

EFFECTS OF TEACHING METHOD ON ASSESSMENT OUTCOME

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ABSTRACT

Background and Objectives: New teaching methods are under trial in most of the medical schools. The methodology is changing from usual methods (lectures), which are more teacher – centered to modern techniques which encourage students for self directed learning making them independent, life - long learners. We conducted this study to evaluate the assessment outcomes of two teaching methodologies (Lecture vs. Small group discussion) and their relationship with gender.

Methods: A quasi – experimental study was conducted at Wah Medical College, Wah Cantt. Fourth year students of two sessions who appeared in written assessment were included in the study without any exclusion. During the session 2010 – 2011, the method of teaching adopted was lecturing for 'Communicable Diseases' and small group discussion (tutorials) for 'Nutrition and Health', while during the session 2013 – 2014 'Communicable Diseases' were taught in small groups (tutorials) and lectures were delivered for 'Nutrition and Health'. A written assessment was placed at the end of each teaching session. The assessment scores of both teaching methodologies were compared. Data was analyzed using SPSS version 19. Independent samples t-test was applied to compare mean scores of both methodologies.

Results: One hundred ninety six (54.3%) students appeared in assessments after Lectures and 165 (45.7%) after small group discussion (tutorials). Mean assessment score after small group discussions (62.80 ± 14.84) was significantly better as compared to Lectures (59.93 ± 12.01). The mean score of girls (63.05 ± 13.55) was significantly higher than that of boys (58.45 ± 12.81).

Conclusion: It concludes that assessment scores may be improved by conducting small group discussion which may also improve the focus of boys.

Key words: Medical education, Lectures, Small group discussion, Tutorial, Undergraduate curriculum.

INTRODUCTION

Constructive criticism on teaching in medical institutions has been growing in recent years.¹ During the past few years, the style and method of medical teaching has been substantially changed to achieve the new learning objectives. It is because of major changes and innovations in the sphere of health profession, health care delivery, and academic syllabus.^{2,3} The central idea behind all these reforms is to encourage student centered self – instructional learning, in order to produce medical graduates having capability to meet the challenge of changing world in which they have to work.⁴

In past decades medical teaching was more teacher – centered. In this system the students only listen to their teachers without any active participation, but in the new methodology the students have to make plan for their learning, set goals and adopt suitable behavior for understanding. Now a days lectures, small group discussions, problem based learning, task based learning and various other teaching strategies are

being followed by medical schools. In earlier times the lectures were the key technique to deliver curriculum but they were not able to achieve all learning objectives. The latest strategy is to employ a combination of various methods in order to have student centered instead of teacher centered teaching; to enhance students' learning and performance.⁴⁻⁷

For smooth progress of students' learning and skill development and for supporting self – directed learning (SDL), the students should be encouraged to make their own decisions regarding how to learn and to identify learning resources. Malcolm Knowles, an American educator defined SDL as a method in which teachers become facilitators, and students themselves identify their deficiencies, define learning objectives, find out sources, execute plans, and appraise for success. In medical schools, SDL is a vital methodology in the promotion of life – long learning.^{4,8,9} SDL is supposed to be a useful method for medical education, mainly for evidence based active learning. Various methods, like Problem Based (PBL), Peer Assisted Learning (PAL)

etc., have been adopted for self directed learning which encourage active learning by accretion and help students to build up their knowledge as well as professional skills.⁴

In recent years teaching in small groups is considered to be the best method in medical education.¹⁰ Small group discussions include tutorials, seminars and small problem – solving classes. In small group discussions about 8 – 12 students, the number can range from 15 – 30, work together in a face-to-face situation with 1 tutor who facilitates them.^{3,11,12} Small group discussion build confidence and good relationship between team members, such discussions encourage active learning, improve understanding, retention and development of lifelong learning skills. The students activate prior knowledge and build on existing conceptual knowledge framework. The discussions require all students to be engaged in the learning process, the students interact with learning materials, draw on each other's knowledge and identify areas of incomplete knowledge resulting in motivation and deep learning.¹²

