

## Review report

**Final title:** Effectiveness of the flipped classroom versus the traditional teaching method in enhancing learning among

**Title at submission:** Enhancing learning for first-phase MBBS students: Flipped classroom versus traditional methods of teaching

### Round 1



**Reviewer:** Najnin Akhter, ORCID: 0000-0002-5560-849X

We are grateful to the Editor for their supportive and insightful remarks on our article. We believe that these suggestions are extremely detailed and beneficial in improving the content, as well as in increasing the scientific merit of our revised article. We have taken all the comments, suggestions, and addressed all the comments, with appropriate revisions in this amended part of the revised manuscript, which are outlined in our response below.

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#### Trail registration number

Not obtained

#### Declaration

This article encompasses PhD  
thesis of Dr. Dipti Mohapatra.

- 1. Comment** Overall research is not reflected in the title, it could be better if it includes Subject name rather than phase. My recommendation is to modify title.

**Response** The title has been changed and renamed as “Assessing the effectiveness of the flipped classroom versus the traditional teaching method in enhancing learning among undergraduate medical students” bearing line numbers 2-3. Hopefully, the above clarifications adequately address the concerns.
- 2. Comment** In the Abstract, Methods better to contain place, duration of the research. Otherwise, okay.

**Response** We have included the sentence i.e. “The crossover study was conducted in the Department of Physiology between January to June 2024” in abstract of our revised manuscript bearing line number 39-40.
- 3. Comment** The Objective(s) are inadequately written, do not reflect the research, either modify or rewrite. According to my recommendation objective is – to determine the effectiveness of the flipped classroom compared to ...

**Response** We have included the sentence i.e. “To assess the impact of flipped classroom teaching on the academic performance of first-year MBBS students using pre- and post-test scores, and to analyse their perceptions through a structured feedback questionnaire” in abstract section bearing line number 37-39.
- 4. Comment** The Methods are described in sufficient details so that the study can be reproduced. Whether ethical concerns have been well described. Place, duration must be mentioned. Details of questionnaire-based survey which was addressed by the authors to get feedback of flipped classroom.

**Response** We revised as the study was conducted in the Department of Physiology between January to June 2024. A total of 100 first year MBBS students gave informed consent and were present during the study period. The Feedback from students on the FCR teaching method was also obtained through a pre-validated questionnaire containing information about different aspects of flipped class and students’ preference for T-L method formulated on the basis of literature review and circulated to the students by Google Forms. in methods bearing line numbers 108-113 and 139-142.
- 5. Comment** All tables must contain footnote.

**Response** We have included table foot note for each table.
- 6. Comment** In discussion, better to provide a comparison between your results and other's findings rather than just stating the them.

**Response** We have discussed our finding in comparison of other studies. The following comparison studies are highlighted bearing line numbers 190-198, 214-229 and 232-238.

**Reviewer:** Md Rasel Ahmad, ORCID: 0009-0009-2936-0169

- 7. Comment** Suggested title could be “Effectiveness of the Flipped Classroom Compared to Traditional Teaching Methods in First-Year MBBS Education”.

**Response** The title has been changed as “Assessing the effectiveness of the flipped classroom versus the traditional teaching method in enhancing learning among undergraduate medical students” bearing line numbers 2-3

