EVALUATION OF STRATEGIES TO INCREASE STUDENTS` INVOLVEMENT FOR IMPROVING INTERACTIVE LECTURES IN CHEMICAL PATHOLOGY

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ABSTRACT

Objective: To evaluate students` perspective on effectiveness of various strategies employed to increase their involvement in an interactive lecture.

Study Design: Case study with pragmatic research paradigm.

Place and Duration of Study: College of Physicians and Surgeons (CPSP) Karachi and Regional Centre Islamabad, Pakistan from Jan 2012 to Jan 2014.

Material and Methods: Three hundred and three post graduate students attending preparatory courses (82nd to 87th Basic Medical Sciences) for Fellow College of Physicians and Surgeons (FCPS) Part I were selected for the study. Teaching strategies like multiple choose questions (MCQs), flash cards as audience response system (ARS) and purposefully designed hand-outs were used. Questionnaire based on Likert's Scale (quantitative) and video recorded focus group discussion (FGDs) with small groups of students (qualitative) were used for evaluation of the teaching strategies.

Results: Mostly females (78%) with mean age of 29 years from 15 different medical and dental specialties were included in the study after obtaining their informed written consent. Average total score was found to be 25.71(95% CI: 25.40 to 26.02) out of maximum possible score of 30 (if all the six questions were strongly agreed to). Liking of the students as determined from feedback forms was for Flash Cards as ARS (89%), MCQs (88%) and hand-outs (85%) while content coverage received poorest liking (79%). Similar themes were found in the content analysis of FGDs. There was a significant increase in the students` liking from 82nd course (Jan 2012) to 88th Course (Jan 2014).

Conclusion: Post-graduate students preparing for FCPS part I examination highly approved the strategies to increase effectiveness of lectures in the preparatory courses.

Keywords: Audience response system, Interactive lectures.

INTRODUCTION

Lectures have been an important mode of information transfer (MIT) since antiquity[1] and still remains the most commonly used MIT in undergraduate medical education, in our country and abroad. The reasons for its wide use are many folds such as convenience for teachers, less requirement of resources and its suitability for teaching Basic Medical Sciences (BMS)[2]. Moreover, in presenting information and explaining phenomena, lecturing has been shown to be a potentially very effective MIT provided it has been handled well[3]. A bad lecture may not only cause wastage of time for the students but can also lead to frustration in students and teachers[4]. Research in medical education has clearly shown that active involvement of students greatly increases their learning as it keeps them attentive[5]. Many medical educationists, therefore, have suggested strategies to improve the students` involvement and thus making the lecture more interactive and meaningful[6-8]. Asking questions is an example of such strategies, as several benefits of questioning have been described during a lecture e.g. arousal of the students' attention, ice breaking and bringing the students' concentration back to the class[6,7].

Basic Medical Sciences (BMS) course is organized by CPSP for preparation of Part I examination of the Fellowship of the College of Physicians and Surgeons (FCPS Part I)[9]. This

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course is held thrice a year, for nearly thirty years. Its duration is about six weeks and teachers from various disciplines of BMS teach students in sessions of 1-3 days. The students are also from various disciplines and come from various parts of the country with the sole aim of passing FCPS Part I. With this mind-set they want these lectures to be of extreme benefit in achieving their aim. In view of quite a large number of participants, interactive lectures with maximum involvement of students are more feasible option as compared to small group discussion and similar MITs. Such situations do arise in other areas of medical education, too, when it is not possible to divide the students in smaller groups and lecturing is the only option[7]. The real challenge is to make lectures useful for these fast tract learners of BMS intensive course by employing various techniques that could increase lecture effectiveness

So a study was planned to evaluate students` perspective regarding effectiveness of strategies used for students` involvement based on principles of adult learning, constructivist theory of learning and keeping various learning styles in mind.

