

ASSESSMENT OF IMPACT OF SMALL GROUP TEACHING OVER DIDACTIC LECTURES AND SELF-DIRECTED LEARNING AMONG SECOND YEAR BDS STUDENTS IN GENERAL AND DENTAL PHARMACOLOGY IN GOA MEDICAL COLLEGE.

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Abstract

This study was conducted to assess the impact of small group teaching (SGT) in pharmacology among the second year dental students and also to analyze the feedback to identify intricacy for better learning in future. SGT encourages the students in their studies, enhances the process of deep learning and the, moreover students are actively involved in entire learning cycle.

Although the didactic lecture format may be effective for providing large body of information to a large number of students, it presents many challenges to both teachers and learners, because it often promotes passive learning and fails to motivate students. Altogether we conducted 3 MCQ tests on the topic 'aminoglycosides and beta-lactam antibiotics' among second year BDS. First after didactic lectures, second after allowing one week time for SDL and third after 2 days of SGT. After SGT, students achieved significantly higher scores in MCQ test with minimum score of 18 (45%) and maximum score of 38 (95%). Mean marks scored by the students in MCQ test after didactic lectures, SDL and SGT were 11.13, 20.26 and 31.46 respectively which was statistically significant ($p=0.0001$).

Considering 20 marks (i.e. 50%) required for passing, none of the students cleared the test after didactic lectures while 60% students passed following SDL, whereas after SGT percentage of students passing increased to 93%. The difference in percentage of improvement after SDL and SGT as compared to didactic lectures is 22.83% and 50.83 respectively. In feedback majority (93%) of students believed that SGT helped them in answering MCQ test while 87% of students reported that their learning improved after SGT. 13% students thought that, SGT improved retention of knowledge which ensures better performance in exam. The introduction of SGT as active learning tool was appreciated by students. SGT can be considered as a comprehensive tool for productive academic achievement, strategy for dynamic and collaborative learning both in basic and clinical medical science.

Small group teaching and learning sessions offer active participation of learners, increase the teamwork ability, help in retention of knowledge, increase student interest, and improve critical skills. SGT helps to develop self-motivation, deep learning, interpersonal and communication skills, and enhances student-faculty and peer-peer interaction.

Key words: Didactic lectures, Self-directed learning (SDL), Small group teaching (SGT), Multiple choice questions (MCQ)

Introduction

In the era of explosion of information, students are over burdened with ever-increasing academic load making learning painful instead of delight. The global trend towards rationalizing teaching-learning process is gathering momentum toward dynamic mindset instead of traditional didactic lectures [1].

There can be no single best way of learning in medicine and so also the pharmacology, since each method has its own merits and demerits [2]. For medical teachers around the world, teaching duties have expanded beyond the classroom and include teaching small groups, assessment, providing instructional materials beyond the syllabus, problem-based learning, learner-centered teaching, clinical teaching on the fly and the list goes on [3]. Medical schools are also changing their educational programs and teaching strategies, at national and international levels, to ensure that students have active responsibility for their learning process and are prepared for life-long, self directed learning [4].

Although the didactic lecture format may be effective for providing large body of information to a large number of students, it presents many challenges to both teachers and learners because it often promotes passive learning and fails to motivate students [5]. Therefore, over the past few decades, a lot of attention has been paid to promoting active learning by adopting interactive student-centered approaches in medical education, including problem based learning (PBL) and case-based learning (CBL) [6-7]. Active learning is a student-centered rather than a teacher-centered process; it makes learner responsible for their own learning by self-directed, peer-assisted seeking new information [8].

The effort toward developing active learning was based on meaningful learning which ensures understanding and applying concepts rather than memorizing only which is rote learning [9]. Meaningful learning involves the acquisition of "useful knowledge" so that it can be accessed from different starting point and has to correlate with previous knowledge with multiple representations [10].

We have used small group teaching (SGT) method to improve learning in second year BDS students because, small group teaching and learning has achieved an admirable position in medical education and has become more popular as a means of encouraging the students in their studies,

and enhance the process of deep learning [11].