- 8. Comment** In the Abstract, (Lines 32–36) It repeats the general idea of "homework into the classroom" but does not elaborate on why this method is worth evaluating. Fails to justify why the flipped classroom was chosen for MBBS students or what learning challenges it aims to address. Methods section (Lines 37–44): How were students assigned to groups? Were all 150 students included (only 100 students mentioned by group breakdown)? No details on test format (MCQs? duration?), number of questions, scoring criteria, or validity/reliability of tests. Results Section (Lines 44–46): No descriptive statistics: No mean, standard deviation, or sample sizes for post-test scores. Concluding that flipped classrooms create "self-directed and lifelong learners" is not justified by the short-term test scores and survey results. The conclusion does not offer guidance on how or when to implement flipped classrooms in MBBS curriculum.
- Response** The proper justification for choosing flipped classroom as follows: The flipped classroom is reverses traditional learning: students study core content at home (e.g., pre-recorded lectures) and use class time for interactive, application-based activities. For MBBS students, this promotes active learning, deeper comprehension, and long-term retention by applying theory to clinical scenarios. It fosters critical thinking, problem-solving, and clinical reasoning essential skills for future doctors. Personalized learning allows students to review material at their own pace, while instructors clarify doubts in class. This approach aligns with competency-based medical education, preparing students for lifelong learning in a dynamic field. The following above clarification also mentioned in abstract in short sentences with yellow highlighted bearing line number 35-38.
- Regarding methods section how students were assigned to groups. Were all 150 students included (only 100 students are group by breakdown) and rest of students are absent during the studied period. During the study assessment the pre-reading material was provided to flipped class students one week prior, facilitating in-class interactive discussions. Pre-tests and post-tests were administered before and after both teaching methods. Students were categories by pretest marks, the < 50% and the 50% category and the significance between the two categories was found out using the Wilcoxon test. Student perceptions were gathered via a Google questionnaire. The following above clarification also mentioned in abstract in short sentences with yellow highlighted bearing line number 39-48.
- For result section the descriptive statistics was done by Wilcoxon test with P value <0.05 among 100 students. The post-test marks of the flipped class were significantly higher than the post-test marks of the didactic lecture class from 100 students. The student's perception was also in favour of the flipped class. The following above clarification also mentioned in result section of abstract part in short sentences with yellow highlighted bearing line number 49-51.
- Regarding conclusion section we have changed the sentences as "The flipped class involves the active participation of students and encourages higher-order thinking. The future research scope was there, which may implement to integrate flipped learning modules within the extensive MBBS curriculum to maximize benefits". The following above clarification also mentioned in conclusion section of abstract part in short sentences with yellow highlighted bearing line number 52-54.
- 9. Comment** Clarity and appropriateness of the Objective(s).
- Improvement should be: To assess the impact of flipped classroom teaching on the academic performance of first-year MBBS students using pre- and post-test scores, and to analyse their perceptions through a structured feedback questionnaire
- Response** We have included the sentence i.e. "To assess the impact of flipped classroom teaching on the academic performance of first-year MBBS students using pre- and post-test scores, and to analyse their perceptions through a structured feedback questionnaire" in abstract section of our revised manuscript with yellow colour highlight bearing line number 37-39.
- 10. Comment** Clarity of the rationale for conducting the study is given in the Introduction section.
- Lines 59–61: Redundant and grammatically incorrect — "shifted the paradigm shift" is awkward.
- Lines 62–63: Acceptable but vague. It doesn't explain how interaction fosters higher-order thinking.
- Lines 63–66: Wordy and repetitive. "Make them become" is awkward.
- Lines 67–69: Subject-verb agreement error — "FCR potentially support" should be "supports".
- Lines 70–72: Repetitive with previous sentence; also "significantly adopted" is vague.
- Lines 90–92: Redundant phrasing again — "FCR method compared to the traditional classroom method" could be tighter.
- Response** We have corrected the grammatical error of the sentence i.e. "The introduction of the competency-based medical education (CBME) curriculum by the National Medical Council of India (NMC) has marked a paradigm shift to more interactive classes from the traditional didactic lecture classes". The following line no was shifted due to revision amendment in our manuscript with reflected line no. 68-70 with yellow highlights.
- In Lines 62-63: We have changed the word "higher-order thinking" to "critical analysis and problem-solving". The following line no was shifted due to revision amendment in our manuscript with reflected line no. 71 with yellow highlights.
- In Lines 63–66: We have changed the word "to evolve into" instead of "Make them become". The following line no was shifted due to revision amendment in our manuscript with reflected line no. 74 with yellow highlights.
- In Lines 67–69: We have replaced the subject-verb agreement error i.e., "FCR potentially support" to "FCR supports". The following line no was shifted due to revision amendment in our manuscript with reflected line no. 76 with yellow highlights.
- In Lines 70-72: We have replaced the repetitive word "significantly adopted" to "increasingly integrated". The following line no was shifted due to revision amendment in our manuscript with reflected line no. 78 with yellow highlights.
- In Lines 90-92: We have replaced the phrasing word "FCR method compared to the traditional classroom method" to "flipped classroom compared to traditional method". The following line no was shifted due to revision amendment in our manuscript with reflected line no. 105 with yellow highlights. Thank you for your kind suggestion and over-viewing of our manuscript.

