

ORIGINAL ARTICLE

EVALUATION OF PHYSIOLOGY LABORATORY TEACHING
BY STUDENTS' FEEDBACKParminder Kaur Sandhu, Dimple, Sukhjinder Kaur Dhillon, Ravneet Sandhu*,
Harkirat Kaur

Department of Physiology, Sri Guru Ram Das Institute of Medical Sciences and Research,

*Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Sri Amritsar, Punjab, India

Background: The evaluation of the learning experience and the effective use of student feedback can benefit all those with a stake in high quality teaching and learning: students, teaching staff, department and college. Feedback in medical teaching is an important part of medical education. This study was conducted with an aim to improve teaching in physiology practicals by taking student feedback at Department of Physiology, Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar. **Methods:** All the second semester medical students of batch 2014 (males: 73 and females: 137) were given a pre-validated questionnaire which enclosed 10 questions (to be responded on a 5 point Likert scale) with reference to syllabus and teaching. It also had 3 open ended questions about strengths and weaknesses of laboratory teaching. Descriptive statistics were used and results were expressed as percentage. **Results:** 120 females and 63 males returned the filled questionnaire. Majority of students found teaching and learning in the physiology laboratory motivating and of assistance for next semesters. They were happy as performing practicals helped in clearing concepts, developing clinical skills, better understanding of theoretical topics, broadening the range of thinking. They were unhappy about outdated apparatus, long demonstrations, less number of equipments, writing of practical files, not performing animal experiments and less number of practicals. The results were presented at Departmental meeting and remedial measures were initiated. **Conclusions:** Student feedback comprises a major source of evidence for assessing laboratory teaching and it can be communicated in way that it is informative for faculty. The present study can help to design a model evaluation system which by using data can play a key role in review, modification and hence evaluation of curriculum.

Keywords: Evaluation of teaching, feedback, Medical Education, Physiology practical

Pak J Physiol 2015;11(4):32-6

INTRODUCTION

Giving feedback is a critical skill for effective teaching and learning, the heart of medical education.^{1,2} Feedback is central to medical education in promoting learning and ensuring that standards are met.³ Importance of feedback in medical education has been emphasised for more than 20 years. Feedback has been studied and classified in the literature by delineating specific characteristics or schemes that should be included in order to provide the best opportunity for performance enhancement.^{4,5}

It is well-known that feedback improves performance.⁶ Medical educators rely on feedback from learners to impel enhancement of educational programs.⁷ As for the content of feedback, studies have validated the effective feedback is constructive, specific and non judgemental.⁸⁻¹⁰

Little is available in literature about consistently incorporating teaching feedback by medical students and on developing programs to improve individual teaching ability.¹¹ For improving quality of undergraduate teaching, it should be monitored and assessed regularly. Effective feedback

has long been recognized as one of the main catalyst for effective learning.¹² Laboratory-Based Learning (LBL) session, which is a part of Physiology curriculum, provides students an opportunity to have hands on experience and also help them understand the concepts better through active mode of learning, enhancing student learning and performance.¹³ "Tell me, I will forget; show me, I may remember; allow me to do it, I will understand." goes the Chinese proverb, which clearly explains the importance of Laboratory-Based Learning. Students generally enjoy laboratory based exercises and involve themselves more as compared to general lectures.¹⁴

In such a climate of change there is a need for medical teachers to continually review and revise the learning experience they offer. This process can be effectively facilitated by on-going, upright formative evaluation, which must include feedback from the primary stakeholders in the course - the students.

This study was aimed to obtain feedback of Physiology Laboratory teaching from the second semester medical students of Sri Guru Ram Das

Institute of Medical Sciences and Research, Sri Amritsar, with an objective of quality enhancement.

