

EFFECTIVENESS OF PROJECT WORK AS A TEACHING-LEARNING METHOD FOR TEACHING OF MEDICAL MICROBIOLOGY TO UNDERGRADUATE MEDICAL STUDENTS

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ABSTRACT

BACKGROUND:

This study was interventional education research aiming to assess the effectiveness of the project method of teaching when compared to traditional teaching methods in Medical Microbiology to undergraduate medical students.

MATERIALS AND METHODS:

A total of 162 students volunteered to get enrolled in this study. The students were broadly divided into Group A and Group B. Each of the groups was further divided into 20 small groups. Group A students worked on one topic and Group B students worked on another topic. Each project had 30 – 35 slides in Microsoft PowerPoint format. The topics assigned for project work were taught again by didactic lecture after the completion and submission of projects. Assessment for the topic was conducted by MCQs and feedback from students was collected regarding their experience during the project.

RESULTS:

Out of 208 students, a total of 162 (77.88%) students volunteered to get enrolled. A total of 40 projects were submitted, out of which 16 groups scored between 61 to 80 points, 19 groups scored between 41 to 60 points and 5 groups scored between 21 to 40 points. The topics for project work were taught again by didactic lecture and the average marks obtained by students who participated in the project were higher than students who did not participate in the project. The feedback displayed that 92% of students who participated in the project enjoyed being part of it and that it helped them in gaining knowledge.

DISCUSSION:

There was a significant difference in marks of students who participated in the project and also attended lectures when compared to students who did not participate in the project or class. The students who agreed that they enjoyed being part of the project did not find any difficulty in finding material on the internet and were willing to participate in similar projects in the future. To conclude, project-based teaching and learning methods will aid in increasing interest and knowledge in the subject of Microbiology in medical students.

Keywords - Self-directed learning, Microbiology, project method of teaching, team-based learning, medical students

Introduction

Medical microbiology is a para-clinical subject taught in the second year of MBBS and a major part of it contains teaching through didactic theoretical lectures. This monotonous way of teaching and learning takes away the interest of students from the subject.¹The objectives of this study were to assess the effectiveness of the project method of teaching when compared to traditional teaching methods in Medical Microbiology to undergraduate medical students. This study also intended to assess self-directed learning in Medical Microbiology in undergraduate medical students, while using internet resources and to evaluate teamwork in students and effective use of WhatsApp application in team building during the project work.

Materials and Methods:

This study was interventional education research aiming to assess the effectiveness of the project method of teaching when compared to traditional teaching methods in Medical Microbiology to undergraduate medical students. A total of 162 students volunteered to get enrolled in this study. Consent for the study was taken by Google form online from each participant. The students were broadly divided into two groups of 81 students (Group A) and 81 students (Group B). Each of the groups was further divided into 20 small groups, 19 groups of 4 students, and one group of five students. Each small group selected a group leader who coordinated with the group members for the preparation of the project, research, and feedback. Group A students worked on a project on “COVID-19 vaccines”; Group B students worked on a project on “Prevention of the spread of COVID-19 in the community”. Instructions were given to each subgroup to use WhatsApp/mobile for communication with each other. Each group had a time limit of 1 week to complete the project and submit it to the staff assigned to that group. Each project had about 30 – 35 slides in Microsoft PowerPoint format. All members of the project were strictly instructed to refrain from copy-pasting from internet resources. Research for the project was done on the internet from relevant medical information websites and the same references were included in the PowerPoint submitted.

The power points were assessed based on content, creativity, recent updates, and references. The topics assigned for the project work were taught again by the traditional teaching method (didactic lecture) after the completion and submission of the projects. Assessment for the topic was conducted by MCQs and each participant was scored accordingly. Feedback from students

was collected regarding their experience during the project, whether they enjoyed being part of the project as a team, using online resources, and recall of content after each teaching method. The students were also asked to give feedback regarding the use of mobile phones and WhatsApp as good communication tools during the project and whether they will participate in similar projects in the future during their course. Results were calculated using statistical analysis by Microsoft Excel and SPSS software. Ethical approval from the institutional ethical committee was obtained before starting the study.

