

Comparison of Flipped Classroom and Large-Group Interactive Strategies for Teaching the Basis of Screening to MBBS Students

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ABSTRACT

Objective: To compare the effectiveness of a flipped classroom model and a large group interactive session (LGIS) method to teach the basis of screening to fourth-year MBBS students.

Study Design: Quasi-experimental study.

Place and Duration of the Study: Department of Community Medicine, Wah Medical College, National University of Medical Sciences, Wah Cantt, Pakistan, from December 2024 to February 2025.

Methodology: The sample was selected from fourth-year medical students using a purposive sampling technique and divided into two groups. Group A and B were taught the topic "Basis of Screening" by two subject experts, following the LGIS and flipped classroom methods, respectively. Students were assessed through a class test comprising of one-best-answer type multiple choice questions (MCQs). Data were analysed using SPSS version 23. Mean test scores and standard deviation were calculated for both groups, and an independent t-test was applied to find the difference between the groups. The Chi-square test was applied to determine the difference between achieving more than 75% marks and teaching strategies. A p-value of <0.05 was considered statistically significant.

Results: A total of 95 students who attended the teaching sessions and appeared in the assessment were included in the study. The number of students who passed the exams was 69 (72.6%), and only 26 (27%) students attained $\geq 75\%$ marks. A significant difference was noted among students' scores when their results were categorised as more and less than 75% marks. Out of the 26 students, 19 attended flipped classroom sessions.

Conclusion: The flipped classroom model is a very effective strategy for teaching the basis of screening to medical students, as compared to the LGIS, to improve their performance in examinations.

Key Words: Curriculum, Education, Students, Teaching, Flipped classroom.

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INTRODUCTION

The flipped classroom is a perfect model of blended learning for Generation Z learners, who work self-sufficiently and use technology proficiently for learning.^{1,2} In the flipped classroom model, students are provided with reading materials, online links, and videos as pre-class resources, while class time is utilised for discussions and interactive group activities on the given content. Engaging in higher-order thinking discussion questions during in-class activities not only improves students' cognition but also promotes their critical thinking, communication skills with peers and mentors, and problem-solving skills.

Moreover, this approach helps students to learn the subject at their own pace and suitability, which enables them to enhance their understanding.^{3,4} Previous literature has supported the effectiveness and efficacy of the flipped classroom model as compared to traditional learning.⁵ Large group interactive session (LGIS) is another educational strategy used for medical teaching, in which lecture is structured by using Gagne's nine events of instruction and delivered in a limited period. The lecture is comprised of literature, scenarios for discussion, pictures, videos, and practical examples. During the session, students are involved through discussion and assessments. At the end of the session, teacher also gives feedback.⁶⁻⁸ Lu *et al.* disclosed that the performance and final examination results of students who attended the flipped classroom were significantly better than those of students who attended the traditional lecture method ($p < 0.05$).⁹

This study aimed to compare the effectiveness of the flipped classroom model and the LGIS method to teach the basis of screening to fourth-year MBBS students.

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METHODOLOGY

This quasi-experimental study was conducted in the Department of Community Medicine, Wah Medical College, National University of Medical Sciences, Wah Cantt, Pakistan, from December 2024 to February 2025. After obtaining ethical approval from the Institutional Ethics Review Board of Wah Medical College, Wah Cantt, Pakistan (Ref No. ERC/IRB/052; dated: 27th November 2024), the sample was collected from 100 enrolled fourth-year medical students using a purposive sampling technique. Only those students were included in the study who had attended all three sessions of screening, while students having supplementary examinations were excluded from the study. These sessions included the selection of an ideal screening test; interpretation of validity, reliability, and predictive values of screening test; recognition of the effect of changes in the cut-off value on sensitivity, specificity, false positives, false negative, true positive, and true negatives rates; relation of validity with the precision of a screening test; interpretation of possible errors in screening; and explanation of methods for evaluating a screening programme. After obtaining informed consent from the participants, they were divided into two groups: Group A and Group B. Both groups were taught the topic "Basis of Screening in Community Medicine" by two subject experts over three hours (one hour per week). Group A was taught the topic through the LGIS methods, and Group B were taught by the flipped classroom method. In the fourth week, the students were assessed by a class test comprising twenty pre-tested, post hoc, and validated one-best-answer type multiple choice questions (MCQs). The questions were taken from the question bank created by the subject experts after assessing the validity and reliability of the questions. Responses were taken on response sheets readable by the optical mark reader.

Data were analysed using the SPSS version 23. The mean test scores and standard deviation were calculated for both groups, and an independent sample t-test was applied to find the difference between them. While the Chi-square test was applied to determine the difference in achieving more than 75% marks and teaching strategies; $p < 0.05$ was considered statistically significant.