SUBJECTS AND METHODS

This study was carried out at the Department of Physiology, Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar, after obtaining permission of Institutional Ethical Committee. A questionnaire was prepared, discussed and validated by faculty members of the Department. The questions were to be responded on 5-point Likert scale. Participants were the entire class of 210 (73 males and 137 females) second semester medical students of the single institution, batch 2014. A consent form was provided to all students which explained the purpose and methods of the study and students voluntarily participated in the study. Feedback was gathered from the students anonymously by making them fill the questionnaire. Of the 210 students, 183 students (63 males and 120 females) returned the completely filled questionnaire. Incompletely filled questionnaires were excluded. All open-ended comments by the students were edited only for language and grammatical errors, grouped based on response and reported as such. The results were presented in departmental meeting and corrective measures were initiated.

Descriptive statistics were used for analysis of data. Frequency was shown as percentage.

RESULTS

The results of the study are summarized in Tables 1–4. Responses of the students, to the 10 items using 5-point Likert scale is shown in Table-1 and 2. Results of open ended questions by female and male students are shown in Table-3 and 4 respectively.

Table-1 depicts the response of female students (120) to the questions pertaining to syllabus, teaching and learning. 46.6% of female students agreed to the ‘development of scientific approach’ by doing laboratory work. When asked whether the ‘laboratory work encourages you for decisive and creative thinking’ 45% of students agreed. When

enquired that ‘laboratory work increases the perception of Physiological concepts’, the majority of the students agreed to this (64%). When asked ‘were practical and theory properly linked’, again most (63%) of the students agreed to this query. When asked ‘whether demonstration helped in performing practicals’, 49.1% and 41.6% agreed and strongly agreed respectively. The question ‘was faculty helpful in solving problems’ was agreed by 54.1% students, and 37.5% strongly agreed to the question. When enquired ‘were you prompted to ask question’, 58.3% agreed. Majority (57.5%) students agreed when asked ‘Were your queries properly addressed’. When enquired ‘Were their proper guidelines for preparing the lab result’, 50.8% students agreed. Majority (59.1%) of the students agreed, when asked ‘were topic properly covered by the laboratory result’.

Table-2 shows the response of male students to the questions regarding syllabus, teaching and learning. Slightly more than half (50.7%) students agreed when they were asked ‘Did lab work developed scientific approach in you’. When enquired ‘whether the laboratory work encourages you for decisive and creative thinking’, only 38% students agreed to this. To the question ‘did laboratory work increases the perception of physiological concepts’ 53.9% of students agreed. Most (60.31%) of the students agreed when asked ‘was practical and theory properly linked’. A lesser proportion, 47.6% agreed and 38% strongly agreed to the query ‘was demonstration helpful in performing practical’. ‘Was faculty helpful to you in solving problem’ was agreed by 69.8% of the male participants. Most (68.2%) of the students agreed to when asked ‘were you prompted to ask questions’. Seventy-nine percent of male participants agreed when enquired ‘were your queries properly addressed by faculty members’; 60.31% students agreed to the query ‘were their proper guidelines in preparing result’; and 68.2% agreed when they were asked ‘was the topic properly covered by lab result’.

Table- 1: Responses of female students to questionnaire [n=120; n (%)]

Item	Strongly Disagree	Disagree	Agree	Strongly Agree	Neutral
A: Syllabus (Objectives)					
1. Did lab work developed scientific approach in you?	5 (4.16)	21 (17.5)	56 (46.6)	32 (26.6)	6 (5)
2. Did lab work encourage you for decisive and creative thinking?	5 (4.16)	20 (16.6)	54 (45)	29 (24.2)	12 (10)
3. Did lab work increases the perception of Physiological concepts?	4 (3.3)	8 (6.7)	77 (64.1)	29 (24.1)	2 (1.6)
4. Was practical and theory properly linked?	2 (1.6)	24 (20)	76 (63)	13 (10.8)	5 (4.16)
B: Teaching and Learning					
1. Demonstration helped in performing practicals?	4 (3.3)	4 (3.3)	59 (49.1)	50 (41.6)	3 (2.5)
2. Was faculty helpful to you in solving problem?	5 (4.16)	1 (0.83)	65 (54.1)	45 (37.5)	4 (3.3)
3. Were you prompted to ask questions?	1 (0.83)	16 (13.3)	70 (58.3)	23 (19.16)	10 (8.3)
4. Were your queries properly addressed by faculty members?	4 (3.3)	5 (4.16)	69 (57.5)	34 (28.3)	8 (6.7)
5. Were their proper guidelines for preparing the lab result?	2 (1.6)	12 (10)	61 (50.8)	34 (24.83)	11 (9.16)
6. Was the topic properly covered by lab result?	4 (3.3)	10 (8.3)	71 (59.1)	30 (25%)	5 (4.16)

