

EFFECTIVENESS OF INTERACTIVE LECTURES ON KNOWLEDGE RETENTION AND STUDENTS' MOTIVATION IN UNDERGRADUATE MEDICAL EDUCATION - A MIXED METHOD STUDY

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ABSTRACT

Objective: To assess the effectiveness of interactive lectures on academic performance and motivation for learning in undergraduate medical students.

Study Design: Mixed-method study.

Place and Duration of Study: Quaid-e-Azam Medical College Bahawalpur, from Jan to Nov 2012.

Material and Methods: Study included a series of interactive lectures on endocrine surgery to groups of final year students having all academic and clinical learning sessions in the wards, while class lectures were annulled. Two hundred students participated in the study. In the quantitative component, learning acquisition was evaluated using Pre- and Post-test multiple choice questions (MCQs) assessment. Survey was conducted to ascertain student motivation with a modified Motivated Strategies for Learning Questionnaire (MSLQ). Qualitative component was addressed by focus group discussions (FGDs) on effectiveness of active interaction, pre- and post-test assessments on critical learning skills, retention of knowledge, and student motivation for self-regulated learning.

Results: Interactive lectures were found to improve critical thinking skills and motivated students for self-directed learning. Mean Pre-test score was 9 and Post-test score was 13.06 (p -value<0.001). Similar statistically significant trend was maintained in send up scores. Use of pre- and post-test assessments resulted in enhanced and long-term retention of knowledge and improved academic performance. MSLQ is an effective tool to assess students' motivation. FGDs supported that interactive teaching motivated students to engage in meaningful learning.

Conclusion: Interactive lectures foster deep learning and critical thinking abilities in undergraduate medical students. Strategic use of interaction and assessments improved the academic performance and motivate students for self-regulated learning.

Keywords: Assessment, Interactive, Learning, Lectures, Motivation.

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INTRODUCTION

Didactic lectures are described as least effective instructional strategy since students remain 'passive recipients of knowledge' and their attention declines after a few minutes^{1,3}. Conventional lectures do not influence critical thinking and learning attitudes of students^{2,4}. Interactive lectures have been accepted as viable alternative to address reduced attention span, low retention rates and passive learning^{4,5}. Interactive lectures are different in terms of active participation of students and the tutor as a

facilitator of effective learning^{6,7}. Interaction stimulates cognitive engagement, critical thinking and intrinsic motivation bringing a positive change in students' learning behaviors^{8,9}. Motivated Strategies for Learning Questionnaire (MSLQ) is a widely used validated instrument in educational research to assess students' motivation and learning strategies^{10,11}. The questionnaire is based on social-cognitive model of motivation comprising mainly of three domains: expectancy, value and affect^{12,13}. Quaid-e-Azam Medical College Bahawalpur is a public sector medical college. The college inducts each year 250 students in a 5-year teaching program. In the session of 2012, class lectures were abandoned for the final year and students were divided into

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groups of 22 to 24 students. Each group was deputed to clinical wards for 4 weeks and students were required to spend 6 hours in the wards for academic and clinical learning. Heads of clinical wards were responsible for covering the academic syllabus of each subject for final professional examination. No uniform instructional strategy was enforced. In Surgical Unit II, the students were given a full 4 weeks schedule of learning activities including interactive lectures and clinical encounters. This study was carried at Surgical Unit II with objective to determine effectiveness of interactive lectures on academic performance and motivation for learning in final year medical students using modified MSLQ and FDGs. The generated evidence is anticipated to provide insight into the effectiveness of interactive teaching and may help in the wider application of this instructional

adrenal disorders was administered to measure the baseline knowledge of students in the beginning of a 4-week session. Each session included 12 interactive lectures on endocrine surgery (thyroid, parathyroid and adrenal disorders) delivered by the professor. Three interactive lectures were taken every week on alternate days. Similar lecture content and format was used for each batch employing white board and multimedia as main instructional tools. Total time for each lecture was 60 minutes. An equivalent form Post-test comprising 15 MCQs was administered at end of session. Comparison of pre- and post-test scores was done. Later, five single best answer MCQs of 1 mark each and 1 SAQ of 5 marks (total comprising 10 marks) from the same topics were administered in the send up paper at the end of academic year. Scores of pretest and posttest were entered in SPSS version

Table-I: Comparison of Pre, post-test and send up scores percentages showing improved learning and long-term retention of knowledge.