Lectures continue to be the most accepted teaching methodology even though a lot of denigration has been raised regarding the role of lectures in achieving curriculum learning objectives.¹³ In lectures a lot of information can be delivered to a maximum number of students, who only listen to the content being delivered or note it down on paper without critically thinking about it.¹⁴ For retaining the integrity of lectures as an essential teaching method and to make them more practical for students, the teachers should try to make lectures more interactive, meaningful and interesting. At the end of each lecture feedback should be taken from students on how to improve the session and critical thinking should be promoted by asking conceptual questions. Success of lecturing sessions is inextricably linked with the excellent teaching process.^{13,15}

In the past decade due to the financial predicament the job of government in community development has been decreased and is being shifted to private sector. This situation has also affected the medical education. Due to lack of resources, the old – fashioned tools and traditional teaching methods generate doctors having outmoded information, skills and behavior. The graduates get annoyed when after a long tiring session of medical education they find themselves incapable of facing the challenge of new changing world.¹⁶ Medical teachers are feeling this pressure and are adopting new teaching methodologies while maintaining excellence in education. Different researches have highlighted the effectiveness of modern teaching methods in comparison to usual ones; but the assessment outcomes of different methods have been compared in only a few researches. In this study we compared the students' assessment outcomes of two teaching metho-

dologies (Lecture vs. Small group discussion) to determine the usefulness of these methods.

METHODOLOGY

A quasi – experimental study was conducted at Wah Medical College, Wah Cantt. Fourth year students of two sessions (2010 – 2011 and 2013 – 2014) who appeared in written assessment were included in the study without any exclusion. During the session 2010– 2011, the method of teaching was lecture for 'Communicable Diseases' and small group discussion (tutorials) for 'Nutrition and Health', while during the session 2013 – 2014 'Communicable Diseases' were discussed in small groups (tutorials) and lectures were delivered for 'Nutrition and Health' by the same teacher. The small groups were consisted of 12 – 15 students supervised by a teacher. A written assessment (consisting of MCQs and SEQs) was given at the end of each teaching session. Same papers were given to students of both sessions. To assure the transparency of results the question papers were collected back from the students after assessment; till the time when assessments were given to students of session 2013 – 2014, the batch of 2010 – 2011 had graduated from the college. Pass percentage of students was calculated for each assessment. The average scores (% age) obtained by students following both teaching methods were compared. Data was analyzed using SPSS version 19. Independent samples t-test was applied to compare mean scores of both methodologies. Mean scores of both male and female students, both sessions and chapters (topics) were also compared separately for the lecture and small group discussion (tutorials). P-value of < 0.05 was considered as significant.

RESULTS

Fourth year students of two sessions (2010 – 11 and 2013 – 14) who appeared in written assessment were included in the study. A total of 219 (60.7%) girls and 142 (39.3%) boys appeared in different assessments. A total of 196 (54.3%) students appeared in assessments after Lectures and 165 (45.7%) after small group discussion (tutorials). The mean scores after small group discussion and lectures were 62.80 ± 14.84 and 59.93 ± 12.01 respectively. Mean scores according to teaching method, gender, session and topic are shown in Table 1. The difference of means for boys and girls of session 2013 – 14 (p-value 0.23) was not statistically significant, while all other results were statistically significant. Pass percentage of results along with p-value calculated by independent sample t-test is shown in Table 2. Pass % age of students were higher for small group discussion (85.45 vs. 83.16), girls (86.75 vs. 80.28) and Nutrition (88.7 vs. 79.4). Assessment results after Lectures and small group discussion (tutorials) are projected in Figure 1 and those of boys and girls in Table 3. Girls scored better both after lectures

(61.8 vs. 56.9, p-value 0.005) as well as small group discussion (64.5 vs. 60.1, p-value 0.05) and the difference was statistically significant. The mean scores of both boys and girls were higher after small group discussion. Mean assessment score after small group discussions was significantly better as compared to Lectures (p-value 0.047). The mean score of girls (63.05 ± 13.55) was significantly higher (p-value 0.001) than that of boys (58.45 ± 12.81). The mean score for Communicable Diseases was higher after Lectures (59.82 ± 9.47 vs. 52.45 ± 9.03) while for Nutrition and Health it was higher after small group discussion (73.53 ± 11.75 vs. 60.02 ± 13.89).

Mean scores were higher for small group discussion, girls and Nutrition. The mean score for Communicable Diseases was higher after Lectures while for Nutrition and Health it was higher after small group discussion.