Results:

Out of 208 students in the second-year MBBS batch, a total of 162 (77.88%) students volunteered to get enrolled in this study. Consent for the study was taken by Google form online from each participant. The remaining 46 (22.11%) students who did not consent to the project stated various reasons for not participating in the study. The reasons for not participating in the project are displayed in Table 1.

Reason for not participating in the project	Number of students	Percentage
Network issues and slow internet	18	39.13%
No interest in the project	6	13.04%
Need to focus on study	5	10.86%
Personal issues	5	10.86%
No specific reason	12	26.08%

Table 1: Reasons for non-consent for the project

A total of 40 projects were submitted by the students and were evaluated based on a checklist created by the various faculty of Microbiology in our institute. The power points were scored out of 100 points based on content, creativity, recent updates, and references. Out of the forty groups, 16 groups scored between 61 to 80 points, 19 groups scored between 41 to 60 points and 5 groups scored between 21 to 40 points. The same is represented in the table below. (Table 2)

Points scored (Out of 100 points)	Number of Groups (40)	Percentage
0-20	0	0
21-40	5	12.5%
41-60	19	47.5%
61-80	16	40%
81-100	0	0

Table 2: Points scored by the groups in Power Points

The topics assigned for the project work were taught again by the traditional teaching method (didactic lecture) after the completion and submission of the projects. Out of 208 students studying in the second year, 157 (75.48%) attended the lecture, and the remaining 51 (24.51%) students did not attend the lecture. An MCQs test for 20 marks was conducted as an assessment for all the students on the topics given for the project and they were scored accordingly. Out of 208 students in the second-year batch, 188 (90.38%) attended the test and the remaining 20

(9.61%) students did not attend the test. The students who did not attend the test included 13(65%) male students and 7(35%) female students and were scored zero. These students were not included in the analysis of the results obtained. Fifty percent (10 marks) was considered as pass marks on the test. Ten members (5.31%) out of the 188 students scored 100% (20/20) marks on the MCQ test.

The marks obtained in the MCQs test of all 188 students were compared considering participation in the project and attendance for the lecture. Out of 188 students who took the test, 151 (80.31%) participated in the project, 23 (12.23%) students attended only lecture and did not participate in the project and 14 (7.44%) students did not participate either in the project or attended the lecture class. Among the 151 students who participated in the project, 126 (83.44%) students attended the lecture class and 25 (16.55%) students missed the lecture class. The marks obtained are displayed in Table 3.

Marks obtained (total 20)	Number of students who participated in project and lecture (total 126)	Number of students who participated in the project only (total 25)	Number of students who attended only lecture (total 23)	Number of students who neither participated in the project nor attended lecture (total 14)
0-5	0	0	0	0
6-10	0	0	0	2 (14.28%)
11-15	11(8.73%)	5 (20%)	8 (34.78%)	4 (28.57%)
16-20	115 (91.26%)	20 (80%)	15 (65.21%)	8 (57.14%)

Table 3: Marks obtained by the students in MCQs test

The average marks obtained by students who participated in the project only and who participated in the project and attended the lecture are 16.17 and 16.67 respectively. The average marks obtained by students who attended only lectures and students who did not participate either in the project or lecture are 14.36 and 10.05 respectively as displayed in Table 4. The students who participated in the project and attended the lecture class scored better than the other students. The ten students who scored 100% marks in the MCQs test took an active part in the project and attended the lecture class as well.

	Mean	Std. Deviation
Marks of project	16.17	4.620
Marks of the project with lecture	16.61	3.934
Marks of only lecture	14.36	4.872
Marks of none	10.05	7.781

Table 4: MCQs test marks

The comparison of assessment marks of the four groups of students; the students who participated in the project only, the students who took part in the project and attended lecture class, the students who attended only lecture, and the students who did not participate in the project nor attended class showed significant difference (P value <0.05) as demonstrated in Table 5. There was a significant difference in marks of students who participated in the project and also attended lecture class when compared to students who did not participate in the project or class. These students also scored better than the other groups of students.