Paired sample test		t
Test Type	t	p-value
Pre-Post tests	-24.4	<0.01
Pre-Send up	-5.59	<0.01
Post-Send up	11.425	<0.01

strategy and its inclusion in the official curriculum.

MATERIAL AND METHODS

This mixed method study was conducted at Quaid-e-Azam Medical College Bahawalpur over 11 months period from January till November 2012 after approval from the Institutional Review Board. The study comprised a quantitative component (pre and post-test design), further assessed with a survey questionnaire based on motivational components of MSLQ, and a qualitative component based on focused group discussion (FGD). Total of 10 groups, each having 24 students, both males and females, were included, using non-probability convenience sampling technique. A Pre-test comprising 15 scenario-based single best answer MCQs on surgical aspects of thyroid, parathyroid, and

24 to calculate means and standard deviations, which were then compared with those of send up to assess long-term retention of knowledge using paired sample t test. Results were considered statistically significant with p -value<0.05. A modified questionnaire based on motivational component of MSLQ was used to assess the student motivation with interactive lectures upon completion of each session. The motivation section of original MSLQ has 31 items to assess students' expectancy, value and affect beliefs¹²⁻¹³. For this study, the MSLQ was modified to 15 questions measured on 7 points Likert scale and a section for open comments in the end. The selected questions are considered as most representative, having high internal consistency (0.68 or above)¹⁰⁻¹². The questions addressed all three components of motivation; task value, expectancy and affective domains. Internal

consistency of the Questionnaire was assessed using Cronbach Alpha.

After assessment of data generated from the

low achievers (50-60% marks), 4 average (61-75% marks) and 4 high achievers (>75% marks) based on post-tests results. Key areas discussed were:

Table-II: Outcome of modified motivated strategies for learning questionnaire for assessment of students' motivation by interactive lectures.

S No.	Item	1	2	3	4	5	6	7	Mean ± SD
1	It is important for me to learn the course material in this class (Task value)	0	0	0	0	7 (3.5)	53 (26.5)	140 (70.0)	6.67 ± 0.542
2	The lectures made the topic interesting and easy to learn and that is most important for me (Expectancy -self efficacy for performance)	0	0	0	1 (0.5)	7 (3.5)	56 (28.0)	136 (68.0)	6.64 ± 0.577
3	I am confident that I can learn the basic concepts taught in these lectures (Expectancy - Control of learning beliefs)	0	0	0	1 (0.5)	12 (6.0)	48 (24.0)	139 (69.5)	6.63 ± 0.622
4	I am confident I can understand the most complex material presented by the teacher in these lectures (Expectancy - self efficacy for performance)	1 (0.5)	2 (1.0)	5 (2.5)	23 (11.5)	21 (10.5)	54 (27.0)	94 (47.0)	6.00 ± 1.246
5	In a class like this, I prefer challenging learning material so that I can learn new things with concepts (Expectancy - self-efficacy for performance)	0	0	1 (0.5)	3 (1.5)	25 (12.5)	79 (39.5)	92 (46.0)	6.29 ± 0.780
6	Most satisfying thing in these lectures is a feeling to thoroughly understand the contents (Task Value)	0	0	1 (0.5)	3 (1.5)	27 (13.5)	62 (31.0)	107 (53.5)	6.36 ± 0.808
7	I am certain that I can retain the topics for a sufficient period of time to be recalled in my examination (Expectancy - self-efficacy for performance)	2 (1.0)	4 (2.0)	11 (5.5)	41 (20.5)	77 (38.5)	56 (28.0)	9 (4.5)	4.96 ± 1.109
8	I am confident I will perform excellent on the assignments and tests in this session (Expectancy - self-efficacy for performance)	1 (0.5)	2 (1.0)	2 (1.0)	9 (4.5)	14 (7.0)	54 (27.0)	118 (59.0)	6.34 ± 1.053
9	I believe I will be able to use what I learn in this session (Task value)	0	1 (0.5)	1 (0.5)	2 (1.0)	27 (13.5)	66 (33.0)	103 (51.5)	6.33 ± 0.844
10	Getting good marks in the final assessment of this session is the most satisfying thing for me (Value - goal orientation)	0	0	1 (0.5)	1 (0.5)	24 (12.0)	47 (23.5)	127 (63.5)	6.49 ±0.763
11	If I can, I want to get better marks in this session than my batch mates (Value - goal orientation)	0	0	1 (0.5)	3 (1.5)	20 (10.0)	64 (32.0)	112 (56.0)	6.42 ± 0.772
12	I believe the lectures made me motivated to self study the subject (Expectancy - self-efficacy for performance)	0	0	1 (0.5)	2 (1.0)	8 (4.0)	36 (18.0)	153 (76.5)	6.69 ±0.645
13	It is my own fault if I don't learn the material presented in the lectures Expectancy - Control of learning beliefs)	1 (0.5)	0	0	6 (3.0)	10 (5.0)	42 (21.0)	141 (70.5)	6.57 ± 0.824
14	I feel so nervous during a test that I cannot recall facts what I have learnt (Affective - Test anxiety)	1 (0.5)	0	3 (1.5)	1 (0.5)	24 (12.0)	52 (26.0)	119 (59.5)	6.40 ± 0.918
15	I have an upset and uneasy feeling when I take a test (Affective - Test anxiety)	1 (0.5)	2 (1.0)	0	6 (3.0)	19 (9.5)	46 (23.0)	126 (63.0)	6.41 ±0.983