- 11. Comment** The Methods are described in sufficient details so that the study can be reproduced. Whether ethical concerns have been well described.  
Lines 94–95: "Quasi-experimental cross over study" needs clarification: specify what makes it quasi-experimental (lack of randomisation?) and crossover (swapping groups).
- Response** The Quasi-experimental cross over study is an study with simple randomised study done by lottery method. Hopefully, the above clarifications adequately address the concerns.
- 12. Comment** Clarity and appropriateness of the Design to achieve the objective(s).  
Why quasi-experimental?  
The term is used but not explained. There's no clear justification for why full randomisation wasn't used (e.g., grouping by roll number before lottery).
- Response** The Quasi-experimental cross over study is an study with simple randomised study done by lottery method. Furthermore, total of 100 out of 150 undergraduate medical students who gave informed consent and were present during the study period were included in the study by a convenient sampling method. They were divided into four smaller groups (A, B, C, D) based on their roll numbers and twenty-five students in each group selected by lottery method. The above following information are included in method section and highlighted with yellow colour with line no 111-115. Hopefully, the above clarifications adequately address the concerns. Thank you for your kind concerns.
- 13. Comment** Appropriate and thorough description of the Statistical methods.  
In the abstract (Lines 42–43), it briefly states: Pre-tests and post-tests were administered before and after both teaching methods and analysed using unpaired t-tests.  
However, in the full Methods section, no mention is made at all of the statistical methods used to: Compare pre- and post-test scores, evaluate retention test scores, Analyse Likert-scale perception data, Account for crossover design.
- Response** We have included the statistical methods i.e., Wilcoxon test using SPSS software. The following statistical methods also mentioned in abstract section with yellow colour highlighted bearing line number 45-48. Hopefully, the above clarifications adequately address the concerns.
- 14. Comment** Quality, clarity and appropriateness of the Table(s).  
Line 373–374: The title. Table 1 Comparison of Pre-test and Post-test marks of Didactic lecture class is too long and not formatted professionally. No clear indication of units (e.g., scores out of what? 100?).  
Unclear Table Title (Line 376) Table 2 Comparison of Pre-test and Post-test marks of flipped class. Lacks formatting, context, and clarity. Table 2: Comparison of Pre- and Post-Test Scores in the Flipped Classroom Group (n=100) Add a caption/footnote: Scores are out of 100. Values are expressed as Mean  $\pm$  SD.
- Response** We have included table foot note for each table i.e., Table 1, Table 2 and Table 3. The following footnote highlighted in yellow colour in our revised manuscript. The Table no. 01 also formatted with clear indication of units. Hopefully, the above clarifications adequately address the concerns.
- 15. Comment** Quality, clarity and appropriateness of the Figure(s), if any.  
Figure 1: Visual clarity: poor – not an actual figure; lacks visual formatting.
- Response** We have changed the figure with enhanced clarity with in our revised manuscript. Thank you for your kind concerns.
- 16. Comment** Pertinence of the Discussion section whether it justify the main message of the manuscript without repeating the results.  
Excessive Repetition of Results. Lines 178–190 restate the core results already presented in Tables and Figures. Our study reveals. repeated % and performance differences. References to Table 1, 2, 3, and Figure 2 are redundant in the Discussion if they've been described in Results.  
Lacks Thematic Structure: The discussion jumps between: Literature support, Student perception, Cognitive theory, Results again, Meta-analyses, Anecdotes, Challenges.
- Response** We appreciate your insightful comments, which will significantly help us strengthen this section. We have carefully considered all your points and revise the manuscript accordingly. The following modification are highlighted with yellow colour in our revised manuscripts bearing line number 181-198. Hopefully, the above clarifications adequately address the concerns.
- 17. Comment** Whether Strength(s) and Limitation(s) are well described.  
Missing limitations: No mention of single-centre, sample size, topic variation, or blinding  
Clarity: Needs more structured articulation of both strengths and limitations.
- Response** We agree that a comprehensive and clearly articulated section on strengths and limitations is crucial for contextualizing our findings. According to your valuable suggestion we have included a paragraph about our strength and limitations with yellow colour highlights in our revised manuscripts bearing line number 244-253. We believe that explicitly detailing these limitations will provide a more transparent and robust context for interpreting our study's findings and will guide future research directions more effectively.

