

Evaluating the Group Debate Activity as a Student-Centered Approach in Microbiology Course for PharmD Students: An Observational Study

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Background: Group debate is an educational strategy meant to equip undergraduate students with enhanced communication skills as well as the understanding of complex topics. Many controversial topics in the microbiological field pose challenges to the pharmacist's ability to attribute a specific opinion to its supported clinical evidence and to discuss these topics with confidence.

Methods: A total of 76 second-year pharmacy students who enrolled in a PharmD program participated in the group debate as part of the student assessment in microbiology course. The students prepared selected topics on controversial issues in microbiology, which were presented as a debate. Post-debate questionnaire was distributed to the students and used to measure student perceptions.

Results: The majority of the students (82.89%) demonstrated an improvement in their understanding of the topics after the debate. The highest percentage was recorded from one topic group (97.37%) which stated that they had improved understanding after the debate. About a third of the total students reported great improvement in their communication skills.

Conclusion: This debate group clearly provided the students with high confidence in presenting their arguments from relevant scientific information gathered from existing literature. It also enhanced their understanding of complex and controversial microbiology topics that will be needed during their pharmacy education.

Keywords: debate, microbiology course, student-centered activity, pharmacy education

Introduction

Instructors in various health disciplines are particularly aware of different learning capabilities of their students, thus the need for instructors to employ a scheme and implement unique, student-centered strategies covering both curricular and extracurricular activities, which proves most effective in the teaching/learning processes. In general, instructors need to change the traditional passive method of teaching and learning, in which the lecturers deliver the lesson verbally, give students a set of duties and activities, after which they provide them with a specific end-to-end evaluation. A study has demonstrated that passive learning has become less effective than the student-centered approach.¹ Shifting the role of the instructor to become a “guide on the side” in modern pedagogy helps students to manage their information and use critical thinking.² Many studies described the successful and effective application of student-centered and active learning approaches by faculty members in higher education.^{3,4}

The debate strategy in teaching is based on the idea of concentrating the minds on a specific problem, or issue, for organized study, with the intention of reaching a solution to the problem or reaching an opinion on the topic of the issue.⁵ To achieve that, an instructor or a fellow student will both introduce the topic and direct the group along the intellectual line in which the discussion proceeds until it reaches the desired solution.² The definition of ‘debate’, according to Hanna et al, is a formal discussion on a particular matter at a public meeting or legislative assembly, in which opposing arguments are put forward and which usually ends with a vote.⁶ It has been demonstrated that at the end of such debate sessions, the discussion engaged impacts each group member positively in different key-learning areas: 1) effective and

sound thinking, 2) continuous learning, 3) team spirit, 4) group working methods, 5) instructor–students interaction, 6) students–student interaction, including all the activities that lead to the exchange of views and ideas.^{4,7,8}

Group debates have been described as an educational forum designed to foster not only clinical reasoning and thinking skills but also in other fields of study, as well as boost awareness, attitudes, values, and beliefs while learning specific contents.⁹ This creates an atmosphere that provides participants with the advantage of being actively exposed to ideas and arguments they may not have encountered previously and an opportunity to deal with them. Equally, diversity of the views and perspectives of the group participants have been shown to facilitate an air of openness to the quality of opinions that they were not previously exposed to, while critically reflecting on personal views in the light of their own research.¹⁰ Effective preparation requires premeditating the arguments and opinions of the opponents and how you can respond,⁷ a reason for the students to critically examine both sides (proposition or opposition) of the topic in the group debate. Students will have to decide, whether to think about what the other team is going to come up with and what they are likely going to deal with, which then makes the student look at the whole picture rather than just focus on one thing (his/her own opinion).¹⁰ The debate or argument is the process of thinking that involves addressing issues of confrontation without clear answers. Bloom's classification identifies critical thinking and logical argument as higher thinking skills associated with evaluation skills for learners.^{11,12} Debate sessions typically feature discussions that give students the opportunity to demonstrate a more in-depth analysis of the existing issue, with emphasis on evaluation, criticism, and reflection on the issue in order to reach a potential solution. For example, healthcare workers often come up with new evidence, and the only way to separate the valid from the invalid opinion is to evaluate and critique the evidence.⁸ Group debate in such cases promotes active participation in the subject, thus exposing the student to new ideas, evidence, and data. It also creates an environment where each student has an equal opportunity to propose their own views on these ideas, identify the views of others, critically assess and discuss various relevant information. By challenging their own perspectives in the context of data that supports or disproves others' views, students can create new meaning by cognitively re-structuring an opinion.⁸ The meaning may also be developed within the group dynamics where members have the opportunity to share input and reach an agreement on ideas discussed. Active student participation is essential in structural pedagogy; however, student participation must be placed in a rigorous context that promotes understanding, analysis, and application of ideas and concepts. One of the ways students can develop skills is to apply a group approach to activities such as searching the existing literature, collecting admissible evidence from legitimate sources, defining the argument, formulating an opinion and presenting the results to a wider audience.⁷