Pass % age of students were higher for small group discussion, girls and Nutrition. The pass % age for Communicable Diseases was higher after Lectures while for Nutrition and Health it was higher after small group discussion. The difference of pass % age for boys and girls of session 2013 – 14 was not statistically significant, while all other results were statistically significant.

After lectures 163 out of 196 students (83.16%) and after small group discussion 141 out of 165 students (85.45%) pass the assessment.

Girls scored better both after lectures as well as small group discussion and the difference was statistically significant.

DISCUSSION

In this study the comparison of the assessment scores of two teaching methodologies (Lecture vs. Small groups' discussion) showed that students perform relatively better (62.80 vs. 59.93, p-value 0.047) after small groups' discussion. The results are consistent with previous studies in which students' scores were higher after active learning as compared to traditional classroom teaching (34.6 vs. 23.5, p-value 0.04),¹ (3.24 vs. 2.98, p-value 0.031),⁶ and (7.8 vs. 7.3).¹⁷ In a study to investigate the performance of students after facilitative and directive methods, the understanding and life-long learning of students following facilitative method was significantly better (Mean 3.94 ± 0.47), than the students following directive method (Mean 3.71 ± 0.58 , p-value 0.00) while no significant difference was

Table 1: Mean scores with SD according to teaching method, gender, session and topic.

Variable		N	Mean	Std. Deviation
Subject	Nutrition	186	65.9086	14.60349
	Communicable diseases	175	56.2857	9.95037
Teaching method	Lecture	196	59.9337	12.01455
	Small group discussion	165	62.80	14.84604
Gender	Boys	142	58.4507	12.81875
	Girls	219	63.0548	13.55169
Session	2010-2011	172	66.3041	12.64032
	2013- 2014	189	56.6614	12.53088
<i>Session 2010 – 2011</i>				
Teaching method	Lecture	91	59.8242	9.47464
	Small group discussion	81	73.5309	11.75275
Gender	Boys	67	61.9552	12.62925
	Girls	105	69.0381	11.84915
<i>Session 2013 – 2014</i>				
Teaching method	Lecture	105	60.0286	13.89068
	Small group discussion	84	52.4524	9.03461
Gender	Boys	75	55.3200	12.23880
	Girls	114	57.5439	12.69530
<i>Communicable Diseases</i>				
Teaching method	Lecture	91	59.8242	9.47464
	Small group discussion	84	52.4524	9.03461
Gender	Boys	70	54.2714	8.86439
	Girls	105	57.6286	10.43870
<i>Nutrition</i>				
Teaching method	Lecture	105	60.0286	13.89068
	Small group discussion	81	73.5309	11.75275
Gender	Boys	72	62.5139	14.6969
	Girls	114	68.0526	14.1932

found in acquired knowledge (41.21 vs. 40.81, p-value 0.16).⁹ In another research the thoughtfulness of students was better after teacher centered strategy (p-value 0.005), while confidence was more after student centered strategy (p-value 0.003).⁵ Contrary to this a study revealed that initial improvement in information was 28% after didactic teaching as compared to 9.93%

after computer – based asynchronous teaching (p-value 0.0001).¹⁸ Like recent trends in other fields the girls scored better both after lectures (p-value 0.005) as well as small group discussion (p-value 0.05) and the difference was statistically significant. The mean score of boys was higher after small group discussion, showing that improvement in their scores can be achieved by the process of active learning.

Lectures are a common teaching method in medical education by which large amounts of information can be transferred to a vast number of students, but are ineffective in nurturing conceptual understanding of subject.^{1,8} Lectures as the only teaching method must be well thought-out for more perfection.² The lectures can be more effective by making them interactive and enjoyable for students, which depends on the ability of the presenter to captivate the undivided attention of the students by learning and developing basic lecturing skills.¹³

The partiality for small group teaching has been endorsed by medical graduates from all over the world.^{3,10,14,19} The students have difficulty in remaining attentive during the lectures and retaining knowledge. Retention is the most desirable element in any kind of learning and small group discussions help students to retain knowledge by active participation, stimulation of interest and critical thinking.¹⁰ In small group discussions the students are able to build good relationship between themselves and with their tutor. A class having a small number of students will be more beneficial for both the tutor and students; every student will be able to get tutor's full attention, and it will be easy for

the teachers to handle the class properly and maintain discipline. In this way a teacher will be able to communicate properly with all students for better teaching.¹¹ There are certain limitations for small group discussions in a system like ours as; poor infrastructure, shortage of trained faculty, need of teaching rooms

Table 2: Pass percentage of results along with p values.