SGT may be defined as process of learning that take place when students work together in groups of 8-10 [12-13], in which group of learners demonstrate three common actions; active participation, a specific task and reflection [14]. The small group, case-based learning approach is believed to be a useful strategy for facilitating interprofessional learning and interaction factors are said to have a significant effect on student interest, learning and satisfaction with such approaches [15]. The most important characteristics of small group teaching are active involvement of the learners in entire learning cycle and well defined task orientation with achievable specific aims and objectives in a given time period [12].

SGT develops self-motivation, allows student to test their thinking and higher-order activities. It also facilitates acceptance of personal responsibility for own progress. Moreover SGT enhances student-faculty and peer-peer interaction, improves communication skills and provides opportunity to share the responsibility. It promotes transferable skills such as leadership, teamwork, organization, prioritization and encouragement to others, problem solving, and time management skills [14-16-16].

We conducted a study to assess the impact of SGT in pharmacology among the second year dental students and also to analyze the feedback from them to identify intricacy so that better learning can be facilitated in future.

Methods

This study was undertaken in the month of April 2014 among the supplementary batch of 15 undergraduate students of second year BDS in General and Dental Pharmacology, studying at Goa Medical College, Bambolim-Goa, India which is a tertiary care teaching hospital. As the batch was small, we did not divide it further but considered 15 students as one small group for our convenience. The General and Dental Pharmacology teaching learning is done for one year from August to July in 2 semesters and at the end of the second semester, the students have to appear for the second BDS university examination for summative evaluation. The necessary approval was taken from the Institutional Ethics Committee and departmental head. The students were explained the purpose of the study and its usefulness for academic improvement along with the scope of future intervention.

We conducted a test I, comprising predesigned multiple choice questions (MCQ) after completion of didactic lectures on aminoglycosides and beta-lactam antibiotics. MCQs were drafted on the topics "aminoglycosides and beta-lactam antibiotics" at the Department of Pharmacology, Goa Medical College, Bambolim-Goa with the assistance of the faculty members. Later on students were allotted one week time for self-directed learning (SDL) and test II on the same MCQs was repeated at the end of the week. Following this we used SGT method and after two days, test III was conducted with the same MCQ used for test I and test II.

The marks obtained in MCQ test after self-directed learning (test II) and SGT (test III) were compared with the marks obtained after didactic lectures (test I). Students were asked to provide feedback on the SGT session at the end of the third test. The findings of all the three tests were discussed with the faculty and students at the end of the study.

Statistical analysis

The collected data was thoroughly screened and entered into Microsoft Excel 2007 spreadsheets and analysis was carried out using SPSS version 15.0. The comparison of mean marks after didactic lectures (test-I), SDL (test-II) and after using SGT (test-III) was made using Repeated Measure ANOVA by Green House-Geisser method. A p-value less than 0.05 were considered statistically significant.

Results

Following are the results obtained after comparing the MCQ scores of test I, test II and test III.

Considering 20 marks (i.e. 50%) required to pass the test, the minimum score obtained in MCQ test by students after didactic lectures was 5 (13%) while maximum score was 18 (45%). After self-directed learning minimum and maximum score obtained was 10 (25%) and 34 (85%) respectively. Whereas after SGT, students achieved significantly higher scores in MCQ test with minimum score of 18 (45%) and maximum score of 38 (95%) which clearly shows that, SGT helped the students to understand the topic in depth and retain the knowledge as well. Considering 20 marks (i.e. 50%) required for passing, none of the students cleared the test after didactic lectures while 60% students passed following SDL, whereas after SGT percentage of students passing increased to 93% with the significant improvement difference of 28% as compared to SDL.

