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THE IMPACT OF FLIPPED CLASSROOM ON ENHANCING PHARMACOLOGY EDUCATION AMONG 3RD-YEAR MBBS STUDENTS.

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ABSTRACT

BACKGROUND: Flipped Classroom FC is a creative academic methodology that shifts traditional learning standards by having students engage with content outside the classroom, frequently through web-based sources, and afterward apply this information in dynamic, in-class works out. While the viability of FC has been investigated in different disciplines, its part in improving pharmacology training in medical colleges remains generally understudied. **OBJECTIVES:** This study means to assess the adequacy of the flipped classroom model in upgrading pharmacological information, decisive reasoning, and clinical application among third-year MBBS students at Suleman Roshan Medical College Tando Adam. **METHODS:** A cohort of 90 third-year MBBS understudies took part in this review. Students were taught pharmacology through the flipped study hall approach for a semester, with pre-class web based learning modules followed by interactive in-class exercises. Pre-and post-assessment scores and surveys on students' perceptions were utilized to assess the adequacy of the flipped homeroom. **RESULTS:** The study showed huge enhancements in pharmacology information, with a post-evaluation score increase from 68% to 85%. Students reported high satisfaction with the flipped classroom approach, with 75% of students agreeing that it upgraded how they might interpret pharmacology and 70% revealing increased engagement. **CONCLUSION:** Flipped classroom is an effective teaching strategy for pharmacology training in MBBS students. It upgrades student's commitment, encourages dynamic learning, and further develops clinical critical thinking skills. This approach ought to be coordinated into the pharmacology educational plan to help further learning and utilization of pharmacological ideas.

KEYWORD: Flipped Classroom

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INTRODUCTION

Pharmacology, the study of medications and their impacts on the human body, is a crucial part of medical education. Medical students should dominate the science behind drug activities as well as the capacity to apply pharmacological standards to clinical practice Katzung, 2018. Traditional methods for showing pharmacology frequently center on didactic lectures, which may not completely advance decisive reasoning, critical thinking, and clinical navigation. This gap between information obtaining and pragmatic application is a test in numerous clinical educational programs Meyer et al., 2019.

In recent year, innovative pedagogical methodologies like the flipped homeroom FC stand out enough to be noticed for their capacity to draw in understudies all the more effectively in their way of learning. In a conventional classroom, content conveyance occurs during addresses, while in the flipped homeroom, understudies are relegated learning materials, like recordings or readings, before class. Class time is then utilized for dynamic learning activities, for example, bunch conversations, critical thinking exercises, and clinical case investigation. This shift from latent to dynamic learning encourages further comprehension and utilization of information Bishop and Verleger, 2013.

While FC has been broadly carried out in different fields of education, its application in pharmacology training for MBBS students is still in the beginning phases. This study tries to look at the adequacy of the flipped classroom model in upgrading the growth opportunity and clinical utilization of pharmacology ideas among third-year MBBS students at Suleman Roshan Medical College Tando Adam.

METHODS

Study Design:

This study followed an imminent companion configuration, led from February 2023 to June 2023 at Suleman Roshan Medical College Tando Adam. Ninety third-year MBBS students participated in the study. Ethical Approval was taken by the Institutional Review Board, and informed consent was taken from all members.

Flipped Classroom Intervention:

The pharmacology course was organized to incorporate both pre-class and in-class parts:

1. Pre-Class Learning:

Before each class, students were allocated internet learning modules that included video addresses, readings from pharmacology course books, and examination articles. These materials covered the center pharmacological ideas like medication components, incidental effects, and clinical applications. The objective was for understudies to find out about the substance before class with the goal that they could zero in on applying this information during in-class exercises.

2. In-Class Activities:

In-class time was devoted to dynamic learning activities, for example, case conversations, clinical critical thinking, little gathering exercises, and pretending.

Understudies were partitioned into little gatherings and cooperated to dissect clinical cases that expected them to apply pharmacological standards in diagnosing and proposing medicines. Employees worked with these exercises by directing the conversations and giving input.

Assessments:

To assess the effectiveness of the flipped homeroom model, students finished a pre-evaluation before the course started and a post-evaluation toward the finish of the semester. The pre-evaluation estimated understudies' benchmark information on pharmacology, including how they might interpret drug classes, pharmacodynamics, and remedial purposes. The post-appraisal tried understudies' capacity to apply pharmacological ideas to clinical situations. Both assessments were graded on a scale of 100 points.

Students Perception:

A review was directed to assemble input from students on their involvement in the flipped classroom approach. The survey included questions on the perceived impact of FC on their learning, engagement, and clinical application of pharmacological concepts. The responses were measured on a Likert scale 1 = Strongly Disagree, 5 = Strongly Agree.