RESULTS

The total number of students who attended the teaching sessions and appeared in the assessment was 95, including 43 male and 52 female students. Out of them, 48 were taught by the flipped classroom model, and 47 by the LGIS. The total number of students who passed the exams was 69 (72.6%). The frequency of students who attained $\geq 75\%$ marks was 73%.

There was no significant difference in mean scores of students taught by the two different strategies (Table I), and a significant difference was noted when their results were categorised as more and less than 75% (Table II).

Table I: Comparison of the flipped classroom and LGIS methods using independent t-test.

Teaching strategies	Mean	Standard deviation	Standard error	p-values
Group A	11.49	3.155	0.460	0.138
Group B	12.58	3.924	0.566	

An independent t-test was used to determine the p-value. LGIS: Large group interactive session.

Table II: Comparison of the flipped classroom and LGIS methods with more and less than 75% marks.

Teaching strategies	Obtained Marks		p-values
	$\geq 75\%$	$\leq 75\%$	
Group A	7	40	0.007
Group B	19	29	

Chi-square test was used to determine the p-value.

DISCUSSION

This study was conducted to assess the effectiveness of the flipped classroom model in teaching the Basis of Screening, which requires conceptual understanding, so that students can apply the acquired concepts in real-life situations. The topic of screening is selected for this study because the concepts of disease selection, test selection, validity of screening tests, screening-related biases, and evaluation of screening are not easily comprehended without discussing various situations and scenarios. Most of the questions asked in examinations require critical thinking and problem-solving skills. Therefore, the flipped classroom model was chosen to evaluate its effectiveness in teaching the topic of screening to fourth-year MBBS students.

In this study, a comparison of two teaching educational strategies—flipped classroom and LGIS—were conducted by instructors with the same qualifications and experience, and each group had an equal number of females and males to control bias. The preparation time for examination was adequate and equal for both groups. The MCQs designed to test assess students mostly targeted the comprehension and application levels, with some questions addressing the analytical level. The results of the study showed that both groups obtained almost the same results, and no significant difference was found after applying t-test on their mean scores. The reason might be the execution of interactive sessions in both teaching strategies. Although pre-class activities were not used in LGIS, the teachers used various scenarios, pictures, and videos during class to enhance students' understanding. The results are comparable with the findings of Moraras *et al.*, who reported no association between the flipped classroom and academic improvement,¹⁰ and with Galway *et al.*, who found no difference in examination scores between groups taught through flipped classroom and those taught via traditional lecture.¹¹

Interestingly, most of the students who achieved $\geq 75\%$ belong to Group B. This result indicates that higher-order thinking questions related to the topic of screening were answered more correctly by students in Group B. It means that the flipped classroom method helps students to clear their concepts and understanding, thereby enhancing their grasp

on the subject. The results are consistent with other studies which reported that the use of flipped classroom method enhances students' learning level and examination performance.¹²⁻¹⁵ This improvement in performance may be attributed to the sufficient time provided for pre-class reading, interactive in-class activities using practical situations, and peer assistance during group work. Studies supported that by applying different interactive methods, such as group activities, case discussion, and plenum discussion during flipped classroom would not only improve academic performance but also augment communication skills and learning interests.^{9,16-18}

The LGIS approach is quite challenging for educators; however, the correct use of technology—such as various study applications, videos, and feedback tools—increase both the effectiveness and efficiency of teaching, making the learning experience better for both the teachers and students.¹⁹ Although the flipped classroom showed promising results regarding academic improvement, employing a larger sample size, probability sampling technique, and adopting a mixed-method research design may improve the generalisability of the study.

CONCLUSION

The flipped classroom is a very effective strategy for teaching the Basis of Screening to medical students as compared to the LGIS to improve their performance in examinations. It is recommended that teachers adopt this strategy for educating students; however, further studies should be conducted with a large sample size.

ETHICAL APPROVAL:

Ethical approval was obtained from the Institutional Ethics Review Board of Wah Medical College, Wah Cantt, Pakistan (Ref. No. ERC/IRB/052; dated: 27th November 2024).

PARTICIPANTS' CONSENT:

Informed consent was obtained from the study participants.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

SSI, KWK: Conception and design of the study and drafting of the manuscript.

SN: Data acquisition.

LK: Data analysis.

RM, MR: Critical revision.