Group debates are used in academic fields such as history, law, and literature as a way for students to discuss and express varying degrees of individual perspectives on a particular topic; but it has often been used in the health sciences.¹³ As a method of teaching, the fields of law, history, and literature have traditionally provided many topics for discussion. More recently, emerging technologies from disciplines like molecular biotechnology, medication, and vaccination development have changed the way students think about science. The introduction of current scientific issues in the classroom helps students connect science to everyday problems and use scientific evidence to critically assess societal challenges.¹⁴ The discussions that ensue during the debate between students provide a unique opportunity for students to get out of their comfort zone to experience situations they may not have otherwise enjoyed and change their minds.⁴ Group debate is effective in Microbiology courses to the undergraduate level by engaging them to the most recent topics in the field of microbial world and contribution to the disease on human which is the main objective of the course.⁴ The students acquired skills through prerequisite courses such as Biology and Physiology. Group Debate provides an air of open thinking as well as assesses scientific issues peculiar to both teams. This strategy was investigatively used as a tool designed as part of the student-centered strategy for the pharmacy students, which is applicable to both required and elective courses¹⁵ such as healthcare delivery course,¹⁶ ethics,^{6,17} and during journal clubs in advanced courses.^{18,19} These studies concluded that group debate has a positive impact on students' engagement and their evaluation as well as their ability to search, compare, gather and evaluate information from existing literature. Group debates in pharmacy education are a recommended strategy to enhance the skills of pharmacy students and it was noticed to be an underutilized teaching tool.¹⁹ Group debates were the type of activities that were not used in any other course in our pharmacy program at the time of this study. Group debate in this study was implemented as a teaching strategy, particularly in the Microbiology course for second-year pharmacy students. The aim of this study is to apply

a student-centered learning approach and evaluate the student's development of skills in both self and group learning, using group debate.

Methods

Participants

This study was conducted during the 2019 academic year with a sample of 76 female students, who are enrolled in the College of Pharmacy, Umm Al-Qura University. The student-centered group debate activity is a part of the Microbiology course content for the second-year students according to the PharmD curriculum, which was implemented for both males and females; however, this study conducted the perception of the female study group only since there is high segregation between male and female students in this university.

The Design and Setting for Debate Activity

The initial aspects of the activity cover the introduction of the list of topics by the instructor who also provides the instructions as outlined in Table 1, a sample of references/reference materials for guidance (n=3), dates for each debate. The instructor also divides the students into small groups of six or seven students, thus constituting individual debate group and finally giving each debater an active role. The list of topics provided for the students was selected by the instructor from the recent debatable topics in the microbiology field.

This debate is following the Oxford-style.⁷ The remainder of the students in the class are stationed as audience/listeners. The activity is designed in a way that the students present the opposing sides of a particular issue without the instructors' intervention. Each side of the debate is seen as credible and legitimate, and the audience students participate by critically evaluating the input from both sides (proponent and opponent) of each debates group.

Five roles are assigned to the student in each group; First is the team leader, who introduces the topics and coordinates the entire activity; the second role provides the guidelines and the policies from the formal policymakers and agencies; the third one acts as a scientist who provides the facts and statistics for the topic selected; the fourth role consists of one or two students who propose the point, while the fifth role consists of one or two students to oppose the point. Given the help and guidance provided, the students are then required to independently research the existing literature in order to collect information from legitimate sources, relevant to the preparations of the debate.