Results expressed as responses on a 5 point Likert scale

Table-2: Responses of male students to questionnaire [n=63; n (%)]

Item	Strongly Disagree	Disagree	Agree	Strongly Agree	Neutral
A: Syllabus (Objectives)					
1. Did lab work developed scientific approach in you?	2 (3.17)	13 (20.6)	32 (50.7)	9 (14.28)	7 (11.11)
2. Did lab work encourage you for decisive and creative thinking?	1 (1.58)	14 (22.22)	24 (38)	12 (19.04)	12 (19.04)
3. Did lab work increases the perception of Physiological concepts?	4 (6.34)	3 (4.7)	34 (53.9)	20 (31.7)	2 (3.17)
4. Was practical and theory properly linked?	3 (4.7)	10 (15.8)	38 (60.31)	11 (17.46)	1 (1.58)
B: Teaching and Learning					
1. Demonstration helped in performing practical's ?	1 (1.58)	3 (4.7)	30 (47.6)	24 (38)	5 (7.9)
2. Was faculty helpful to you in solving problem?	1 (1.58)	1 (1.58)	44 (69.8)	13 (20.63)	4 (6.34)
3. Were you prompted to ask questions?	4 (6.34)	8 (12.69)	43 (68.2)	5 (7.9)	3 (4.7)
4. Were your queries properly addressed by faculty members?	4 (6.34)	2 (3.17)	50 (79)	7 (11.11)	-
5. Were their proper guidelines for preparing the lab result?	2 (3.17)	11 (17.46)	38 (60.31)	9 (14.28)	3 (4.76)
6. Was the topic properly covered by lab result?	4 (6.34)	2 (3.17)	43 (68.2)	11 (17.46)	3 (4.76)

Results expressed as responses on a 5 point Likert scale

Table-3: Typical responses to open ended questions by female students (n=120)

Questions and Responses	Frequency
What are the strong points of the lab work?	
1. Gives true doctor like feeling	1
2. Better understanding of subject	5
3. More clinical practice, hands on practice, fun& interactive	1
4. Faculty try their level best so that students can understand	3
5. Comprehensive detailed preparation	1
6. Cooperative lab technician	1
7. Proper apparatus, interaction with teachers	3
8. Faculty helps a lot as each row provided with instructors	1
9. Exposure obtained quite good	4
10. Hand on activity to help learning	3
11. Revision classes are helpful	1
12. It helps us to broaden our range of thinking	1
13. Helps in developing doctor patient relationship	4
14. Helps in developing clinical skills	1
15. Apparatus well maintained	3
16. Helps in learning and enhancing practical knowledge	
What are the weak points of the lab work?	
1. Duration of practical long	1
2. Proper results are not obtained	3
3. Lack of proper apparatus	5
4. Old equipments used	3
5. Old methods used	1
6. Lack of enthusiasm in some instructors	2
7. Crowded lab	1
8. Everyone does not get chance to perform	1
9. Not all demonstrations are put into lab work (experimental)	1
10. Sometimes chaotic Nuisance created by some students deprives other from learning	4
11. Lab work not linked well with theory lectures	1
12. Teachers tend to be bit strict sometime	1
13. Creative thinking depressed	1
14. Large size of groups	3
15. Less revision	
Remarks & Additional Comments	
1. Best Physiology Lab, very interesting	1
2. Demonstration can be made more interesting	1
3. Overall satisfactory	1
4. Demonstration should be shorter, more hands on work	1
5. Time should be given complete the files	1
6. At least 2 demonstrations before lab work	2
7. Proper instructions are required so that we can know how to perform in final exams	1
8. Interesting way to learn	1
9. Teachers can prepare us for viva questions	1

