

RESEARCH ARTICLE

Small group effectiveness in a Caribbean medical school's problem-based learning sessions

P Ravi Shankar^{1*}, Atanu Nandy², Ramanan Balasubramaniam³, Soumitra Chakravarty⁴

Departments of ¹Pharmacology, ²Microbiology, ³Pathology, and ⁴Biochemistry, Xavier University School of Medicine, Aruba, Kingdom of the Netherlands

Abstract

Purpose: The Tutorial Group Effectiveness Instrument was developed to provide objective information on the effectiveness of small groups. Student perception of small group effectiveness during the problem base learning (PBL) process has not been previously studied in Xavier University School of Medicine (Aruba, Kingdom of the Netherlands); hence, the present study was carried out. **Methods:** The study was conducted among second and third semester undergraduate medical students during the last week of September 2013, at Xavier University School of Medicine of the Netherlands. Students were informed about the objectives of the study and invited to participate after obtaining written, informed consent. Demographic information like gender, age, nationality, and whether the respondent had been exposed to PBL before joining the institution was noted. Student perception about small group effectiveness was studied by noting their degree of agreement with a set of 19 statements using a Likert-type scale. **Results:** Thirty-four of the 37 (91.9%) second and third semester medical students participated in the study. The mean cognitive score was 3.76 while the mean motivational and de-motivational scores were 3.65 and 2.51, respectively. The median cognitive category score was 27 (maximum score 35) while the motivation score was 26 (maximum score 35) and the de-motivational score was 12 (maximum score 25). There was no significant difference in scores according to respondents' demographic characteristics. **Conclusion:** Student perception about small group effectiveness was positive. Since most medical schools worldwide already have or are introducing PBL as a learning modality, the Tutorial Group Effectiveness Instrument can provide valuable information about small group functioning during PBL sessions.

Key Words: Program evaluation; Medical education; Problem-based learning; Educational measurement

INTRODUCTION

Group work plays an important role in problem base learning (PBL) and is critical to its success [1]. Ensuring small groups are effective and functioning is critical to the success of a PBL program. Interactions within the small group provide students with opportunities to ask questions, receive explanations, and discuss disagreements, which can lead to a deeper understanding of the subject matter [2]. Group learning environments

like PBL also have to deal with dysfunctional groups and ritual behavior where students pretend to be actively involved in group work while in reality they are not so engaged [3]. Dolmans et al. [4] found a linear relationship between the success of the small group and several motivational and cognitive dimensions. Students' backgrounds and cultures can also influence both the motivational and cognitive dimensions and the success of the small group [5]. Attention should also be focused towards students who respond negatively to group work as they may be an important contributing factor to group dysfunction [6].

The Tutorial Group Effectiveness Instrument (TGEI) was developed to provide objective information on the effectiveness of small groups in the tutorial process [1]. TGEI appeared

*Corresponding email: ravi.dr.shankar@gmail.com

Received: January 8, 2014; Accepted: March 18, 2014;

Published: March 24 2014

This article is available from: <http://jeehp.org/>

to provide valid and reliable factor scores. According to the authors, their PBL groups were mixed and well balanced and their findings may be generalizable towards other PBL curricula. The instrument was developed based on the motivational and cognitive perspectives involved in small group PBL [7] and some items in the instrument were modified from the study by Dolmans et al. [3]. Student perception of the effectiveness of small groups during the PBL process has not been previously studied at Xavier University School of Medicine (XUSOM), Aruba, Kingdom of the Netherlands. Hence the present study was carried out to obtain information about student perception of PBL small group effectiveness at XUSOM.

METHODS

PBL program at Xavier University School of Medicine

XUSOM is a private medical school. Students in the undergraduate medical (MD) course are mainly from the United States (US) and Canada [8]. In the summer 2013 semester, which commenced on the first Monday of May, the school shifted to an integrated organ system-based curriculum. The first five semesters of the MD program are in Aruba and students complete their clinical rotations in the US. Normal human structure and function are taught during the first two semesters, abnormal human structure and function during semesters 3 and 4, followed by a hybrid curriculum. During the MD 5 semester students mainly prepare for the step 1 United States Medical Licensing Exam (USMLE), take various exams, and participate in live online lectures. They also prepare for the clinical semesters and further develop their clinical skills through interaction with standardized patients. The major learning methodology during semesters 1 to 4 is didactic lectures, though recently faculty have been motivated to make the sessions more interactive through training workshops. PBL sessions are conducted for approximately twelve weeks during the fifteen-week semester. The first session concentrates on identifying the learning objectives and analyzing and working on the problem, while during the second session each group makes a presentation according to the learning objectives they established in the first session. The facilitator evaluates students and provides feedback to further improve the group dynamics. Most topics covered during the PBL session have already been covered during the didactic lectures but at least two topics are new. Six disease conditions are covered during each semester for the different cohorts of students. The PBL sessions primarily focus on learning objectives from anatomy, physiology, biochemistry, history taking, and social issues during the first two semesters and, during the next two, on pathology, microbiology, pharmacology, clinical examina-

