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Flipped Classroom: An Innovative Teaching Model to Train Undergraduate Medical Students in Community Medicine

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Abstract

In the current curriculum, students are exposed to the community, through a family case study. During family visits, students are expected to effectively apply theoretical knowledge into practice by advising family members. In spite of receiving orientation; students are not able to advise allotted family members satisfactorily during their family visit Thus, it was felt that use of the flipped classroom a blended learning where students are introduced to content at home and practice working through it at class would improve student engagement. To find the effectiveness of the flipped classroom method for ability to transfer knowledge in the community setting and to understand the perception. Intervention was done in the 2nd year among students posted for block posting in the department of community medicine. The Flipped classroom model was implemented in the following steps Pre-class activity, In-Class Activity, Family case study and assessment. 30 Students posted in the department were enrolled for the study. Attendance for two in class room activities was 93% (28/30). All the 28 students completed pre and in class room activities. Students were graded based on their involvement and participation. The average pretest mark was 8 with SD = 2 and post test was 18 with SD=4. (t = 11.83 and p<0.0001) Feedback was taken from 28 students who participated in all pre-class and in-class activities regarding "flipped classroom model." Students were able to apply theory knowledge gained into practice. This model can be used to create interest among students.

INTRODUCTION

In the present medical curriculum undergraduate medical students learn community medicine in the 1st, 2nd and 3rd professional years. The summative assessment is in the 3rd professional year (part I). In the current curriculum, students are exposed to the community, through a family case study. The students have to visit families in the community which is scheduled in the 2nd professional year. During family visits, students are expected to effectively apply theoretical knowledge into practice by advising family members. In spite of receiving orientation to family visits, students are not able to advise allotted family members satisfactorily during their family visit.

To train 2nd-year students, to be able to give appropriate advice, it is necessary to utilize the classroom timing (in clinical posting) for discussion and facilitation and there is a need to free up time for interactive engagement between students and the teacher. Thus, it was felt that use of the flipped classroom model would improve student engagement. The rationale behind this approach is that teachers can spend their face-to-face time supporting students in deeper learning processes. Using this model, what is normally done in class and what is normally done as homework is switched or flipped^[1]. Currently, theoretical teaching on a particular topic and family case orientation is covered in clinical postings. Students are then instructed to read books to come prepared for a family case study. However, this methodology is not serving the purpose because 2nd-year students lack the applied skills. They are not able to correlate the theory with practice when they are in the community^[2]. They lack competence in advising the allotted family members on health issues. By implementing a flipped classroom, we want to utilize the classroom time for developing skills so that they can apply theory into practice. However, for this, students should be aware of the aspects of theory that will be delivered before class. Han and Klein^[3] drafted a list of "best practices" to approach pre-class learning materials for flipped classroom approaches. These are as follows: align pre-class learning materials with learning objectives, avoid replicating material from pre-class learning during in-class learning, provide specific guidance for pre-class learning materials, be conscientious of preparation time and other demands on students' time, include assessments within pre-class learning materials, allow time at the beginning of class for students' questions and summary of key concepts, hold students accountable for pre-class preparation, and provide access to pre-class learning materials in a timely fashion. Flipped classroom methodology is an educational innovation that shows promise for use in medical education^[4].

However, the systematic review done on the effectiveness of flipped classroom in medical education by Chen *et al.*^[5] mentioned that out of 46 articles

reviewed, 25 were focused in the USA, 5 in the UK, 3 in Canada, 2 in Hong Kong and 2 in India. There is a paucity of information on the applicability of flipped classroom in an Indian setting. Moreover, among these articles, much of the changes in knowledge have examined knowledge acquisition. To better inform educational practices, studies examining long-term impact of the flipped classroom with regard to knowledge retention and transfer of knowledge to professional practice and patient care are warranted. Thus, this study aims to find the effectiveness of the flipped classroom model in community medicine to train undergraduate medical students with a focus on retention on knowledge and ability to transfer knowledge in the community setting.

Aims and Objective: To find the effectiveness of the flipped classroom model in community medicine to train undergraduate medical students with a focus on retention on knowledge and ability to transfer knowledge in the community.

- To find the effectiveness of the flipped classroom method for ability to transfer knowledge in the community setting among 2nd professional year medical students during the family case study
- To find the effectiveness of the flipped classroom method on retention of knowledge among 2nd professional year medical students during the family case study

MATERIALS AND METHODS

Study Design: Inter ventional study.

Study Population: Students of 2nd professional year-3rd Semester.