The difference in percentage of improvement after SDL and SGT as compared to didactic lectures is 22.83% and 50.83 respectively, which suggests that SGT creates the perfect environment for learning and discussion. It increases the student interest, team work ability, retention of knowledge and enhances transfer of concepts to innovative issues, which may not be possible in SDL as few queries may remain unsolved. The exercise was effective and equally beneficial for low, medium and high achievers. Majority (93%) of students believed that SGT helped them in answering MCQ test and all the students (100%) wanted more such sessions in the future. 87% of students reported that their learning improved after SGT. Though SGT was rated good by 27% of students, 20% students considered that SGT largely helped them to clear their doubts. 13% students thought that, SGT improved retention of knowledge which ensures better performance in exam while according to 7% of students SGT could also increase thinking skills and concentration.

Discussion

Teaching methods which increase student motivation and enhance learning have evolved throughout history. However, the introduction of an interactive student-centered approach in medical education has dramatically changed the way students learn [1].

Our primary goal of introducing SGT oriented session in General and dental pharmacology for II BDS students was to promote student learning by improving their motivation and engagement. The SGT session was carried out to analyze the difference in students' performance in examination as compared to didactic lectures and self-directed learning. By and large, our data demonstrated that all the students (100%) accepted this innovative technique and wanted to have more such sessions. Most of them (87%) also reported that SGT improved their learning skills. The findings of the current investigation are consistent with positive results demonstrated by other studies which examined impact of CBL on medical education [1-18-19].

Our data showed that students' reaction to SGT was overwhelmingly positive as most students believed that this interactive approach boosted their learning and should be implemented more frequently as also similarly observed by Yasin in CBL [2].

In line with our findings, Yasin in their studies reported improved team-work and communication skills as a result of participating in the small group discussions [2]. Similar findings have also been

reported by Ciraj et al on their implementation of CBL in a microbiology course [20].

The effects of SGT on learning motivation in II BDS students in our study was high which is consistent with study by Yoo et al on CBL in nursing students [21]. There is general consensus about better learning in small groups in terms of deeper understanding, critical thinking, problem solving skills [21] and better student satisfaction [1-22-23] but not in terms of factual knowledge and assessment scores [24-25].

In our study we observed that SGT provides opportunity for meaningful learning and improves students' knowledge acquisition and retention as concluded by Rendas et al in a study in the New University of Lisbon in creative methods in PBL and concept map in SGT [9] and Peets AD et al in the University of Calgary in the study on the effects of teaching on learning outcomes of peer educators that involve SGT [26].

McKimm J. et al report that SGT is an effective method in encouraging student engagement and discussion [27]. According to Chan LK et al, introduction of small group teaching in gross anatomy had a significant positive impact on the academic achievement of students in anatomy [28], which seems to be similar as per the feedback by the students in our study where 13% of students reported that, SGT improved retention of knowledge and this was converted into better performance in exam. SGT (i.e. tutorial, seminar, or small problem-solving class) is uniquely suited to transformative change as the ultimate goal of education. The small group can be fertile environment for both individual and group development on both personal and professional levels by recognizing the unique needs of small group facilitation, and developing necessary faculty skills, and by modeling thoughtful preparation, reflective execution and perceptive feedback [29].

Evidence suggests small group productivity depends on good facilitation rather than on topic knowledge. Good SGT creates the perfect environment for learning and discussion. SGT emphasizes the role of students in sharing and discussing their ideas in a safe learning environment, without domination by the tutor [30]. As mentioned in the feedback form, all the students (100%) wanted to have similar exercise in future. These findings may be considered in line with findings by Cendan et al where in students reported more satisfaction with the small group teaching environment [31]. Hofer M

et al in their study concluded that, modern practice-oriented SGT will provide high quality results even with large number of students [32].

Limitations

Though 8-10 students in a group are generally considered as a small group, our study involved 15 students from supplementary batch of second BDS. But we did not divide them further into small group for our convenience. This factor may limit the generalization of this study's results.

Conclusions

Despite limitations, the results of our study clearly indicate that small group discussions lead to better cognitive learning as compared to didactic lectures and SDL in undergraduate second BDS general and dental Pharmacology students. The introduction of SGT as active learning tool was appreciated by students and led to a significant improvement in students' self reported satisfaction, engagement and motivation.