tion skills, social issues, and diagnosis. Student performance during the small group sessions is assessed using a standardized instrument. The small groups and the faculty facilitator are kept constant over all four semesters.

Subjects

The study was conducted among second and third semester undergraduate medical students at XUSOM during the last week of September 2013. The study was approved by the Institutional Review Board vide notification number XUSOM/IRB/2013/08. The students were explained the objectives of the study and invited to participate. Written permission was obtained from Dr. Singaram, the first author of the instrument [1]. Written informed consent was obtained from all participants.

Study design

Student perception of small group effectiveness during the PBL sessions was assessed using the TGEI developed by Singaram et al [6]. By the time the instrument was administered, respondents had completed six PBL sessions. The questionnaire used is shown in the Appendix. Demographic information like gender, age, nationality, and whether the respondent had been exposed to PBL before joining XUSOM was noted. Student perception about small group effectiveness was studied by noting their degree of agreement with a set of 19 statements using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Student perception of overall group productivity was scored from 1 (insufficient) to 5 (excellent). The cognitive aspects were calculated by adding the scores of statements 1 to 7, motivational aspects by summing the scores of statements 8 to 14 and demotivational aspects by adding the scores of statements 15 to 19. Free text comments about PBL were invited from the respondents and common ones were tabulated.

Statistical analysis

The median scores were calculated and compared among different subgroups of respondents using appropriate nonparametric tests. The Mann-Whitney U test was used to compare medians where the respondents could be divided into two subgroups (for example, by gender) while the Kruskal-Wallis test was used where the respondents could be divided into more than two categories (for example, by nationality). A P-value of less than 0.05 was taken as statistically significant.

RESULTS

Thirty-four of the 37 (91.9%) second and third semester students participated in the study. The final numbers did not reach

34 since some respondents did not provide complete information about their demographic characteristics. More respondents were male, of American nationality, and had not been exposed to PBL before joining the institution (Table 1). The median score for statements one to ten, statements 12 to 15, and statement 20 (overall rating of group productivity) was four. The median score for statement 11 (The small group stimulated my self-study activities) was 3.5 while the score for statements 16 to 19, which dealt with demotivational aspects was 2. The mean cognitive score was 3.76 while the mean motivational and demotivational scores were 3.65 and 2.51, respectively.

The median cognitive category score was 27 (maximum score 35) while the motivation score was 26 (maximum score 35) and the demotivational score was 12 (maximum score 25).

Table 1. Demographic characteristics of respondents*

Characteristic	No. (%)
Gender	
Male	19 (55.9)
Female	11 (32.4)
No response	4 (11.8)
Age (yr)	
20-25	14 (41.2)
More than 25	13 (38.2)
No response	7 (20.6)
Nationality	
American	15 (44.1)
Canadian	8 (23.5)
Others	3 (8.8)
No response	8 (23.5)
Previous exposure to problem-based learning	
Yes	5 (14.7)
No	24 (70.6)
No response	5 (14.7)

Table 2. Cognitive category scores according to demographic characteristics of respondents

Characteristic	Median score (maximum 35)	P-value
Gender		0.987
Male	27	
Female	25	
Age (yr)		0.212
20-25	26.5	
More than 25	28	
Nationality		0.207
American	26	
Canadian	27.5	
Others	25	
Previous exposure to problem-based learning		0.619
Yes	27	
No	28	

Table 2 shows the cognitive category scores according to respondents' personal characteristics. There was no significant difference in scores according to respondents' demographic characteristics. Tables 3 and 4 show the motivational and demotivational scores according to respondents' characteristics. The difference in median scores was not statistically significant. Analyzing the individual statements contributing to the median score, the score for statement 15 'During the course of the PBL some group members contributed less to the group discussion' was 4 while the median scores for the other statements (16 to 19) was 2. This was a problem that had been noticed in certain groups and counseling and support was provided to the group members by the facilitator and the PBL director.