- 18. Comment** Whether the Conclusion of the manuscript is supported by the data.  
The phrase should be implemented and established as strong and policy-prescriptive, yet the study Was conducted at one institution. Covered only two topics in physiology. Involved only one batch of students and a limited faculty. Assessed only short-term performance and perception. Conclusion partially overstates the generalisability of the results.
- Response** We entirely agree with your assessment that our original conclusion may have overstated the generalizability of our findings, especially given the specific context and inherent limitations of our study. To address your suggestion, we have revised the conclusion section which it will acknowledge the positive findings of our study while providing a more balanced and realistic perspective on their broader applicability, aligning it precisely with the study's scope and limitations. We believe that explicitly detailing these limitations will provide a more transparent and robust context for interpreting our study's findings and will guide future research directions more effectively.
- 19. Comment** Whether the Conclusion of the manuscript is supported by appropriate and up-to-date References. Some Older References. Ref 4: Merriam (1996) – acceptable as a classic, but only if critically used. Ref 8: Butler (1992) – foundational, but may not reflect current didactic environments. Ref 12: Rodgers (2001) – older panel study on attendance.
- Response** We have updated the following references with yellow highlights.

**Responsible editor:** Tahniyah Haq, ORCID: 0000-0002-0863-0619

- 20. Comment** In the title, instead of “first-phase MBBS students”, would it be more understandable to a global audience if you wrote “undergraduate medical student”? This term could also be changed throughout the manuscript.
- Response** The title has been changed and renamed as “Assessing the effectiveness of the flipped classroom versus the traditional teaching method in enhancing learning among undergraduate medical students” bearing line number 2-3 and the title has been highlighted with yellow colour in our revised manuscript. The “first-phase MBBS students” also changed with “undergraduate medical students” throughout the manuscript with yellow highlights. Hopefully, the above clarifications adequately address the concerns.
- 21. Comment** The key message should contain information derived from the study.
- Response** We have included key message in this revised manuscript which has been highlighted with yellow colour with bearing line no 58-66. Hopefully, the above clarifications adequately address the concerns.
- 22. Comment** The statistical test mentioned in the abstract is different from the one written in the text.  
Please verify which test was used.
- Response** We have revised the statistical test method in abstract section within this revised manuscript which has been highlighted with yellow colour with bearing line no 45-49. Hopefully, the above clarifications adequately address the concerns.
- 23. Comment** The study needs a more detail rationale.
- Response** We have revised the abstract with detailed rational within this revised manuscript which has been highlighted with yellow colour with bearing line no 34-39. Hopefully, the above clarifications adequately address the concerns.
- 24. Comment** Please give the ethical review number in the ethical review section (line 272) only. It does not need to be mentioned in the main text.
- Response** We have included the ethical statement in ethical review section and omitted from main text within this revised manuscript. Hopefully, the above clarifications adequately address the concerns.
- 25. Comment** In figure 1, were pre and post tests taken in case of topic 2? This is not clear in the diagram. Please include how the groups were selected in the diagram.
- Response** We have revised the figure 1 with clear pre- and post-test taken of this topic. Hopefully, the above clarifications adequately address the concerns.
- 26. Comment** The reference to figure 1 given in line 127 does not match the description
- Response** The reference to Figure 1 in line 127 has been removed and added in the appropriate place of method section bearing line no 131. Hopefully, the above clarifications adequately address the concerns.
- 27. Comment** Was a sample size calculation done for this study? If not, why?
- Response** Sample size calculation was done by convenient sampling and has been mentioned in method section.
- 28. Comment** When was the study done?
- Response** The study was conducted in the Department of Physiology between January to June 2024. A total of 100 first year MBBS students gave informed consent and were present during the study period. The Feedback from students on the FCR teaching method was also obtained through a pre-validated questionnaire containing information about different aspects of flipped class and students' preference for T-L method formulated on the basis of literature review and circulated to the students by Google Forms. in methods section of our revised manuscript with yellow colour highlight bearing line number 108-113 and 139-142.