1=Strongly disagree, 2=Disagree, 3=Somewhat disagree, 4=No comments, 5=Somewhat agree, 6=Agree, 7=Strongly agree

responses to questionnaire and post-test results, three focused group discussions (FGDs) were arranged comprising 12 students each, 6 males and 6 females. Selected participant included 4

Effectiveness of interactive lecture in terms of academic performance and motivation for learning. Students were allocated aliases to ensure anonymity and audio recording was done.

Important comments were documented word to word and nonverbal cues were carefully recorded. For qualitative analysis NVivo 10 was used to identify themes through generation of word clouds. The transcribed FGD discussions were then manually classified under the themes identified through the word clouds for triangulation with emerging themes from the

information was seen in the analysis. Overlapping information was further collapsed under two basic themes to ensure mutual exclusivity.

RESULTS

Out of total of 250 students, a total of 211 students from 10 consecutive batches agreed to participate. Eleven students dropped out later

Table-III: Thematic analysis of 3 focus group discussions.

Theme	Word Frequency Count	Comments Verbatim
Teaching method	Questions in lectures (193) Lecture (189) Interaction (191) Asking (188) Conceptual (181) Easy (172) MCQs (151) Logical (149) Understanding (146) Discussion (141) Books (124) Clinical Correlation (121) Contextual (103) Assess (95) Simulation (82) Role play (59) Strategic (48)	1. "Questions made the lecture engaging and motivating in terms of active involvement and stimulate critical thinking". 2. "Lectures were useful as he explained topics effectively, supported with illustrations, clinical examples and demonstrations". 3. "He makes us recall the previous day contents in the beginning and then ensures that we understand contents by repeatedly asking and revising important concepts". 4. "Most important is use of various thought provoking questions in between lectures and using illustrations, photographs and videos, which help to engrave important concepts". 5. "In his lectures he not only teaches book content but also use simulations and videos to make them interesting, and it helps us to recall in examination". 6. "I have now become aware for the first time in five year what actually contextual learning and practical correlation is". 7. "Now we analyze MCQs more critically. Sometimes I fear it may go wrong with logic, but then at least I know I am doing it myself and not depending on any key". 8. "Almost same (difficulty), but in Post-test we knew better, what is the answer and our concepts were clearer". 9. "To me it is the best way to assess our learning" 9. 10. "For me, most important is to assess our weaknesses and strengths immediately after completing a subject, see the comparison how much we improved!".
Motivation	Motivated (173) Interesting (169) Confident (157) Enjoy (154) Liked (152) Satisfaction (148) Easy (133) Difficult (121) Environment (120) Useful (117) Excited (102) Pass (101) Examination (93) Fear (91) Anxiety (87) Clinical Application (79) Career Choice (32)	11. "We do not even look at our watches, the way he keeps us engaged". 12. "Time never comes to our mind, isn't it strange!" 13. "Only improvement in knowledge is not important, it's the satisfaction that we now understand the subject with concepts and feel more confident to deal any difficult question or scenario from these topics". 14. "I feel confident that I can approach patients in a much better way now" 15. "He makes us think, recall and create a link between our basic and clinical learning, that is what we enjoy most". 16. "So motivated, I will pursue a career in endocrine surgery". 17. "You know how shy I am to ask questions, but now I don't feel any hesitation in class interaction. He never insults or bullies us". 18. "I am motivated since I know now how to study a topic with critical thinking and this is going to help me in other subjects as well". 19. "I am excited that my concepts have now become much clearer, I can attempt any Anquestion from these topics in the examination".