SGT can be considered as a comprehensive tool for productive academic achievement, strategy for dynamic and collaborative learning both in basic and clinical medical science. Small group teaching and learning sessions offer active participation of learners, increase the teamwork ability, help in retention of knowledge, enhance transfer of concepts to new problems, increase student interest, and improve critical skills. SGTs help increased self-identification of lacunae by students and promotion of instant resolution of confusion and learn the art of holistic problem solving approach.

SGT helps to develop self-motivation, deep learning, interpersonal and communication skills, and enhances student-faculty and peer-peer interaction which are important in their later education and career. With the encouraging results on constructive gains and acceptability by the students, we hope to continue small group teaching method, in near future.

References

1. Ranabir Pal, Sumit Kar, Forhad Akhtar Zaman, et al. Assessment of impact of small group teaching among students in community medicine. *Indian J Community Med.* 2012 Jul-Sep; 37(3):170-173
2. Yasin I. Tayem. The impact of small group case-based learning on traditional pharmacology teaching. *Sultan Qaboos univ Med J.* 2013 Feb; 13(1):115-20
3. Ramani S. Twelve tips to promote excellence in medical teaching. *Med Teach.* 2006 Feb; 28(1):19-23
4. West DC, Powerory JR, Park JK, Gerstenberger EA et al.

- Critical thinking in graduate medical education: A role of concept mapping assessment? *JAMA*. 2000; 284:1105-10
5. Sprawls p. Evolving models for medical physics education and training: a global perspective. *Biomed Imaging intervention J*. 2008; 4:e16.
 6. Husain A. Problem-based learning: A current model of education. *Omen Med J*. 2011; 26:295.
 7. Srinivasan M, Wilkes M, Stevenson F et al. Comparing problem-based learning with case-based learning: effects of a major curricular shift at two institutions. *Acad Med*. 2007; 82:74-82
 8. Ozbicakci S, Bilik O, Intepeler SS. Assessment of goals in problem-based learning. *Nurse Educ Today*. 2012; 32:e79-82
 9. Rendas AB, Fonseca M, Pinto PR. Toward meaningful learning in undergraduate medical education using concept maps in a PBL pathophysiology course. *Adv Physiol Educ*. 2006; 30:23-9.
 10. Michael J. The Claude Bernard distinguished lecture. In pursuit of meaningful learning. *Adv Physiol Educ*. 2001; 25:145-58.
 11. Sultan Ayoub Meo. Basic steps in establishing effective small group teaching sessions in medical schools. *Pak J Med Sci*. 2013 Jul-Aug; 29(4):1071-1076
 12. Crosby J. Learning in small group: AMEE Medical Education Booklet No 8. *Med Teach*. 1996; 19: 189-2002
 13. Zubair Amin, Khoo Hoon Eng. *Basics in Medical Education*, World Scientific, Singapore, 2006: World scientific; 2006. Pp 115-116
 14. Jones RW. Learning and teaching in small groups: Characteristics, benefits, problems and approaches. *Anaesth Intensive Care*. 2007; 35(4):587-592.
 15. Curran VR, Sharpe D, Forristall J. Et al. Student satisfaction and perceptions of small group process in case-based interprofessional learning. *Med Teach*. 2008; 30(4):431-3.
 16. O'Neil G. Small group including tutorials and large group teaching, Centre for a teaching and learning. UCD-Dublin: *Good Practice in Teaching and Learning*; 2003. pp.1-12.
 17. Steinert Y. Student perceptions of effective small group teaching. *Med Educ*. 2004; 38:286-293.
 18. Blewett EL, Kisamore JL. Evaluation of an interactive, case-based review session in teaching medical microbiology. *BMC Med Edu*. 2009; 9:56.
 19. Hirshbein LD, Gay T. Case-based independent study for medical students in emergency psychiatry. *Acad Psychiatry*. 2009; 29: 96-9.
 20. Ciraj AM, Vinod P, Ramnarayan K. Enhancing active learning in microbiology through case-based learning: Experiences from an Indian medical school. *Indian J Pathol Microbiol*. 2010; 53:729-33.
 21. Yoo Ms, Park Jh, Lee SR. The effects of case-based learning using video on clinical decision making and learning motivation in undergraduate nursing students. *J Korean Acad Nursing*. 2010; 40: 863-71.
 22. Mark Kitchen GHH, Birmingham, UK. Facilitating small groups: how to encourage student learning. *Clin Teach*. 2012; 9: 3-8
 23. Schmidt HG, Rotgans JI, Yew EH. The process of problem-based learning: what works and why. *Medical Education*. 2011; 45(8):792-806
 24. Khan I FA. Problem-Based Learning Variant: Transition phase for a Large Institution. *JPMA*. 2001; 51 271
 25. Tayyeb R. Effectiveness of Problem based learning as an instructional tool for acquisition of content knowledge and promotion of critical thinking among medical students. *JCPSP*. 2013; 23(1):42-6
 26. Peets AD, Coderre S, Wright B et al. Involvement in teaching improves learning in medical students; a randomized cross-over study. *BMC Med Educ*. 2009; 9:55
 27. McKimm J, Morris C. Small group teaching. *Br J Hosp Med (Lond)*. 2009 Nov; 70(11):654-7.
 28. Chan LK, Ganguly PK. Evaluation of small-group teaching in human gross anatomy in a Caribbean medical school. *Anat Sci Educ*. 2008 Jan; 1(1):19-22.
 29. Macauley R, Billings JA. Teaching small groups in palliative care. *J Palliat Med*. 2011 Jan; 14(1):91-5.
 30. Kitchen M. Facilitating small groups: How to encourage student learning. *Clin Teach* 2012 Feb; 9(1):3-8.
 31. Cendan JC SM, Ben-David K. Changing the student clerkship from traditional lectures to small group case-based sessions benefits the student and the faculty. *J Surg Educ*. 2011 Mar-Apr; 68(2):117-20.; 68(2):117-20
 32. Hofer M, Schiebel B, Hartwig Hg Et al. Innovative course concept for small group teaching in clinical methods. Results of a longitudinal, 2-cohort study in the setting of the medical didactic pilot project in Dusseldorf. *Dtsch Med Wochenschr*. 2000 Jan 9; 1