MATERIAL AND METHODS

'Case study' was the design used in this study in a pragmatic paradigm i.e. mixed qualitative and quantitative examination of the phenomenon in a real world situation. The study was conducted at CPSP Karachi and Regional Centre CPSP Islamabad from January 2012 to January 2014. The post-graduate students were attending a five weeks course to prepare for FCPS Part I in 15 different specialties. They were generally very focused on their studies and had great expectations from their instructors to provide them right information in right manner. Teachers of basic sciences were invited from all over country and the criteria of selecting teachers were based on feedback (written and verbal) of students of previous batches. These teachers usually followed interactive pattern of lecturing but teachers who failed to satisfy students` demand were politely regretted to continue. Initially all 303 students who attended 82nd to 88th Basic Medical Sciences (BMS) courses (in varying numbers-Table 1)were selected for the study by non-probability convenience sampling. Then students who did not or could not fill the consent form and/or fill feedback proforma were excluded from the study (n=23). Following procedure was adopted for the data collection:

The research question of the study was: 'does employment of specific strategies increasing students` involvement improves effectiveness of the interactive lectures?

Informed written consent from the participants (students) was obtained on a proforma with optional personal information and signatures. This form was distributed and collected separately from feedback form to maintain confidentiality of the feedback.

Feedback questionnaires were distributed to all the participants of the seven BMS courses at the end of each lecturing session.

The study was carried out during all the sessions of chemical pathology which lasted for 2-3 days. This time was allocated according to the content of various subjects by the coordinator of the course at CPSP Karachi.

Two hundred and eighty (280) students who completed the consent form and feedback questionnaire were included in the study (92.4% out of total 303 students).

Interactive lectures of total of 50 hours duration were evaluated; each lecture was of 1-2 hours duration.

Last two courses (87th and 88th) were conducted via video- link in six regional centres of CPSP in addition to CPSP Karachi

The researcher conducted all sessions from Karachi except for the last (88th BMS course) which was conducted from Islamabad.

In two video-linked sessions, only those participants were included in the study who were present at the place where the researcher was conducting the session i.e. CPSP Karachi (87th

Course) and Regional Centre CPSP Islamabad (88th Course).

Some blank space was available on the hand-outs for students to write their notes (to help

Table-1: Batch-wise distribution of students who filled feedback proforma and participated in video focus group discussion (FGD).

BMS* course no	Month and year	Total teaching	Total number of participants	Number of students who participated in:		Mean total score (95%CI)@ (Based on Likert`s scale students` feedback)
				Feedback proforma (%) (n=280)	In video recorded FGD** (n=49)	
82nd	Jan 2012	8 hours	46	42 (91%)	Nil	24.1(23.7-25.7)
83rd	Apr 2012	8 hours	48	45 (93%)	Nil	24.9 (24.3-25.4)
84th	Sep 2012	8 hours	58	53 (91%)	18	25.2 (24.5-25.8)
85th	Dec 2012	6 hours	42	39(92%)	14	25.1 (24.4-25.9)
86th	April 2013	8 hours	40	37 (93%)	12	27.0 (26.3-27.7)
87th	Aug 2013	6 hours	49a	46 (94%)	15	27.3 (26.7-27.9)
88th	Jan 2014	6 hours	20b	18 (90%)	Nil	28.06(27.5-28.6)

*BMS: Basic Medical Sciences; **FGD: Focus Group Discussion, @ $p < 0.001$ on applying ANOVA test
[a]Video-linked course (Presenter at Karachi), [b]Video-linked course (Presenter at Islamabad

Each component of the lecture started with an MCQ of single best type which is the format of assessment used in FCPS Part I examination. In most of the MCQs the C3 (problem solving) pattern was maintained but they did not necessarily contain clinical scenarios in the stems. Single best questions format used for MCQs was exactly similar to the format used in CPSP and other institutes i.e. a stem with five options.

Use of flash cards as ARS: When an MCQ was shown on the powerpoint, the students would ponder for a minute or so to select the best answer and flash an appropriate card showing letters from 'A' to 'E'. All the students were encouraged to show the cards according to the options they thought were the best.

Discussion on student`s response: Any student out of the whole class was randomly invited to give justification of the selected option for class discussion.