Variable		Result		Total Students	Pass % age	P-value
		Pass	Fail			
Subject	Nutrition	165	21	186	88.7	0.000
	Communicable diseases	139	36	175	79.4	
Teaching method	Lecture	163	33	196	83.16	0.047
	Small group discussion	141	24	165	85.45	
Gender	Boys	114	28	142	80.28	0.001
	Girls	190	29	219	86.75	
Session	2010-2011	160	12	172	93.02	0.000
	2013- 2014	144	45	189	76.19	
Session 2010- 2011						
Teaching method	Lecture	79	12	91	86.81	0.000
	Small group discussion	81	0	81	100	
Gender	Boys	59	8	67	88.05	0.000
	Girls	101	4	105	96.19	
Session 2013- 2014						
Teaching method	Lecture	84	21	105	80	0.000
	Small group discussion	60	24	84	71.42	
Gender	Boys	55	20	75	73.33	0.234
	Girls	89	25	114	78.07	
Communicable Diseases						
Teaching method	Lecture	79	12	91	86.81	0.000
	Small group discussion	60	24	84	71.42	
Gender	Boys	51	19	70	72.85	0.028
	Girls	88	17	105	83.81	
Nutrition						
Teaching method	Lecture	84	21	105	80	0.000
	Small group discussion	81	0	81	100	
Gender	Boys	63	9	72	87.5	0.011
	Girls	102	12	114	89.47	

suitable for small group discussion, need of internet facility, audio-visual equipment and whiteboards, etc. These problems have also been identified in other studies.^{3,11}

It **concludes** that assessment scores may be improved by conducting small group discussion which may also improve the focus of boys. There is better retention and comprehension of knowledge during the process of active learning which helps in conceptualization. It is essential to develop strategies for medical education faculty members to teach fundamental knowledge and skills using the principles of adult learning, such as self directed learning, to produce independent professionals with effective problem analysis skills.

Some limitations should also be considered while interpreting the results of this study. Our study was conducted at a single Medical College, and simply the assessment scores of small group tutorials were compared with that of lectures, so the results may not be applicable universally. Regardless of these limitations, this study does offer a basis for future research regarding the role of different teaching strategies in maintaining excellence in education. However it still provides enough ground to adopt the approach in combination with the other rather than relying solely on this or the didactic vice versa.

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AUTHORS' CONTRIBUTIONS

M. R. has made a large contribution to the conception and design of study, construction of assessment questions (MCQs and SEQs) and critical review of article. R. M. has been involved in construction of assessment questions, analysis and interpretation of data, and drafting the manuscript. A. A. has contributed in acquisition of data and revised the manuscript for important scholarly content. A. B., S. S., A. M., S. N., and K. W. have contributed in construction of assessment questions, smooth conduction of examinations and paper marking. All authors read and approved the final manuscript.

REFERENCES

1. Tsaushu M, Tal T, Sagy O, Kali Y, Gepstein S, Zilberstein D. Peer learning and support of technology in an undergraduate biology course to enhance deep learning. *CBE Life Sci Educ.* 2012; 11 (4): 402–412.
2. Alzahrani HA, Alzahrani OH. Learning strategies of medical students in the surgery department, Jeddah, Saudi Arabia. *Adv Med Educ Pract.* 2012; 3: 79–87.
3. Ahmad RN, Bhatti MM, Khan AH, Ghayur S, Rafi S, Naseem S, et al. Small group discussion as a learning

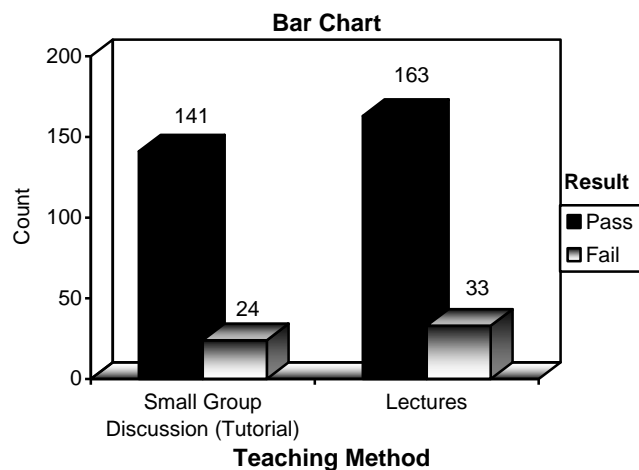


Figure 1: Assessment results after Lectures and small group discussion (tutorials).