transcriptions. The chunks of classified thick description were revisited by two researchers, using constant iterative approach by matching thick description with FGD questions and research objective. The transcripts were iteratively explored to confirm themes, categories, and concepts until no new

due to their own reasons. Results on remaining 200 students who completed the study are presented. There were 81 males and 119 females (M:F being 1:1.47), reflecting roughly the class composition.

Mean Pre-test score was 9 ± 2.92 (range, 2-14) and Post-test score was 13.06 ± 1.74 (range, 8-15),

p -value<0.001. Mean send up score out of 10 marks was 7.02 ± 1.75 (range 1-10). When pre and post-test score were compared with the send up score, similar statistically significant trend was observed (table-I). Figure compares the trend of percentages for pretest, posttest and send up scores, mean time lapse between sessions and send up being 6.5 months.

Item-wise response to modified MSLQ is shown in table-II. Internal consistency (Cronbach alpha) of the questions asked was 0.683. Overall 95.1% (190) students expressed agreement with positive effect of interactive lectures on their motivation; 57.2% (114) being in strong agree-

Table-III summarizes the thematic analysis of FGDs.

DISCUSSION

Educational research proves that interactive lectures foster critical thinking, facilitate increased student satisfaction, enhance students' motivation, bring positive behavioral changes and improve overall academic performance^{1-5,11-16}. This study aimed to assess effectiveness of interactive lectures on medical students' academic achievements and motivation for learning.

Analysis of questions asked in the questionnaire clearly reflects that interactive lectures increase students' interest in the subject,