- 29. Comment** There is a lot of redundancy in the results section. Please mention the main findings.
- Response** The result section has been modified, and redundancy has been removed within our revised manuscript.
- 30. Comment** Please omit the "test used" column from tables 1, 2 and 3. The author has already mentioned.
- Response** We have modified the tables within our revised manuscript.
- 31. Comment** Please mention change of test marks form baseline, especially since the author mentions that the change was more marked in line 183.
- Response** The baseline mark is the pretest mark. Hopefully, the above clarifications adequately address the concerns.
- 32. Comment** In line 187 to 190, the author mentions that the FCR method resulted in better understanding, application, and analysis. However, only the student's perception of these were assessed in the study. Please clarify.
- Response** We have included the student analysis perceptions in result section within our revised manuscript with line no 161-165. Hopefully, the above clarifications adequately address the concerns.
- 33. Comment** Please include the limitations in the discussion. Mention the strengths of the study as well, eg advantage of using a cross over design, why the test scores were seen in 2 groups (> and < 50%).
- Response** We agree that a comprehensive and clearly articulated section on strengths and limitations is crucial for contextualizing our findings. According to your valuable suggestion we have included a paragraph about our strength and limitations with yellow colour highlights in our revised manuscripts bearing line number 244-253. We believe that explicitly detailing these limitations will provide a more transparent and robust context for interpreting our study's findings and will guide future research directions more effectively.
- 34. Comment** Is this study sufficient to recommend implementation of FCR method in the curriculum (line 253)? Rather, the author can propose it.
- Response** We agree with your concern that our conclusion may have overstated the generalizability of our findings, especially given the specific context and inherent limitations of our study. To address your suggestion, we have revised the conclusion section which it will acknowledge the positive findings of our study while providing a more balanced and realistic perspective on their broader applicability, aligning it precisely with the study's scope and limitations. The conclusion of implementation FCR method are revised manuscripts bearing line numbers 255-263. We believe that explicitly detailing these limitations will provide a more transparent and robust context for interpreting our study's findings and will guide future research directions more effectively.
- 35. Comment** Please follow the journal style for authorship criteria
- Response** We agree made the changes according to your following suggestion within our revised manuscript.