Table 3: Assessment results of boys and girls.

Teaching Method	Gender	No. of Students	Mean Score	Standard Deviation	p-value
Small group discussion	Boys	67	60.1	13.3	0.05
	Girls	98	64.5	15.5	
Lecture	Boys	75	56.9	12.1	0.005
	Girls	121	61.8	11.5	

strategy for medical undergraduates. *Rawal Medical Journal*, 2014; 39 (3): 344-348.

4. Spencer JA, Jordan RK. Learner centered approaches in medical education. *BMJ.* 1999; 318 (7193): 1280–1283.
5. Anvar M, Khademi S, Meshkibaf MH, Fereidouni Z, Ebrahimi A. The Comparison between Teacher Centered and Student Centered Educational Methods. *Journal of Medical Education*, 2006; 9 (1): 31-34.
6. Stanger – Hall KF, Lang S, Maas M. Facilitating Learning in Large Lecture Classes: Testing the “Teaching Team” Approach to Peer Learning. *CBE Life Sci Educ.* 2010; 9 (4): 489–503.
7. Raupach T, Brown J, Harendza S. Summative assessments are more powerful drivers of student learning than resource intensive teaching formats. *BMC Med.* 2013; 11: 61.
8. Benedict N, Schonder K, McGee J. Promotion of Self – directed Learning Using Virtual Patient Cases. *Am J Pharm Educ.* 2013; 77 (7): 151.
9. Berghmans I, Druine N, Dochy F, Struyven K. A facilitative versus directive approach in training clinical skills? Investigating students’ clinical performance and perceptions. *Perspect Med Educ.* 2012; 1 (3): 104–118.
10. Badar S, Musarrat-ul-Hasnain, Hashmi ZY. Searching the ways to keep students awake in class room. *Biomedica*, 2014; 30 (1): 62–68.
11. Saleh AM, Al-Tawawil NG, Al-Hadithi TS. A Qualitative

- Assessment of the Small Group Teaching at Hawler College of Medicine. *J Clin Diagn Res.* 2013; 7 (5): 883–887.
12. de Jong Z, van Nies JAB, Scherpbier A. Interactive seminars or small group tutorials in preclinical medical education: results of a randomized controlled trial. *BMC Med Educ.* 2010; 10: 79.
 13. Najmi RS. Lecture as a Mode of Instruction in Undergraduate Medical Education. *JPMA.* 1999; 49: 30.
 14. Grant A, Kinnersley P, Field M. Learning contexts at Two UK medical schools: A comparative study using mixed methods. *BMC Res Notes,* 2012; 5: 153.
 15. Andrews TM, Leonard MJ, Kalinowski ST. Active Learning Not Associated with Student Learning in a Random Sample of College Biology Courses. *CBE Life Sci Educ.* 2011; 10 (4): 394–405.
 16. Nasim M. Medical education needs to change in Pakistan. *J Pak Med Assoc.* 2011; 61 (8): 808–11.
 17. de Jong N, Verstegen DML, Tan FES, O'Connor SJ. A comparison of classroom and online asynchronous problem based learning for students undertaking statistics training as part of a Public Health Masters degree. *Adv Health Sci Educ Theory Pract.* 2013; 18 (2): 245–264.
 18. Jordan J, Jalali A, Coates W. Asynchronous vs. didactic education: it's too early to throw in the towel on tradition. *BMC Med Educ.* 2013; 13: 105.
 19. Papanna KM, Kulkarni V, Tanvi D, Lakshmi V, Kriti L, Unnikrishnan B, et al. Perceptions and preferences of medical students regarding teaching methods in a Medical College, Mangalore India. *Afr Health Sci.* 2013; 13 (3): 808–813.