There were positive comments: *PBL sessions are very effective in a small group setting and heightens our overall learning;*

Table 3. Motivational category scores according to demographic characteristics of respondents

Characteristic	Median score (maximum 35)	P-value
Gender		0.364
Male	25	
Female	27	
Age (yr)		0.326
20-25	27	
More than 25	28	
Nationality		0.963
American	26.5	
Canadian	25	
Others	22	
Previous exposure to problem-based learning		0.069
Yes	21	
No	27	

Table 4. Demotivational category scores according to demographic characteristics of respondents

Characteristic	Median score (maximum 35)	P-value
Gender		0.484
Male	12	
Female	11	
Age (yr)		0.911
20-25	11.5	
More than 25	14	
Nationality		0.709
American	13	
Canadian	10	
Others	13	
Previous exposure to problem-based learning		0.680
Yes	10	
No	12	

PBL is great!; PBL helps me study for classes; I learn more by doing research and reading than I do in the class room; and I would like more PBL sessions. Meanwhile there were also negative comments: not a fan of PBL, communication skills learning, and other such stuff; and not everyone puts in the same time and effort.

DISCUSSION

Student perception about small group dynamics during the PBL sessions at the institution was good overall and there were opinions that the PBL process and small group dynamics contributed to their learning. Research has shown that there are two theoretical perspectives on group learning. The first is a theoretical one while the second is related to motivation [9]. During small group processes like PBL, interactions between group members facilitate learning. A recent review concluded group discussion positively influences students' intrinsic interest in the subject matter under discussion [10]. The authors also concluded that studies demonstrate that a haphazard discussion in the tutorial group or a 'surface' discussion, probably caused by students being less motivated, inhibits student learning. A recent study that examined the verbal interactions of one group of PBL students during an entire PBL cycle concluded that 53.3% of episodes were collaborative, 27.2% were self-directed, while 15.7% were constructive [10]. A PBL group motivates its members to exert maximum effort because a member can attain his/her personal goals only if the group succeeds, so group members help each other because it is in their own interest to do so [4]. The group provides students an opportunity to discuss, argue, present and hear each other's viewpoints and they obtain an opportunity to explain their concepts and what they have learned to others in their group, which stimulates learning. The motivational domain is concerned with the extent to which students show concern, motivate, and help each other learn while the demotivational domain deals with the extent to which non-participation of students in the group processes affects learning.

TGEI was developed to create a better understanding of well-functioning and problematic PBL groups and to help facilitators and students develop and implement strategies to improve group functioning during PBL [1]. In the study conducted at KwaZulu-Natal, South Africa the mean cognitive, motivational, and de-motivational scores were 3.12, 3.32, and 3.17 respectively [1]. In our study the mean cognitive score was 3.76 while the mean motivational and de-motivational scores were 3.65 and 2.71, respectively. The cognitive and motivational scores were higher while the de-motivational score was lower. The sample size of our study was much smaller than that in the South African study and the student population

may have been more homogeneous. At XUSOM, the majority of students are of South Asian origin, although they are now US or Canadian citizens.

The strength of the study was the high response rate; however, the sample size was small. Not many studies have been conducted using TGEI. The information obtained using TGEI was not triangulated with that obtained from other sources. Many respondents did not complete all demographic details and so the validity of the information about the influence of gender, nationality, and age on student perception of the small group process could be compromised. This was not a problem during a previous study [11], and it is possible that the small student size at XUSOM made students apprehensive about being identified. The median score for statement 15 about other group members contributing less to the discussion was high and we did not enquire about possible reasons for this during the study.

In conclusion, student perception about small group effectiveness was positive. No major problems were noted but one of the groups had problems with small group dynamics, which was resolved. PBL at XUSOM is still new and sessions have been conducted for only six months. Further studies as PBL progresses and all cohorts of undergraduate medical students have weekly PBL sessions will be required. As most medical schools worldwide already have or are introducing PBL as a learning modality, TGEI can provide valuable information about small group functioning during PBL sessions.

ORCID: P Ravi Shankar: <http://orcid.org/0000-0001-6105-5636>; Atanu Nandy: <http://orcid.org/0000-0002-2188-4453>; Ramanan Balasubramaniam: <http://orcid.org/0000-0002-3111-5383>; Soumitra Chakravarty: <http://orcid.org/0000-0002-3087-8469>

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

SUPPLEMENTARY MATERIAL

Audio recording of the abstract.