Table 1: Marks and the percentage scored in MCQ tests

No. Of Students	Didactic Lectures (test I) (40 marks)	(%)	SDL (test II) (40 marks)	(%)	SGT (test III) (40 marks)	(%)
1	14	35	24	60	34	85
2	18	45	34	85	38	95
3	8	20	18	45	32	80
4	6	15	12	30	36	90
5	18	45	24	60	34	85
6	10	25	22	55	38	95
7	10	25	20	50	36	90
8	14	35	22	55	28	70
9	6	15	14	35	30	75
10	10	25	10	25	26	65
11	12	30	18	45	28	70
12	5	12.5	14	35	18	45
13	16	40	26	65	30	75
14	8	20	20	50	32	80
15	12	30	26	65	32	80

Table 2: Comparison of scores in MCQ tests by Repeated Measure ANOVA.

Instructional tool	Mean	Standard Deviation (SD)
Didactic lectures	11.13	4.22
SDL	20.26	6.27
SGT	31.46	5.21

Table 3: ANOVA table

Source	df	SS	Mean SS	F Value
Test	1.66	3111.51	1870.4	118.86
Error	23.28	366.48	15.73	p-value =0.0001

Table 4: Comparison of percentage scored by students in MCQ test.

Instructional tool	Mean Percentage of marks Scored	Percentage of students passed	Percentage of Improvement as compared to didactic lectures	Percentage of improvement as compared to SDL
Didactic lectures	27.83	0	-	-
SDL	50.66	60	22.83	-
SGT	78.66	93	50.83	28

Table 5: Analysis of feedback from the students after SGT

Feedback	Percentage
Helped in answering MCQ test	93
Improved learning	87
Like to have similar exercise in future	100
Increase thinking skills and concentration	7
Helped to clear doubts	20
Increase remembering and performance in examinations	13
Good	27