During the actual debate, the team starts with a presentation of the topic using digital slides or flashcards and gives an opening statement. Then the proposing group starts the argument and presents at least three verifiable points with valid references which should admissibly evidence, after which the opposing group is then allowed to counter these points with as much valid evidence as possible. Each team tries to persuade the others and the scientist starts to document the referenced/provided facts/evidence. In clarification, one of the students the policies, or any guidelines related to the topic as proposed by the global and/or the national policymakers. Lastly, the team leader summarizes the session with

Table 1 The List of Topics in Microbiology That Were Provided to the Debate Sessions

Topics	Number of Sessions
-Childhood vaccinations are compulsory and effective in eradicating childhood infectious diseases.	4
-The effect of using disinfectant (triclosan) in the development of antimicrobial resistance	1
-The benefit of probiotic for health	1
-The effect of seasonal Influenza vaccine	2
-The impact of food preservatives on health	1
-Using bacterial toxins for cosmetics purposes	1

a concluding remark and ends the debate session. Students from the audience could then ask the team any question and/or provide some feedback. This is the stage where the instructor steps in to finalize the session and distribute the prepared questionnaire to collect feedback from the students.

Debate Assessment

In terms of assessment, an instruction sheet detailing the assessment criteria (Table 2) was provided for evaluating student's communication skills and depth of knowledge. Marks were assigned based on the students' performance, communication skills, as well as their demonstration of accurate and in-depth knowledge of the subject as well as any referenced arguments. The first student is required to begin the assessment from the introductory part of the debate as presented in the slides or cards, then the instructor return immediate feedback in the form of suggestions to the students for revision at the end of the debate session. The assessment is performed to meet the one of the course objectives: "Cooperate and work with others during learning process along with using the appropriate references and microbiology related terminology". The mark allocated to this assessment was 20% of the total course assessment for each group (n=11) and each debate made for 15–20 minutes in duration. A full credit score was awarded to the team that can 1) present three points each from both the proposing and opposing group; 2) present verifiable references for the points; 3) demonstrate excellent teamwork; and 4) give a clear and concise concluding remark. These debate sessions were held during tutorial sessions hours due to the nature of the course timetable. Prior to the scheduled date for the actual event, students were allowed to hold tutorial sessions on selected dates after the midterm exam to provide the students with a solid background on the course basics and to collect the discussion references.

Post-Debate Questionnaire

Prior to the distribution of the debate session, a pre-information briefing was conducted for both the participant group and the audience, and informed consent was obtained with the ethical approval no. (HAPO-02-K-012-2021-06-691) and answering this questionnaire is an agreement for this participation in the study. After the debate session, the questionnaire was distributed, and responses were collected from the group audience. The questionnaire was designed to include two closed, 5 points Likert scale questions ranging from "strongly agree" to "strongly disagree" and two open questions adapted from the Shaw (2012) study with some modifications⁴ (Table 3). The data from the closed question was analyzed by determining the mean, standard deviation and percentage. The open questions were analyzed by categorizing the responses based on three items (improvement in communication skills, understanding the scientific evidences, improvement of their knowledge during the debate). These items were determined from the careful perceptions of the student's responses.

Results

More than third of the students responded with the option "strongly agree" to the question on the impact of the debate on the improvement of their understanding of the topics (46.1%). About one-third of the students (36.8%) agreed that their understanding of the topics improved and (10.5%) was neutral which indicated they had no benefit. Some of the students

Table 2 The Rubric for the Assessment of Each Student in the Team During the Debate

Student Name: Group	A – Presentation, Use of Scientific Language	B – Depth of Knowledge	C – Organization and Collaborating with Others in the Group	D – Development of Idea (Using Advanced and Recent Knowledge)	Total
	Was the student able to present the idea in a logical way and discuss the topic using microbiological aspects?	Did the student discussed the idea with a commendable depth of knowledge, prepared and research supported by scientific references?	Was the student able to organize and collaborate carefully with the others in the group?	Did the student develop the complex idea between the group and the formation of good arguments?	

Table 3 Post-Debate Questionnaire That Was Distributed in This Study

Questions	Response
1. Before the debate, how did you feel about the topic of the debate? Mark the best description that match your point of view.	Strongly agree with the defender Agree with the defender Neutral Agree with the objector Strongly agree with the objector
2. How did you feel about the topic after the debate?	Strongly agree with the defender Agree with the defender Neutral Agree with the objector Strongly agree with the objector
3. "This group debate improved my understanding of the topics that discussed during this activity" Please rate how did you feel regarding this statement	Open question
4. Please provide three things that you learned from this debate.	Open question

who experienced no improvement in their understanding of the assigned topics, responded with "disagree" (1.3%) and "strongly disagree" (5.3%).

Furthermore, the number of students that "strongly agreed" and "agreed" with the proposing group were both increased by 3.9% after the debate. And, 19.7% of the students with neutral opinion before the debate changed to express different side, thus the students who selected the "neutral" option decreased after the debate ($n=16$), whereas the number of the students that "agreed" and "strongly agreed" increased by 1.3% and 10.5%, respectively. The percentage of students' opinion both before and after the debate are illustrated in Figure 1.

