framework.
- Group C: Uses the same or an equivalent AI tool with structured teacher guidance, including asking for explanations, checking claims against course materials, attempting answers independently, and reflecting on mistakes.

The research should document the tool used, access conditions, teacher involvement, and amount of AI use. This helps distinguish the effect of the instructional approach from differences in access or implementation.

9. Research Tools

The following five tools are proposed. They should be reviewed by subject experts and piloted before the main study.

Tool 1: Student Background and AI-Use Questionnaire

This questionnaire will record programme and year of study, previous AI experience, frequency of use, purposes of use, access to devices, and usual study practices.

Tool 2: Curriculum-Based Achievement Test

A subject-specific test will be administered at three points:

- Pre-test: Before the intervention, to establish baseline knowledge.
- Immediate post-test: After the intervention, to measure learning demonstrated without AI.
- Delayed retention test: Approximately three weeks after the post-test, to assess retained knowledge.

Each test may be scored out of 30 or 40 marks and should include recall, conceptual understanding, application, and problem-solving questions. Equivalent test forms should be prepared and reviewed by subject experts.

Tool 3: Assignment Assessment Rubric

Assignments will be evaluated using the same criteria for all three groups.

Criterion	Marks
Accuracy of subject knowledge	25
Conceptual understanding	25
Application and problem-solving	20
Reasoning and evidence	20
Organisation and clarity	10
Total	100

Two independent evaluators should assess at least a subset of assignments, preferably without knowing the students' instructional group. Inter-rater agreement should be checked.

Tool 4: Student Learning Experience Questionnaire

This questionnaire will examine perceived learning, independent study, cognitive effort, and AI dependence. A five-point Likert scale will be used:

1 — Strongly disagree 2 — Disagree 3 — Neither agree nor disagree 4 — Agree 5 — Strongly agree

The following draft questionnaire can be adapted for the study.

Tool 5: Semi-Structured Interview Schedule

Interviews will be conducted with approximately 10–15 students and 3–5 teachers, subject to access and data sufficiency.

Suggested questions include:

1. How do you normally use AI when preparing assignments?
2. Does AI help you understand concepts, or mainly help your complete tasks faster?

3. Can you describe a time when you struggled to answer a question without AI?
4. What strategies do you use to check whether AI-generated information is correct?
5. Does teacher guidance change how you use AI?
6. What teaching or assessment practices would help students learn more independently?

Interviews will be recorded only with consent and analysed thematically.

10. Data Collection Procedure

The research will follow these stages:

1. Obtain college permission and any required research-ethics approval.
2. Conduct the literature review and prepare the assessment tools.
3. Obtain expert feedback and pilot-test the instruments.
4. Recruit eligible students and collect baseline information and pre-test scores.
5. Implement the instructional intervention over six to eight weeks.
6. Collect and evaluate assignments using the common rubric.
7. Conduct the immediate supervised post-test without AI.
8. Administer the delayed retention test approximately three weeks later.
9. Conduct student and teacher interviews.
10. Analyse the data, interpret the findings, and prepare the final report.

The assessment conditions, time limits, subject content, and access to study materials should be kept as comparable as possible across the groups.

11. Statistical Analysis

Quantitative analysis may be conducted using SPSS, R, or Jamovi.

Research objective	**Statistical technique**
Describe student background and AI-use patterns	Frequencies, percentages, means, and standard deviations
Compare assignment scores	ANOVA or an appropriate regression model
Compare post-test scores	ANCOVA controlling for pre-test scores
Compare delayed retention	ANCOVA or a mixed-effects model, depending on the design
Examine assignment and retention relationships	Pearson or Spearman correlation
Examine change over time	Repeated-measures or mixed-effects analysis
Evaluate questionnaire consistency	Cronbach's alpha or omega, where appropriate
Analyse interview responses	Thematic analysis

Before using parametric tests, the researcher should examine relevant assumptions, including residual distribution, homogeneity of variance, and the appropriateness of the model. If students are clustered within intact classes, standard errors and analysis should account for that clustering where possible.

Report effect sizes and 95% confidence intervals alongside p-values. Adjust for multiple comparisons when necessary.

Interpretation of possible outcomes

- Higher assignment scores and higher independent test scores: The findings would be consistent with improvements in both assignment performance and independently demonstrated learning.
- Higher assignment scores without higher independent test scores: This would suggest a gap between the quality of submitted work and demonstrated learning.
- Higher immediate scores without sustained retention: This would suggest short-term gains that do not persist over the measured delay.
- Better outcomes in the teacher-guided AI group: This would support the value of structured pedagogical guidance in the studied setting, subject to the design's limitations.

These are possible interpretations, not findings. The conclusions must be based on the data actually collected.

12. Ethical Considerations

The study will follow appropriate institutional research-ethics requirements and the participating college's policies.