Hand-outs: Hand-outs used in the present study were purposely designed. Booklets of MCQs (without key) of about 50 pages were distributed among the students along-with sets of cards and other related literature. Students were explicitly told at the start that this is not their examination.

kinesthetic learners[10]). Requests of students from other centres who attended the lectures via video-link (87th and 88th courses) for presentations continued several days after the lectures

Verbal questioning: after each MCQ, teacher explained the relevant points using appropriate powerpoint slides. This part of the lecture was also largely interactive. Electronic copies of these powerpoint presentations were given to the students after the lectures (purposefully not before the lectures).

Other strategies: Were also used like humour, metacognition[11], small competitions for chocolates etc.

Data collection tools:

Questionnaire: Students' feedback questionnaire was based on Likert's Scale[12].

Focus group discussion (FGD): FGD with selected students was used for qualitative evaluation of the teaching strategies. FGD was conducted during the breaks and after the completion of the classes. Students were randomly selected for FGDs according to their availability and inclination to give elaborate verbal feedback. Principal investigator of the project (First author)

conducted all the FGDs which lasted for an average of 22 minutes. All efforts were made to hold these sessions at secluded places. FGDs generated information through group synergy and interaction[13]. The discussion started with the questions about the good points, weaknesses and recommendations for improvement. Some of these FGDs were video recorded depending on the willingness of the participants. Data analysis procedure with justification

Table-2: Post-Hoc analysis (Bonferroni) to compare average total score of students of various basic medical science courses.

Number of BMS Course	of BMS course	Mean difference	*p*-value
82nd BMS	83rd BMS	-.748	1.000
	84th BMS	-.956	1.000
	85th BMS	-1.009	1.000
	86th BMS	-2.881*	.000
	87th BMS	-3.142*	.000
	88th BMS	-3.937*	.000
83rd BMS	84th BMS	-.209	1.000
	85th BMS	-.262	1.000
	86th BMS	-2.133*	.002
	87th BMS	-2.394*	.000
	88th BMS	-3.189*	.000
84th BMS	85th BMS	-.053	1.000
	86th BMS	-1.925*	.004
	87th BMS	-2.185*	.000
	88th BMS	-2.980*	.000
85th BMS	86th BMS	-1.872*	.015
	87th BMS	-2.133*	.001
	88th BMS	-2.927*	.000
86th BMS	87th BMS	-.261	1.000
	88th BMS	-1.056	1.000
87th BMS	88th BMS	-.795	1.000

*. The mean difference is significant at the 0.05 level.

Quantitative data

Data was stored in SPSS version 17 and descriptive statistics were calculated[14] including age and gender distribution and relative frequencies of different specialties.

Average total score (based on Likert's Scale) of students from 82nd to 88th BMS courses was calculated along-with 95% Confidence Interval. Maximum possible score was 30, if answers of all 6 questions were'strongly agreed'.

One way ANOVA test was used for comparison of average total score.

Scores for each question e.g. increased knowledge, MCQs, flash cards, hand-outs were calculated. This score was expressed as percentage of maximum possible score for each question i.e. 1400.

Since most of the students gave feedback anonymously no gender or age related comparative or correlation studies were possible. A p value <0.05 was considered as significant.

The project was carried out after due approval of synopsis from Department of Medical Education of CPSP. Written permission of the Ethical Review Committee (ERC) of CPSP was also obtained. Gatekeeper`s permission for all research projects carried out under the auspices of CPSP is given through the ERC. Informed Consent of the participating students was obtained after explaining them the reasons for collecting the information from the feedback questionnaire and FGDs. Strict adherence to personal confidentiality was maintained and no physical risk for the research subjects was ensured.

The participants were informed about the outcome of the study and its potential implications.

Data was carefully and accurately collected without any subjective bias on the part of the researchers. So personal data and consent forms were filled and taken back during the lectures while feedback questionnaires were filled at the end of the lectures which did not contain any

identification information. All the efforts were made to make the study free of any fabricated or manipulateddata to provide a desired answer.