Study Period: 4 months.

Sample Size: All the students attending the community medicine postings.

Inclusion Criteria: 2nd professional year students posted for block posting in the department of community medicine.

Intervention: The intervention was be done for the 2nd professional year students posted for block posting in the department of community medicine after obtaining informed consent from the students. The Flipped classroom model was implemented in the following steps.

- Pre-class activity
- In-Class Activity
- Family case study
- Assessment

Pre-class Activity: Email ID and contact numbers of all the students willing to participate in the study were collected. Google groups and whatsapp groups were created to share the information. Study material like powerpoint slides for the chosen topic were shared among the students. Care was taken to align the study material with the learning objective.

Students went through the study material thoroughly. Replication of materials from both pre-class and in-class was avoided. The material were shared so that students will be knowledgeable regarding the topic before coming to class. After going through material, the students took a quiz in the second part of the pre class activity. Questions of the quiz were of image-based, single best response and open-ended. The quiz was done by using Google forms. The Quiz was incorporated as a method of self-assessment. The third section of the pre class activity had an open-ended question to allow students to ask any query after reviewing the study material and completing the quiz. The Google Form would give immediate feedback scores to the students. It took about 20-30 min to go through all the three sections. Links for Google Forms were shared via e-mail and WhatsApp groups two days before the in-class session. Through this pre-class activity, it was ensured that the students had a fair knowledge about the topic which is one of the main principles of the “flipped classroom”

In-class Activity: Two in-class sessions were planned on two separate days to teach two subtopics. Each classroom session were of 150 minutes. Teaching session began with a short introduction. During this briefing, all queries asked in the Google Form were addressed. The wrong concepts identified from the Google Form analysis were also be addressed. After this, students were put to work. Facilitation was done to build their analytical thinking. For which various group activities were planned.

Family Case Study: After a few days, family visits were conducted. Students were allotted family cases in the field practice area of the department of community medicine. Each student was allotted a family with the situation dealt in the flipped class room. Each faculty member supervised 5-6 students for their various skills learnt.

Method of Assessment: To measure the learning amongst students, 30 marks question paper was set which consisted of MCQ type of questions. This test was given to the students as a pretest. A post-test was done after 3 months of teaching to assess their retention of knowledge. To assess the analytical thinking and ability to give appropriate advice, a practical examination was conducted. After posttest,

student feedback was taken on the “flipped classroom model” using 18 items 5 point Likert scale (grading as: 5-strongly agree, 4-agree, 3-neutral, 2-disagree and 1-strongly disagree). Open-ended questions, namely “how the model helped in understanding the topic, in the retention of knowledge and gaining interest in the Community Medicine subject”, was incorporated to explore students’ views on the learning through the flipped classroom mode.

RESULTS AND DISCUSSIONS

Thirty students posted in the department of community medicine were enrolled for the study. Attendance for two in class room activities was 93% (28/30). All the 28 students completed pre and in class room activities. Students were graded based on their involvement and participation. (Table 1).

The average pretest mark was 8 with SD \pm 2 and post-test average was 18 with SD \pm 4. A statistically significant difference was observed between the pre and post-test outcomes. (t = 11.83 and p<0.0001) Feedback was taken from 28 students who participated in all pre-class and in-class activities because only these students could provide appropriate feedback on overall “flipped classroom model”. (Table 2).

The flipped classroom model has gained traction in various fields, including medical education, for its ability to engage students actively in the learning process and foster deeper understanding of complex topics. When applied to undergraduate medical education, particularly in community medicine, it offers unique advantages.

In a flipped classroom setting, students are introduced to the foundational concepts through pre-recorded lectures, readings, or multimedia resources prior to attending class^[5]. In this study material was shared to the students which allowed them to familiarize themselves at their own pace, which is especially beneficial for medical students who may have varying levels of prior knowledge or learning styles.