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig. (P value)
Marks of project	Marks of the project with lecture	-0.441	0.544	0.850
	Marks of only lecture	1.813	0.998	0.267
	Marks of none	6.125*	1.077	0.001
Marks of the project with lecture	Marks of project	0.441	0.544	0.850
	Marks of only lecture	2.254	1.013	0.119
	Marks of none	6.566*	1.091	0.001
Marks of only lecture	Marks of project	-1.813	0.998	0.267
	Marks of the project with lecture	-2.254	1.013	0.119
	Marks of none	4.312*	1.375	0.010
Marks of none	Marks of project	-6.125*	1.077	0.001
	Marks of the project with lecture	-6.566*	1.091	0.001
	Marks of only lecture	-4.312*	1.375	0.010

Table 5: Comparison of marks of student groups

Feedback from 162 students was collected regarding their experience during the project, whether they enjoyed being part of the project as a team, using online resources, and recall of content after each teaching method. The students were also asked to give feedback regarding the use of mobile phones and WhatsApp as good communication tools during the project and whether they will participate in similar projects in the future during their course.

The students were asked to mark a Google form to give their feedback on various questions and they had to choose between "yes", "no" and "maybe" as their answers. The feedback of students who participated in the project is displayed in Table 6 below.

Feedback from students who participated in the project. (total 162)	Did you enjoy being part of this project?	Did you find this project useful in gaining knowledge regarding the assigned topics?	Did you like to work as a team?	Did you feel any difficulty in finding material on the internet?	Did you find the mobile phone and WhatsApp good communication tools during this project?	Would you take part in similar projects in the future?
Yes	149 (91.97%)	154 (95.06%)	144 (88.88%)	12 (7.40%)	143 (88.27%)	126 (77.77%)
No	2 (1.23%)	3 (1.85%)	4 (2.469%)	116 (71.60%)	9 (5.55%)	6 (3.70%)
Maybe	11 (6.79%)	5 (3.08%)	14 (8.64%)	34 (20.98%)	10 (6.17%)	30 (18.51%)

Table 6: Feedback from students who participated in the project

Based on the feedback of the students who participated in the project, Wilcoxon signed ranks statistical analysis was performed. The students who agreed that they enjoyed being part of the project also did not find any difficulty in finding material on the internet and were willing to participate in similar projects in the future.

The students who agreed that they liked to be a part of a team also said that they found the project work useful in gaining knowledge about the subject. The same students also gave feedback that they found WhatsApp and mobile phones as a good communication tools in this project. The statistically significant comparison of feedback is displayed in Table 7.

Feedback comparison groups		Z score	Asymp. Sig. (2-tailed) – P value
Did you feel any difficulty in finding material on the internet?	Did you enjoy being part of this project?	-9.971 ^b	0.001
Would you take part in similar projects in the future?	Did you enjoy being part of this project?	-4.080 ^b	0.001
Did you like to work as a team?	Did you find this project useful in	-2.582 ^b	0.010

	gaining knowledge regarding the assigned topics?		
Did you feel any difficulty in finding material on the internet?	Did you find this project useful in gaining knowledge regarding the assigned topics?	-10.890 ^b	0.001
Did you find mobile phones and WhatsApp as a good communication tools during this project?	Did you find this project useful in gaining knowledge regarding the assigned topics?	-2.015 ^b	0.044
Would you take part in similar projects in the future?	Did you find this project useful in gaining knowledge regarding the assigned topics?	-5.092 ^b	0.001
Did you feel any difficulty in finding material on the internet?	Did you like to work as a team?	-10.044 ^b	0.001
Would you take part in similar projects in the future?	Did you like to work as a team	-2.973 ^b	0.003
Did you find mobile phones and WhatsApp as a good communication tools during this project?	Did you feel any difficulty in finding material on the internet?	-10.086 ^a	0.001
Would you take part in similar projects in the future?	Did you feel any difficulty in finding material on the internet?	-7.702 ^a	0.001
Would you take part in similar projects in the future?	Did you find mobile phones and WhatsApp as a good communication tools during this project?	-3.105 ^b	0.002

Table 7: The statistically significant feedback of students who took part in the project

Discussion:

Out of 208 students in the second-year MBBS batch, 162 (77.88%) students volunteered to get enrolled in this study. The remaining 46 (22.11%) students who did not consent to the project stated various reasons for not participating in the study; network and internet issues (18, 39.13%) being the most cited reason. Twelve (26.08%) students did not state any specific reason for not consenting to the project work.