1. Obtain written permission from the college and relevant department.
2. Explain the research purpose, procedures, and potential risks before recruiting participants.
3. Obtain informed consent from all participants. Participation must be voluntary.
4. Ensure that participation or withdrawal does not affect students' internal assessment, attendance, grades, or relationship with teachers.
5. Do not enter students' names, roll numbers, contact details, or identifiable academic records into public AI platforms.
6. Store questionnaire responses, test scores, and interview data securely using participant codes.
7. Establish clear rules for permitted AI use and academic integrity.
8. Provide equivalent learning opportunities to all groups and consider offering the conventional group access to the learning strategies shown to be useful after the study.
9. Report results honestly, including non-significant findings and limitations.
10. Follow the institution's requirements for data retention, confidentiality, and publication.

13. Expected Outcomes and Educational Significance

The study is expected to provide evidence about the relationship between AI-assisted assignment preparation and students' independently demonstrated learning.

The findings may help establish:

- Whether assignment-quality improvements correspond to improvements in independent academic performance.
- Whether students retain knowledge after a delay.
- Whether teacher-guided AI use is associated with better learning outcomes than unguided use.
- Which study practices students report using to verify AI-generated information and understand concepts.
- How undergraduate assignments and examinations can better assess individual understanding and reasoning.

The study may contribute to teaching practices, assessment design, digital literacy, and responsible AI integration in higher education. The findings could be relevant to degree colleges in Mumbai and similar educational settings, although generalisation beyond the participating institution will require caution.

14. Scope and Delimitations

The study will be limited to approximately 120 undergraduate students from a selected degree college in Mumbai, one principal subject or curriculum unit, and a six-to-eight-week instructional intervention followed by delayed assessment.

The study will not establish the long-term effects of AI use across all subjects, degree programmes, or institutions. Its findings may also be influenced by students' prior academic performance, AI familiarity, access to technology, teacher implementation, and differences in learning habits.

15. Selected References

These references provide a starting point for the literature review and support the study's rationale. The literature review should also include additional peer-reviewed studies on cognitive offloading, retrieval practice, self-regulated learning, and assessment in higher education.

1. Barcaui, A. (2025). ChatGPT as a cognitive crutch: Evidence from a randomized controlled trial on knowledge retention. Social Sciences & Humanities Open, 12, Article 102287. https://doi.org/10.1016/j.ssaho.2025.102287

2. Miao, F., & Holmes, W. (2023). Guidance for generative AI in education and research.

3. OECD. (2026). OECD Digital Education Outlook 2026: Exploring Effective Uses of Generative AI in Education. OECD Publishing. https://doi.org/10.1787/062a7394-en

4. Roediger, H. L., III, & Karpicke, J. D. (2006). Test-enhanced learning: Taking memory tests improves long-term retention. Psychological Science, 17(3), 249–255. https://doi.org/10.1111/j.1467-9280.2006.01693.x
5. Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. Cognitive Science, 12(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4
6. UNESCO. (2023). Guidance for generative AI in education and research. UNESCO. https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research

16. Conclusion

The proposed research investigates whether the use of generative AI in undergraduate education supports genuine learning or mainly improves the quality of submitted assignments.

By comparing conventional instruction, unguided AI-assisted learning, and teacher-guided AI-assisted learning, the study will distinguish assignment performance from independent academic performance and delayed knowledge retention.

The findings may help educators develop AI-supported learning practices that preserve students' independent thinking, conceptual understanding, and ability to apply knowledge without technological assistance.

The final research report must present the actual data, statistical findings, limitations, and evidence-based conclusions. No results should be fabricated or assumed in advance.

17. Recommended next step before publication

I recommend three final refinements before beginning the project:

- Choose one degree programme and subject, such as B.Com. Accounting, B.Sc. Physics, or B.Ed. Educational Psychology, so the achievement tests measure comparable learning.
- Complete a literature review and power analysis to establish the research gap and a defensible sample size.
- Pilot the questionnaire and achievement tests before using them with the main sample.

With these refinements, the proposal can serve as a strong starting document for a degree-college research project and subsequent development into a research paper for journal submission.

1. I use generative AI tools such as ChatGPT to understand difficult academic concepts.
2. I use AI tools to prepare assignments, reports, or presentations.
3. I verify AI-generated information using textbooks, lecture notes, or reliable sources.
4. I can explain the concepts in my assignment without referring to AI-generated answers.
5. I attempt academic problems independently before asking AI for help.
6. I can solve a new problem using concepts that I previously studied with AI assistance.
7. I can recall key concepts several days after studying them.
8 I can apply previously learned concepts to unfamiliar questions without AI assistance.
9. I actively think through a problem rather than copying an AI-generated answer.
10. I compare AI explanations with my own understanding before accepting them.
11. [AI dependence] I find it difficult to complete some academic tasks without AI assistance.
12. [AI dependence] I sometimes accept AI-generated answers without fully understanding them.
13. AI helps me understand difficult topics when I use it appropriately.
14. Teacher guidance helps me use AI more effectively for learning.
15. I believe AI-assisted learning can improve my academic performance.