ACKNOWLEDGMENTS

The authors would like to acknowledge Ms. Veena Singaram, Nelson Mandela School of Medicine, South Africa for giving us permission to use the Tutorial Group Effectiveness Instrument for the study. Ms. Liza Koolman entered the data into SPSS and her help is gratefully acknowledged. The help of

Mr. Barry Adunmo, information technology director, is also acknowledged.

REFERENCES

1. Singaram VS, Van Der Vleuten CP, Van Berkel H, Dolmans DH. Reliability and validity of a Tutorial Group Effectiveness Instrument. *Med Teach*. 2010;32:e133-e137. <http://dx.doi.org/10.3109/01421590903480105>.
2. Visschers-Pleijers AJ, Dolmans DH, Wolfhagen IH, Van Der Vleuten CP. Development and validation of a questionnaire to identify learning-oriented group interactions in PBL. *Med Teach*. 2005;27:375-381. <http://dx.doi.org/10.1080/01421590500046395>
3. Dolmans DH, De Grave W, Wolfhagen IH, Van Der Vleuten CP. Problem-based learning: Future challenges for educational practice and research. *Med Educ*. 2005;39:732-741. <http://dx.doi.org/10.1111/j.1365-2929.2005.02205.x>
4. Dolmans DH, Wolfhagen IH, Van Der Vleuten CP. Motivational and cognitive processes influencing tutorial groups. *Acad Med*. 1998;73:S22-S24.
5. Carlo MD, Swadi H, Mpofu D. Medical student perceptions of factors affecting productivity of PBL tutorial groups: Does culture influence the outcome? *Teach Learn Med*. 2003;15:59-64. http://dx.doi.org/10.1207/S15328015TLM1501_11
6. Singaram VS, Dolmans DH, Lachman N, Van Der Vleuten CP. Perceptions of problem-based learning (PBL) group effectiveness in a socially-culturally diverse medical student population. *Educ Health (Abingdon)* 2008;21:116.
7. Slavin RE. Research on cooperative learning and achievement: what we know, what we need to know. *Contemp Educ Psychol* 1996;21:43-69.
8. Shankar PR, Dubey AK. 'Modernizing' the Basic Sciences MD program at XUSOM, Aruba. *WebmedCentral Med Educ*. 2013;4(4):WMC004198. http://www.webmedcentral.com/article_view/4198
9. Dolmans DH, Schmidt HG. What do we know about cognitive and motivational effects of small group tutorials in problem-based learning? *Adv Health Sci Educ Theory Pract*. 2006;11:321-336.
10. Yew EH, Schmidt HG. Evidence for constructive, self-regulatory, and collaborative processes in problem-based learning. *Adv Health Sci Educ Theory Pract*. 2009;14:251-273. <http://dx.doi.org/10.1007/s10459-008-9105-7>.
11. Shankar P, Gurung S, Jha N, Bajracharya O, Karki B, Thapa T. Small group effectiveness during pharmacology learning sessions in a Nepalese medical school. *Australas Med J*. 2011;4:327-331. <http://dx.doi.org/10.4066/AMJ.2011.662>.

Appendix. Questionnaire used for the student perception of small group effectiveness during problem-based learning (PBL) sessions

Gender: M/F Age: Nationality:

Have you been exposed to PBL before joining XUSOM? (Yes or No)

Indicate your degree of agreement with the following statements according to the scale provided below: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

1. During the session, many explanations of the subject content were given by individual students
2. In the session, group explanations of the subject content were given in own words
3. Students posed adequate questions to each other to obtain a deeper understanding of the subject matter.
4. Students asked critical questions to check the explanations of content given by other students
5. In the small group, I learnt much from the contributions of the other group members
6. In the small group, misconceptions about the subject matter were corrected by other group members.
7. Group members built on each other's arguments.
8. I felt myself as a member of the group responsible for the progress of the group.
9. If I did not prepare well for the small group meeting, I felt uncomfortable in the group.
10. I became more perceptive and sensitive to the needs of the other students within my group during group work.
11. The small group stimulated my self-study activities.
12. The group had a positive effect on my academic commitments/efforts.
13. My interest in the subject matter increased due to the discussions in the small group.
14. The small group discussion stimulated my group members to exert maximum effort.
15. During the course of the session, some group members contributed less to the group discussion.
16. Some group members intentionally withheld information they had acquired during self-study.
17. I did not contribute as much as to the small group discussion as I could have.
18. Some group members had a negative effect on the contributions of other group members.
19. Some group members let others do the work.
20. Give a qualification for the overall group productivity (overall score) (1-insufficient, 2-reasonable, 3-sufficient, 4-good, 5-excellent)

Any other comments:

Thank you for completing the questionnaire!