Based on the debate topics, the percentage of the students who changed their opinion after the debate and thought that debate improved their understanding is illustrated in Table 4. This table shows that childhood vaccination groups were the highest percentage of students who changed their opinion after the debate (71.1%) and were the highest percentage of

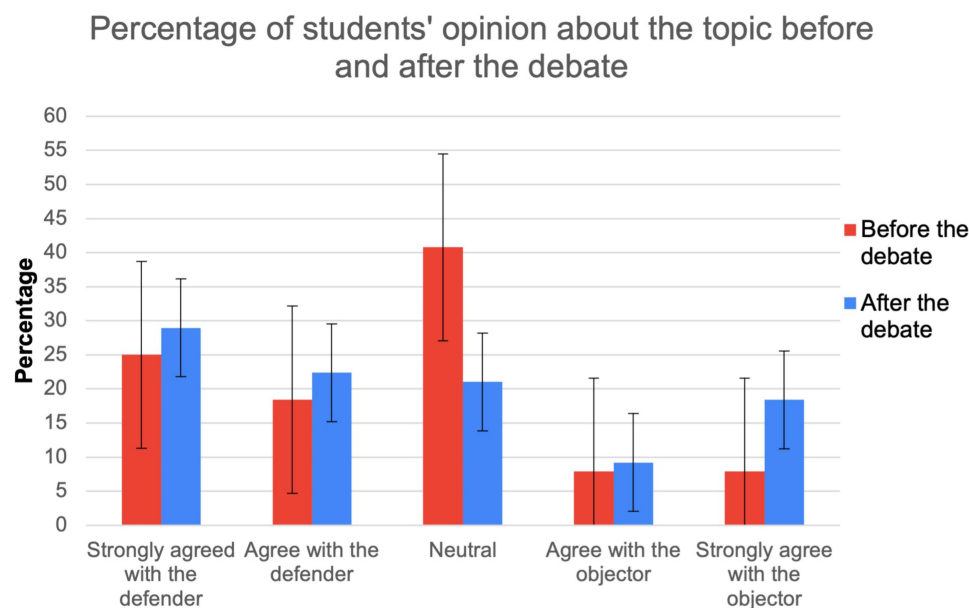


Figure 1 The percentage of the students that calculated from the questionnaire of post-debate measuring the students' perception before and after the debate in all sessions.

Table 4 The Percentage of the Students Who Changed Their Opinion and Improved Understanding of Each Topics

Topics	No. of Students	Percentage Students Who Changed Their Opinion from Before and After the Debate	Percentage of Student Who Thinks the Debate Improved their Understanding
Childhood vaccinations are compulsory and effective in eradicating childhood infectious diseases.	38	71.05	97.37
The effect of using disinfectant (triclosan) in the development of antimicrobial resistance	6	66.67	83.33
The benefit of probiotic for health	6	83.33	33.3
The seasonal Influenza vaccine	14	21.43	14.29
The impact of food preservatives on health	6	50	83.33
Using bacterial toxins for cosmetics purposes	6	83.33	83.33

students who agreed to an improved understanding of the topic (97.4%). The lowest percentage of the students that changed their opinion after the debate was from the group that discussed the influenza vaccine (21.30%). This same group scored the lowest percentage (14.3%) as well in the improvement of their understanding of the topic.

Generally, there are main three themes that respondents agreed they gained from this debate approach according to the three categories that defined after assessment of the open question's responses. More than third of the students (38%) have wrote that group debate enhanced the critical thinking by understanding how to search the evidences from scientific legitimate sources. About third of the students (33%) have commented that they gained improvement in their communication skills and (30%) wrote that this activity improved their understanding to the topics that involved in the activity. Some of the students' comments were mentioned in response to the open question such as "Useful. Effective for learning", "It enhanced my communication abilities. I acquired various skills including the ability to react and object using scientific evidences.", "It improved my expertise in searching and finding new information", "1. improve my communication skills. 2. improve my Critical thinking". However, there were only five students have not responded to the open-question part. A smaller group of students ($n = 5$) were not certain if the debate improved their knowledge acquisition, neither did they record any change in communication skills and we considered these responses as neutral (not positive nor negative). No absolute negative responses were received in this part. In general, many comments indicated that students enjoyed the arguments ensuing from the topics, which aided their comprehension of the topics.