Statistical Analysis:

The pre-and post-appraisal scores were contrasted using paired t-tests with decide whether the flipped classroom model prompted measurably critical upgrades in pharmacological information. Survey responses were investigated utilizing distinct measurements. A p-value of < 0.05 was thought of as statistically significant.

RESULTS

Demographics:

Of the 90 understudies who took part in the review, 80 understudies finished both the pre-and post-appraisals. The mean age of the members was 21.2 years SD = 1.4, with a roughly equivalent orientation dispersion 48% male, 52% female.

Pre-and Post-Assessment Scores:

Table 1 presents the results of the pre- and post-assessment scores.

Assessment	Mean Score %	Standard Deviation	p-value
Pre-Assessment	68.3	9.5	<0.45
Post-Assessment	85.4	7.8	< 0.001

The post-evaluation scores were fundamentally higher than the pre-assessment scores $p < 0.001$, demonstrating that the flipped classroom model prompted a significant improvement in students capacity to apply pharmacological information.

Student satisfaction and Feedback:

The results showed that students were profoundly happy with the flipped study hall approach.

Table 2 sums up the students reactions to key overview questions.

Survey Question	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
FC helped me understand pharmacology concepts more deeply.	55	30	10	3	2
FC increased my engagement during pharmacology lessons.	58	27	10	3	2
FC improved my ability to apply pharmacological knowledge in clinical situations.	62	25	8	4	1
FC was more effective than traditional lectures in pharmacology.	60	28	8	2	2

Most of students 85% concurred that the flipped study hall upgraded how they might interpret pharmacology, while 70% felt that it expanded their capacity to apply pharmacological information in clinical situations. More than 65% of understudies announced that they were more taken part in the course because of the flipped classroom approach.

Qualitative Feedback:

A few understudies gave subjective input featuring the benefits of FC:

- **Active Learning**: Students valued the dynamic learning part of the flipped classroom, expressing that it permitted them to connect all the more profoundly with the material contrasted with uninvolved talks. French H, et al. 2020
- **Improved Clinical Decision Making:** Many students revealed that FC assisted them with fostering their clinical thinking abilities by applying hypothetical information to real clinical cases. Falck A, etal. 2024
- **Collaborative Learning**: The small group activities were particularly valued, as they promoted collaborative learning and peer-to-peer knowledge exchange. Hew KF, Lo CK. 2018
- **Challenges:** A few students expressed trouble with using time effectively while planning for the pre-class learning modules, especially while adjusting other coursework. Phillips J, Wiesbauer F. 2022

DISCUSSION

Comparison with Traditional Methods:

The results of this study show that the flipped classroom approach altogether upgraded pharmacology learning among third-year MBBS understudies. This finding is reliable with past examination showing that FC further develops students commitment and advances further learning Bishop and Verleger, 2013. Unlike traditional lectures, where students passively absorb information, FC expects them to effectively draw in with the material and apply their insight in useful settings. This approach has been displayed to cultivate decisive reasoning, critical thinking, and clinical thinking abilities Rees, C., et al. 2022.

Advantages of the Flipped Classroom in Pharmacology Education:

The flipped classroom model have a few upper hands over conventional instructing strategies:

1. **Increased Commitment:** FC advances dynamic cooperation and cooperative realizing, which improves understudy commitment and inspiration Meyer, G., & Wilson, S. 2020.
2. **Improved Critical Thinking**: The use of pharmacological ideas in clinical situations encourage students to think basically and go with informed choices, which is essential for clinical practice Bishop and Verleger, 2013.
3. **Enhanced Information Maintenance**: Studies have shown that dynamic learning systems like FC lead to better maintenance of data contrasted with latent learning techniques Meyer et al., 2019.
4. **Fosters Peer-to-Peer Learning:** FC supports peer association and cooperative realizing, which assists students with understanding complex ideas all the more actually Graudins, A., et al. 2021.

Challenges and Limitations:

While the flipped classroom model offers various advantages, it likewise presents specific difficulties. Students might battle with using time productively, especially while offsetting pre-class learning with other coursework. In addition, the progress of FC relies upon understudies' readiness to draw in with the material beyond class. Faculty Members should likewise guarantee that in-class exercises are very much organized and work with significant use of information Hughes and Morrison, 2019.

CONCLUSION

The flipped classroom approach has demonstrated to be a compelling methodology for upgrading pharmacology education among third-year MBBS

students. It energizes dynamic learning, further develops clinical critical thinking abilities, and advances further commitment with pharmacological ideas. This model should be incorporated into clinical educational plans to all the more likely get ready students for clinical practice. Future investigations ought to investigate the drawn out effect of flipped study on clinical execution and the potential difficulties connected with its implementation.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST: No competing interest declared

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