RESULTS

This study was conducted mainly to highlight the students' perspective on the effectiveness of strategies used in interactive lectures. The majority of participating students were female (78%) while the mean age was 29 years (SD = 3.1). Students of clinical specialties i.e. Medicine and allied, Obstetrics/ Gynaecology and Surgery and allied dominated the study population (Figure 1). A vast majority of students submitted their feedback proformae (92%) while a total of 49 students participated in four FGDs with video recording (Table 1). Average total score was 25.71 (95% CI: 25.4 to 26.02) (maximum possible score was 30). As shown in Figure 2, the greatest liking of the students was for use of flash cards as ARS. This strategy earned 1249 scores out of possible 1400 (89%) while content coverage was least approved strategy (1106 score). Total Average Score (TAS) based on the Likert's Scale significantly improved from 82nd to 88th BMS courses (ANOVA Test; p <0.001) (Table 1). Post hoc analysis of ANOVA test showed no significant improvement in TAS from 82nd BMS course to 85th BMS Course (p > 0.05); whereas a significant increase in TAS occurred in 86th BMS course (27.0; p< 0.001) (Table-2). But this upward trend stopped in 87th course and there was no significant improvement in TAS from 87th to 88th BMS (Table 2). The qualitative analysis of the content derived from FGD showed several themes and sub-themes (Table 3). Main sub-themes were:

- "Maximum participation due to use of the flash cards": Most of the participants found it innovative way of increasing participation and forcing everyone to think about the best option of the MCQ.
- "Conceptual teaching": Use of MCQs as a primary teaching tool was taken very positively by the participants who took it as a mean of developing (critical) thinking. They also found it very useful in examination preparation as this is the assessment tool used in FCPS-Part I examination.
- "Should be followed by other teachers": Students showed their desire and recommendation for use of similar methods by other teachers.
- "Poor content coverage": Most of the participants were of the view that some other topics could not be discussed as these strategies are more time-consuming.

DISCUSSION

This was a 'case study' designed in real word situation which means studying a phenomena as it is happening rather than designing a study for experiment purposes. Although some authors have shown reservations against such designs, it is very commonly used in social research[15]. So this was an objective analysis of satisfaction level of seven batches of students who attended the classes of Chemical Pathology, over a span of about 24 months. The strategies evaluated in this study were evolved over 2-3 years. Students' verbal and written feedback on teaching methodology of various teachers of the course was a major source to formulate optimum strategies before the present study was designed. The most important finding of the study was that the strategies to improve students` involvement increased effectiveness of interactive lectures. Richard Felder who is considered a present-day pioneer of effective teaching in large classes' believed that people learn by doing, more than by watching and listening[16]. But the real test is to select the strategies suitable and feasible for the group of students a teacher encounters. Miller RG et al and Turpin DL have shown that use of Audience Response System (ARS) improves students` involvement as evident by the students` liking of about 75% and 82%, respectively, in their studies[17,18]. Present study has also shown that students overwhelmingly approved this strategy (89%) (Figure-2). Ytterberg SR et al used an innovative technology as ARS[19], similarly, we also used an innovative ARS i.e. flash cards. The

advantage of these innovations was two folds. Firstly, it is quite cost-effective and secondly, the in the present study. Many authors have advocated use of various formats of questioning

Table-3: Content analysis of the focus groups discussion (FGDs) and comments in feedback proforma (n=49).

Themes	Sub-themes	Remarks
Good points	We liked use of Flash Cards as they increased our involvement. Flash cards facilitated participation of maximum number of students. It forced us to think about the MCQs and find an answer	Very common comments
	A conceptual teaching through the use of MCQs. MCQs required use of back-ground knowledge to reach a diagnosis or to find an answer MCQs helped us prepare for the examination which contained questions on similar pattern	Frequent comment
	All teachers should use these methods	Frequent comment
	Lectures were very interactive	Frequent comment
	We did not lose concentration for several hours	Frequent comment
	Great efforts by a sincere professor	Occasional
	ایسے ٹیچرز کے لیے دلسے دعا نکلتی ہے!!!!!, (Words to that effect)	Occasional
Bad points	Poor content coverage Important aspects are left	Frequent comment
	More time consuming	Frequent comment
	Unnecessary questions and discussion	Infrequent comment
Sugge-stions	More time for such lectures	Very common comment
	Send questions by email prior to lecture	Frequent comment