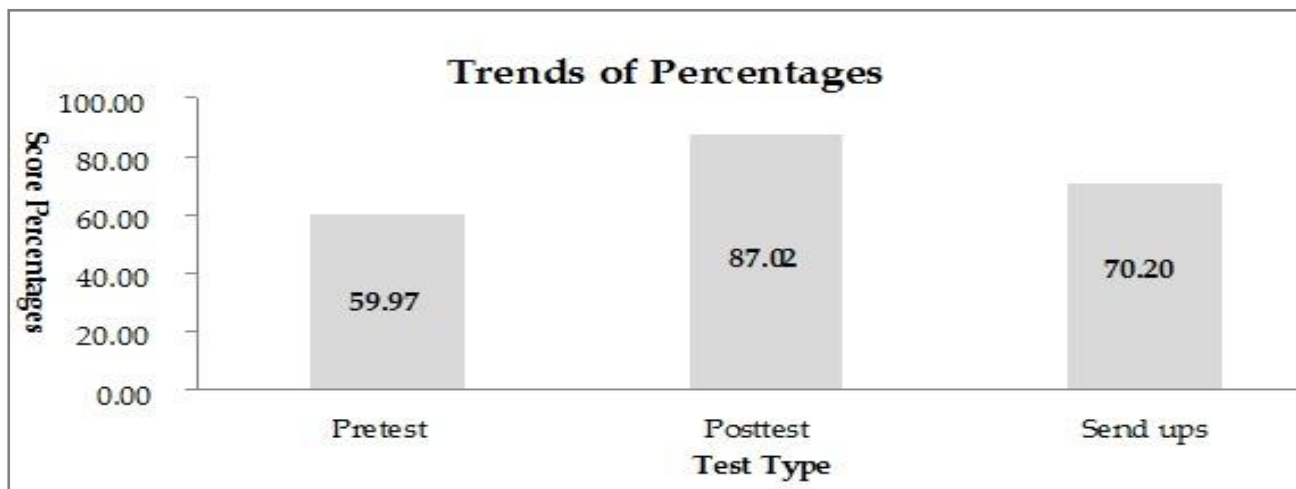


Figure: Improved learning and long-term retention of knowledge by interactive lectures reflected by trends of pre-test, post-test and send up scores percentage.

ment and another 27.2% (54) in agreement. Only 1.5% (3) students had some disagreement, while 3.4% (7) remained neutral.

Statements in parenthesis for each category indicate the task value, expectancy and affective component of original (MSLQ).

Numeric values in parenthesis signify percentage of respondents.

Word cloud generated from 3 FGDs resulted in emergence of two major themes, namely: Teaching method, and Motivated. There was general consensus (93%) that the lectures were interactive and motivating in terms of students' active involvement and academic performance.

simplify the topic, increase depth of conceptual learning, identify and clarify their misconceptions. Results of this study also demonstrate that active participation enhanced students' retention power, motivated them for self-study and academic achievements and developed a positive behavioral change. Majority of students (87%) initially felt some test-related anxiety but after attending the lectures, they realized that their performance in examinations was bound to improve (comment 17, table-III). Similar observations have been described by other educational researchers^{4,5,9,11,14-17}. Analysis of open comments in MSLQ revealed that students experienced less distractions during the interactive lectures

because of active engagement. Active engagement was maintained by frequent change of pace due to interruptions during interaction. Comparable observations about learning benefits of interactive instructional strategies have been described in earlier studies^{3,4,14,16}.

MCQs aid retention of knowledge and administration of Pre and Post-lectures MCQs is accepted as a useful tool to assess effective learning in educational research¹⁷⁻¹⁹. An equivalent form pre and post-test used to assess acquisition and retention of knowledge in this study showed statistically significant difference in pre and post-test scores immediately after the end of ward rotation. Similar statistically significant trend was maintained when long-term retention of knowledge was assessed comparing the pretest and end upscores. This clearly reflects a durable and long long-lasting impact of active engagement on effective learning, as majority of the students were still able to recall whatever they were taught even after a mean period of 6.5 months. These results concur with other studies that interactive lectures followed by appropriately planned assessments lead to effective learning, increased knowledge retention, improved problem-solving skills and enhanced self-efficacy in students²⁰⁻²¹.

There is an affective component of active learning engagement as well; students do not fear assessments and in fact became motivated to deal with any clinical problem [table-III, remarks (13,14,18,19)]. When asked about difficulty level of the post-test compared with pretest, most of the students expressed that though the difficulty level was same but in post-test their concepts were clear, and they attempted the questions with more confidence (table-III, remark 8). These results further strengthen the role of a motivating learning environment, by actively engaging the students in lectures, in bringing a positive change in their learning strategies, self-efficacy beliefs and behavioral approach towards assessments and academic achievements¹⁷⁻²⁴. The results prove that effective use of various interactive instructional strategies induced motivational and beha-

vioral changes for enhanced academic performance in medical students, as described in other studies as well^{1,3,5,13,16}. Motivational component of MSLQ, even when modified, remains an effective tool to assess these domains of self-regulated learning, behavioral changes and motivation in medical education^{10-13,21,24-26}.

CONCLUSION

Interactive lectures ensured active participation of students which lead to increased motivation for learning and improved class performance. Active engagement in lectures and strategically planned assessments enhances knowledge retention, boost self-efficacy beliefs, and bring a positive behavioral change towards students' academic performance.

CONFLICT OF INTEREST

This study has no conflict of interest to be declare by author.

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