## Round 2

**Reviewer: Najnin Akhter, ORCID: 0000-0002-5560-849X**

- 1. Comment** The key message needs to be under 60 words. Please revise.
- Response** We have concise the key message under 60 words. The following key message bearing line numbers 58 to 64 within our revised manuscripts.
- 2. Comment** The methods section of the abstract does not reflect its cross over study design. Is it a quasi-experimental crossover study or just a crossover study? Please include the values of the main finding (post-test marks) in the result section of the abstract. The abstract can be written more explicitly. It needs to be under 250 words.
- Response** We have mentioned the method of study design as (quasi-experimental study) in abstract section of revised manuscript. The following changes are bearing line numbers 40 with in our revised manuscript. Also, we have concise the abstract within 250 words.
- 3. Comment** The response to the Editor's query number 8 has not been satisfactorily addressed. Convenient sampling is the sampling technique used. It is not the same as sample size calculation. How was the sample size of 100 calculated?
- Response** We have described the sample size calculation and also included within methods section of our revised manuscript with yellow colour highlighted bearing line number 116 to 121.

**Reviewer: Md Rasel Ahmad, ORCID: 0009-0009-2936-0169**

- 4. Comment** The test format used to assess the students in each case. I think this should be included in the methods. You should also state the validity of the test format used in the study. This is important.
- Response** We have described the sampling method, study design, Data collection and Data analysis in Methods section of our revised manuscript with yellow colour highlighted bearing line number 111 to 159. Hopefully, the above clarifications adequately address your concerns and found to be satisfactory for publication of our manuscript.

- 5. Comment** The results section needs improvement. There is still redundancy in the results section. Please highlight the main findings, e.g. "There was significant improvement in marks in both the teaching methods in both under and over 50 groups. The post-test mark of FC was significantly higher than that of didactic class. This was seen in the under 50 group as well...."
- Response** We have revised the result section with key highlighting findings as well as described the sufficient details within our revised manuscript. The following changes are also highlighted with yellow in colour bearing line number from 168 to 180. Hopefully, the above clarifications adequately address the concerns.
- 6. Comment** Query 12 was about the change of test results from baseline (difference between pre and post-test marks), not the baseline/pre-test marks. This change should be shown in tables 1 and 2.
- Response** Thank you for your kind concerns. We have made the following changes in Table 1 and Table 2 as per your kind suggestion. The Table 1 and Table 2 are highlighted with yellow in colour with in our revised manuscript.
- 7. Comment** Mann Whitney test should be used instead of Wilcoxon rank test to compare post-test marks between the 2 teaching methods in table 3, as you are comparing unpaired samples.
- Response** The Table 3 is highlighted with yellow in colour with in our revised manuscript.
- 8. Comment** Can a chi square or z test of proportion be done for the data shown in Figure 2 to see if there was any significant difference between perceptions?
- Response** We acknowledge that a chi-square test or z-test of proportions could provide additional insights into potential differences in perceptions. However, due to limited sample size, we are unable to perform these tests at this stage. We recognize this as a limitation of our current analysis and will take this important feedback into account for future studies, ensuring that appropriate statistical comparisons are included where feasible. Thank you for highlighting this opportunity for methodological improvement.
- 9. Comment** Please elaborate how mean retention of memory was calculated in the methods and comment on it in the results section.
- Response** We acknowledge your valuable concerns regarding mean retention of memory within this study. With following your kind suggestion, we have included the data collection as well as data analysis paragraph in method section of revised manuscript. Furthermore, the following mean retention of memory also included in result section with yellow colour highlights. The following included changes are reflected as with bearing line number 141-159 in method section and 168-180 in result section. Hopefully, the above clarifications adequately address the concerns.
- 10. Comment** Please label the x and y axes of Figure 3. Since you have mentioned that data has been expressed as mean, you do not need to write it again in the caption.
- Response** We have modified the figures with proper levels of x and y axis titles within our revised manuscript. Thank you for your kind concerns.
- 11. Comment** The authorship criteria followed by our journal mandates that each author fulfil all 4 criteria. According to your manuscript, only DM fulfils all 4 criteria. Please check and revise this.
- Response** We have revised the author contribution statement within our revised manuscript with yellow highlights bearing line number 283-288. Hopefully, the above clarifications adequately address the concerns.