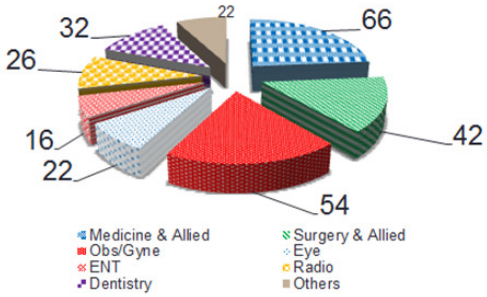

Figure-1: Specialty wise distribution of students participating in study on interactive lecturing (n=280).

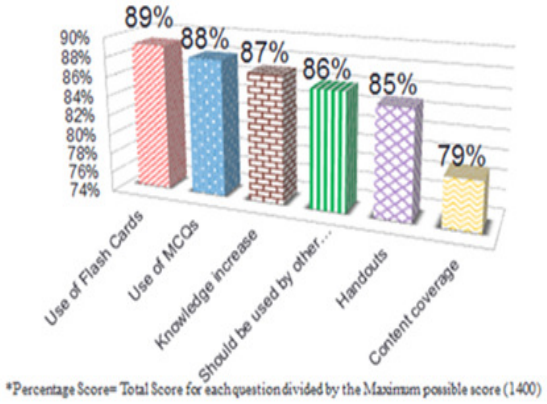

Figure-2: Percentage score of each question answered by the students.

students are asked face-to-face the rational of selecting the answer. Since all the students had equal chance of being invited to give comments on the selected answer, this strategy proved to be most effective in increasing students` involvement (Figure-2) and students showed greatest liking for this innovative strategy. Use of MCQs as a teaching strategy was also quite novel in the class[7-8,20], but using MCQs as an initiating strategy has not been reported earlier. These questions were different from 'cases' used in CBL widely used and evaluated in medical education[21]. Students rated this strategy very high as it greatly contributed to their involvement in the lectures and they also learnt how to attempt MCQs. Many authors have

demonstrated that students greatly appreciate written or electronic hand-outs before a lecture[5-8]. Increasing students 'requests for electronic hand-outs' and very high rating of students for these hand-outs are strong evidence of students` approval (Figure-2). Content coverage received lowest rating in the feedbacks (Figure-2) and interestingly it was also one of the most commonly identified 'bad point' themes during FGD (Table-3). Shrinkage of contents has always remained a problem in interactive sessions[22-24] but increasing content at the cost of interaction with students is not approved by students and faculty. In the present study most of the students attributed this poor content coverage to less time allotted to these lectures. It was also evident from content analysis of the "weak points" of the feedback questionnaire. They demanded 'more lectures and more MCQs' in the "suggestions" part. Since this point was related to the logistics of the BMS courses, it could not be improved during these seven courses. Students' recommendation for other teachers to use similar teaching methods (Figure 2) is still another evidence of their strong approval of these strategies. Although the topics taught in these classes were of basic sciences, students of clinical sciences constituted vast majority of the approvers (Figure-1).

The limitations of the study included lack of the experimental method to assess effectiveness of the lectures e.g. their results of FCPS Part I, smaller number of students in each group (average 37; range 22 to 58) against the usual undergraduate classes of 100-300 students and lack of comparison with traditional methods. The reason of the last limitation was that the instructor delivered the lectures using all the possible strategies at the same time and did not alternate it with traditional lectures i.e. without these methods, merely due to ethical reasons.

CONCLUSION

Students showed great liking for the strategies such as employment of innovative flash cards, properly selected MCQs and purposefully designed hand-outs to increase effectiveness of interactive lectures but showed concern over less content coverage.

Declaration of interest

This research was performed as part of the mandatory research work for MCPS-Health Profession Education, CPSP. Authors have no declarations of interest.

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