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REFERENCES

- Eckleberry-Hunt J, Lick D, Hunt R. Is medical education ready for generation Z? *J Grad Med Educ* 2018; **10(4)**: 378-81. doi: 10.4300/JGME-D-18-00466.1.
- Liu Y, Sun X, Zhang P, Han P, Shao H, Duan X, et al. Generation Z nursing students' online learning experiences during COVID-19 epidemic: A qualitative study. *Heliyon* 2023; **9(4)**:e14755. doi: 10.1016/j.heliyon.2023.e14755.
- Naing C, Whittaker MA, Aung HH, Chellappan DK, Riegelman A. The effects of flipped classrooms to improve learning outcomes in undergraduate health professional education: A systematic review. *Campbell Syst Rev* 2023; **19(3)**:e1339. doi: 10.1002/cl2.1339.
- Shiau S, Kahn LG, Platt J, Li C, Guzman JT, Kornhauser ZG, et al. Evaluation of a flipped classroom approach to learning introductory epidemiology. *BMC Med Educ* 2018; **18(1)**:63. doi: 10.1186/s12909-018-1150-1.
- Kurup V, Sendlewski G. The feasibility of incorporating a flipped classroom model in an anesthesia residency curriculum-pilot study. *Yale J Biol Med* 2020; **93(3)**:411-7.
- Li Y, Liang Z, Li Z, Yu Y, Yang Q, Li X. Effectiveness of Gagne's 9 Events of Instruction in health professions education: A systematic review and meta-analysis. *Front Med (Lausanne)* 2025; **12**:1522830. doi: 10.3389/fmed.2025.1522830.
- Lin GSS, Foong CC, Abdul Aziz YF. Interactive online modules for dental education: A practical example of Gagne's nine events of instruction. *Educ Med J* 2024; **16(3)**:173-84. doi: 10.21315/eimj2024.16.3.13.
- Ali S, Ali L. Efficacy of Gagne's nine events of instruction in improving the performance of undergraduate medical students. *Adv Health Professions Educ* 2015; **1(2)**.
- Lu C, Xu J, Cao Y, Zhang Y, Liu X, Wen H, et al. Examining the effects of student-centered flipped classroom in physiology education. *BMC Med Educ* 2023; **23(1)**:233. doi: 10.1186/s12909-023-04166-8.
- Moraros J, Islam A, Yu S, Banow R, Schindelka B. Flipping for success: Evaluating the effectiveness of a novel teaching approach in a graduate level setting. *BMC Med Educ* 2015; **15**:27. doi: 10.1186/s12909-015-0317-2.
- Galway LP, Corbett KK, Takaro TK, Tairyan K, Frank E. A novel integration of online and flipped classroom instructional models in public health higher education. *BMC Med Educ* 2014; **14**:181. doi: 10.1186/1472-6920-14-181.
- Ajmal B, Ansari M, Akhtar S. Flipped classroom: Promoting active learning on students' engagement at a higher level. *J Policy Res* 2024; **10(2)**:383-90. doi: 10.61506/02.00245.
- Shraddha BH, Iyer NC, Kotabagi S, Mohanachandran P, Hangal RV, Patil N, et al. Enhanced learning experience by comparative investigation of pedagogical approach: Flipped classroom. *Proc Comp Sci* 2020; **172**:22-7. doi: 10.1016/j.procs.2020.05.003.
- Seidi M, Ramezani-Aliakbari F, Doosti-Irani A. Effectiveness of the flipped classroom method using clinical scenarios and educational technology versus subject-based lectures in a gastrointestinal physiology course for medical students. *BMC Med Educ* 2024; **24(1)**:858. doi: 10.1186/s12909-024-05863-8.
- Bhavsar MH, Javia HN, Mehta SJ. Flipped classroom versus traditional didactic classroom in medical teaching: A comparative study. *Cureus* 2022; **14(3)**:e23657. doi: 10.7759/cureus.23657.
- Blomer L, Voigt C, Hoppe U. Face to face with large groups in a flipped classroom. PACIS 2020 Proceedings. Available from: <https://osnascholar.ub.uni-osnabrueck.de/handle/unios/18395>.

17. Goedhart NS, Westrhenen NB, Moser C, Zweekhorst MBM. The flipped classroom: supporting a diverse group of students in their learning. *Learn Environ Res* 2019; **22(1)**: 1-4. doi: 10.1007/s10984-019-09281-2.
18. Rawas H, Bano N, Alaidarous S. Comparing the effects of individual *versus* group face-to-face class activities in flipped classroom on student's test performances. *Health Profession Educ* 2020; **6(2)**:11. doi: 10.1016/j.hpe.2019.06.002.
19. Tuma F. The use of educational technology for interactive teaching in lectures. *Ann Med Surg (Lond)* 2021; **62**:231-5. doi: 10.1016/j.amsu.2021.01.051.

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