Han and Klein^[3]. Reviewed the studies on types of pre class learning modalities in the flipped classroom. According to their findings, the types of pre class learning used by various researchers were as follows:

- Online (modules, simulation and learning resources)
- Reading assignment (textbook, instructor created text, handouts, guided readings, primary literature and guidelines)

Table 1: Association of grading with participation in all activities

Grading	Participation in all Activities	
	No	Yes
Passed	11	06
High Achievers	01	10

Table 2: Proportion of students responding to each statement (n = 28)

Statements	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
I understood the topic very well due to flipped classroom teaching	10	85	5	0	0
Flipped classroom teaching increased interest in community medicine	10	85	5	0	0
Flipped classroom will cause higher retention of knowledge than routine lecture classes	10	75	10	5	0
I was able to learn through group activity in the class	90	10	0	0	0
Due to flipped classroom teaching, I was usually well prepared for class	95	5	0	0	0
The preclass activity (quiz) made sense to me, I understood its purpose	95	5	0	0	0
I felt encouraged to participate in online assignments	10	85	5	0	0
The teacher treated students with respect	95	5	0	0	0
The teacher effectively directed and stimulated discussion	93	7	0	0	0
The teacher effectively encouraged students to ask questions and give answers	96	4	0	0	0
It is not necessary to provide lecture presentation prior to class	0	5	5	70	20
I was curious to understand the topic due to preclass activity	3	60	7	15	15
I was curious to understand the topic after going through presentation	3	60	7	15	15
Learning through "flipped classroom teaching" is time consuming	10	10	15	50	15
Flipped classroom teaching encouraged active participation of students	80	15	5	0	0
Flipped classroom teaching encouraged communication between students and teacher	85	15	0	0	0
Flipped classroom teaching helped me to apply my knowledge into practice (during family visits)	98	2	0	0	0
Flipped classroom teaching helped me to gain confidence in applying the knowledge into practice (during family visits)	98	2	0	0	0

- Video lecture (lecture recordings, PowerPoint slides with voiceover and podcasts) in this study we used the quiz session as a pre-class room activity

The pre-class activity provided, students with a fair knowledge of the topic. Thus, ample of time could be utilized for discussion and group activities. Through the flipped classroom model, there is a scope to make classroom sessions interactive. Furthermore, student-student and student-teacher interactions increase through this model. Carini *et al.*^[6] concluded that student engagement is generally considered to be among the better predictors of learning and personal development. The more student's study or practice a subject, the more they tend to learn about it^[6]. which was observed in the present study. Students who actively participated and were engaged performed better in practical examination.

For an educational intervention to be effective Colt *et al.*^[7] considered a predefined target of a normalized gain of 30% as the minimum value Considering the similar cutoff level, the flipped classroom model proved to be effective to teach undergraduate medical students in community medicine.

The attendance rate for the classroom session was 93%. It is seen that over the last past few years, students attendance for community medicine posting is decreasing year by year. We observed that due to the use of flipped classroom model, students' attendance rate was high. This can be considered as an gain of the use of a flipped classroom model. Thus, this model can be used for other topics in community medicine to increase the interest of the students. In today's era, there cannot be one size fits all approach to make students understand a particular concept.

Learning styles, namely visual, aural, read/write and kinesthetic, have been shown to vary widely among students^[8]. In the present intervention of flipped class room model different styles of learning were incorporated which made the learning effective and interesting. Some key benefits of using the flipped classroom model in training undergraduate medical students in Community Medicine are

Active Engagement: Students actively engage with the material before class, which can lead to better retention and understanding of concepts.

Application of Knowledge: Instructors can focus on applying theoretical concepts to real-world scenarios, such as analyzing community health data, designing health promotion programs, or understanding healthcare disparities.

Collaborative Learning: Class time can be utilized for collaborative activities, fostering teamwork and communication skills essential for practicing medicine in community settings.

Individualized Learning: Students can progress through pre-class materials at their own pace, allowing for individualized learning experiences. Those who need more time to grasp certain concepts can review materials as needed.

Feedback and Assessment: Instructors can provide immediate feedback and clarification during in-class activities, addressing any misconceptions or gaps in understanding.

Preparation for Clinical Practice: By engaging in active learning exercises focused on community health, students develop critical thinking skills and gain

practical experience relevant to their future roles as healthcare providers.

Overall, the flipped classroom model offers a dynamic and student-centered approach to medical education, particularly in disciplines like Community Medicine where practical application and population health are paramount. It encourages active learning, critical thinking and collaboration, preparing students to address the complex healthcare challenges they will encounter in their careers. All these concepts of students learning were reflected in the present study at different levels. Overall, the flipped classroom model offers a dynamic and student-centered approach to medical education, particularly in disciplines like Community Medicine where practical application and population health are paramount. It encourages active learning, critical thinking, and collaboration, preparing students to address the complex healthcare challenges they will encounter in their careers.

CONCLUSION

Students were able to apply theory into practice and knowledge gained is retained through the flipped classroom model of teaching. This model can be used to create interest among 2nd-year medical students for community medicine so that they attend postings with interest and involvement.

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