Discussion

The debates provided a socio-scientific background for the evaluation of relevant issues in the microbiology field with more focus on medical and pharmaceutical microbiology. This debate activity was conducted as a field-assessment spanning three semesters by the same instructor in three microbiology courses in the College of Pharmacy. The reason why the study focused on female students was a result of the nature of segregation between the male and female students in this particular university. This study assessed only the female section for the outcome of only one semester for 76 students, covering various debate topics all of which were focused on the vaccination, antibacterial compounds in household disinfectants, probiotics and food preservatives.

For effectiveness in a discussion, students were required to present brief but relevant ideas, with more focus on the use of verbal communication, critical thinking and organizational skills. To convince their audience, the students must rely on a well-planned analysis of the arguments supporting or refuting their points of view. Students can discuss a situation without fear of exposing their personal views to their peers. It was noted that soft skills such as persuasiveness and teamwork were difficult to assess; however, knowledge and communication skills were easier by following the rubrics of assessment.²⁰

The majority of the students in this study "strongly agreed" that the debate exposed them to the benefits of research in gathering scientific evidence and also improved their understanding of the selected topics with relevant information. This

was indicated by the self-reflection clause in the open questions of the post-debate questionnaire. A total of 6 students reported an increased confidence in finding relevant information from existing literature. This positive outcome was also deduced from the self-reflection clause in the post-debate questionnaire, which is a common method for assessing the positivity of such activities.^{6,15,21} Some of the students' response demonstrated considerable empirical evidence that their abilities to review medical information, formulate an argument and work as part of a team improved greatly during the preparation for the debate as well as during the session.

Many positive comments from the students indicated the effectiveness of the debate sessions in introducing complex and controversial issues, which correspond with other studies.^{22,23} The study showed that the debate also enhanced learning and understanding of course content as noted from the students' responses. Engagement of the students during debates and enhancing the learning process was also stated in previous studies conducted at the higher education level.²⁴⁻²⁶ Pharmacy students responded positively when using debate as a teaching tool for improving communication skills, teamwork, critical evaluation of the literature and a better understanding of controversial issues.^{6,21}

Some of the groups demonstrated increased ability of persuasion and equally provided good scientific evidence in defending their opinion, while the other groups failed to present any evidence to back up or show the importance and the acceptability of their argument. The spotted variation in these groups may yet contribute to the lowest changes in opinion before and after the debate as presented in Table 4. Apparently, a few groups lacked credible scientific evidences as indicated in the strength of their arguments during the debate session. Some of the students among the low graded groups had difficulty in delivering their points to the audience and were often spotted reading from their slides or prepared cards with little or no eye contact with the audience. This performance was also noted in students from previous studies, which showed that the lack of evidences made the arguments weak, hence the students had difficulty in delivering the debate.⁴

Some limitations that faced the instructors during the implementation of the group debate approach. The main obstacle was the implementing of group debate approach that is totally new to student and they are in culture unfamiliar to present the opponent points presently to their colleagues. The debate strategy was never introduced to the students before this year (second year) and the educational environment still under improvement in regard to student-centered strategies. Another limitation was the number of students, which were low and only in one institution. This study is a foundational study that presents the experience of applying the group debate as strategy in our PharmD program initially to encourage other health-related programs in the medical colleges in the area from a culture do not embed a "debate" approach in their educational programs.

Conclusion

The inclusion and implementation of debate activity in microbiology course at the College of Pharmacy was acknowledged as being a helpful and favorable activity for the second-year students. The preparatory tutorial sessions held, enhanced the student's ability to research scientific literature and formulate collective convincing idea to defend their arguments against their colleagues in a respectable manner. This research showed that the debate exercise provided the students with a good background with a view to understanding complex topics in medical microbiology and infectious diseases, which are important parts of the pharmaceutical field, thus exposing them to current medical issues in real life. This debate activity even with the limitations during the adoption of this strategy in the course apparently engaged the students in the learning process and made them part of the learning procedures by employing the student-center model. It had also provided them with important self-learning tools for the early year of undergraduate studies and prepared them for such clinical situations where their knowledge will yet provide them with rich argumentative edge in the medical field. This student-centered approach presented here showed a powerful empowerment potential to both engage and immerse these undergraduate students, thus giving them an effective tri-functional (research, teaching and learning) role in the entire learning process.

Ethical Consideration

The study was conducted according to the guidelines in the Declaration of Helsinki and approved by the Ethics Committee of Umm Al-Qura (HAPO-02-K-012-2021-06-691).

Disclosure

The author reports no conflicts of interest in this work.

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