A total of 40 projects were submitted by the students who participated in the project work and were evaluated based on a checklist created by the various faculty of Microbiology in our institute. The power points were scored out of 100 points based on content, creativity, recent updates, and references. Out of the forty groups, 16 groups scored between 61 to 80 points, 19 groups scored between 41 to 60 points and 5 groups scored between 21 to 40 points.

The topics assigned for the project work were taught again by the traditional teaching method (didactic lecture) after the completion and submission of the projects. Out of 208 students studying in the second year, 157 (75.48%) attended the lecture, and the remaining 51 (24.51%) students did not attend the lecture. An MCQs test for 20 marks was conducted as an assessment for all the students on the topics given for the project and they were scored accordingly. Out of 208 students in the second-year batch, 188 (90.38%) attended the test and the remaining 20 (9.61%) students did not attend the test. The students who did not attend the test included 13(65%) male students and 7(35%) female students and were scored zero. These students were not included in the analysis of the results obtained. Fifty percent (10 marks) was considered as pass marks on the test. Ten members (5.31%) out of the 188 students scored 100% (20/20) marks on the MCQ test. The assessment of students in another study was done by comparison of pretest and post-test scores and the post-test marks of the team-based learning group were better compared to the self-study group⁴. This correlates with our study showing the significance of team-based learning in project work.

The marks obtained in the MCQs test of all 188 students were compared considering participation in the project and attendance for the lecture. Out of 188 students who took the test, 151 (80.31%) participated in the project, 23 (12.23%) students attended only lecture and did not participate in the project and 14 (7.44%) students did not participate either in the project or attended the lecture class. Among the 151 students who participated in the project, 126 (83.44%) students attended the lecture class and 25 (16.55%) students missed the lecture class.

There was a significant difference in marks of students who participated in the project and also attended lecture class when compared to students who did not participate in the project or class. The students who participated in the project also scored better than the other groups of students. The scores of the two groups were highly significant statistically in a study conducted by Suman Singh et al where they used application-based learning through hospital projects for teaching microbiology and the group which participated in the project work scored better.¹³ This is consistent with our study where the average marks of students who took part in project work were 16.67 compared to 10.05 for students who did not take part in the project.

Feedback from 162 students was collected regarding their experience during the project, whether they enjoyed being part of the project as a team, using online resources, and recall of content after each teaching method. The students were also asked to give feedback regarding the use of mobile phones and WhatsApp as good communication tools during the project and whether they will participate in similar projects in the future during their course. The students were asked to mark a Google form to give their feedback on various questions and they had to choose between "yes", "no" and "maybe" as their answers.

The students who agreed that they enjoyed being part of the project also did not find any difficulty in finding material on the internet and were willing to participate in similar projects in the future. The students who agreed that they liked to be a part of a team also said that they found the project work useful in gaining knowledge about the subject. The same students also gave feedback that they found WhatsApp and mobile phones as a good communication tools in this project. In a similar study, the majority of the students gave feedback that they enjoyed the project and such projects increases their interest in the subject of Microbiology.⁸

Conclusion

The comparison of performance in assessment shows that students who participated in the project and attended lecture class performed better than the students who did not participate in the project. The feedback responses of the participants displayed that 92% of the students who participated in the project enjoyed being part of it and also found that the project work helped them in gaining knowledge regarding the topic. More than 70 % of students did not find any difficulty in finding material on the internet and more than 80% found that mobile phones and WhatsApp aided as a good communication tool during this project. To conclude, project-based teaching and learning methods will aid in increasing interest and knowledge in the subject of Microbiology in medical students.

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