Table-4: Typical responses to open ended questions by male students (n=74)

Questions and Responses	Frequency
What are the strong points of the lab work	
1. Instructors and technicians	1
2. Concepts about topic get strong	1
3. Helpful in learning	1
4. Students get clinical approach for topic	2
5. Points missed in lectures are well understood	2
6. Students guided, encouraged and taught properly	4
7. Small group and more number of teachers	1
8. Spacious laboratories	1
9. Students come to know how to perform tasks and learn new techniques	4
10. Every student is given a chance to perform	1
11. Presence of good faculty	1
12. Pre lab demonstrations are good	2
13. Interesting, better than boring theory	2
14. We can put our hands on to the equipment on which lab class is conducted	1
15. Clinical experience and practice	1
16. It helps us to broaden our range of thinking	1
17. Encourages participation	1
18. We get the doctor feel	1
What are the weak points of the lab work	
1. Lot of time wasted in making practical file	1
2. Equipment shortage	3
3. Outdated apparatus & no ventilation	1
4. More practice required to improve skill, hence more time for practice	1
5. Not able to understand the viva questions	1
6. Teachers should not dictate and force the students to write	1
7. Too much writing stuff which is irrelevant	1
8. Less of group discussions	1
9. Results not always same as in theory lecture	1
10. Poor implementation of practicals	1
11. Duration Too long	2
12. Boring	1
13. Limited time for each student	1
14. Some things are not shown and some experiments are not done by students themselves (amphibian)	1
15. Difficult to work because of large groups	3
Remarks and Additional Comments	
1. Physiology department is best	1
2. I have learned a lot and learning was fun	1
3. Practical should be more frequently held than theory classes, as much more is gained in practicals	3
4. Teachers should ensure that each and every student must be entertained	2
5. Good working atmosphere for learning new things	1
6. Demonstrations can be taken in laboratory	1
7. New instruments are required	1
8. Attendance should be given for work performance not for completed files	1

DISCUSSION

Student feedback or student evaluation represents the experiences and opinions of students as captured by their institution. It can be collected in a variety of ways, including formal and informal, quantitative and qualitative. As students are the best judges for assessing effectiveness of Laboratory-Based Learning sessions, perception of students about the same was obtained through questionnaire.^{15,16} It was heartening to know from their response that physiology practicals were informative, interactive and interesting. Their comments like laboratory work should be held more often than demonstrations, it develops scientific approach, helps in better understanding of concerned topic and Physiology Department is best are very encouraging.

Significant number of participants agreed that laboratory work in our department developed scientific approach and improved learning of Physiological concepts, which are an important objectives of physiology curriculum and students were satisfied with this aspect which is in collaboration with other studies done previously.¹⁷ Practical sessions are important in physiology teaching since they assure the consolidation of subjects taught in lectures, create an opportunity for discussion in laboratory environment within small groups and provide students with an opportunity to acquire skills and create chances of analytical thought.¹⁸ On the other hand, the male students agreeing to the question 'did lab work encourage you for decisive and creative thinking' were less. It was decided to take suitable courses to get better off this shortfall.

Laboratory teaching (and learning) is hard work. When the student and the teacher leave the laboratory each day, both should be tired and intellectually gratified that the time and effort are well spent.¹⁹

Most of the students agreed to the questions 'were you prompted to ask questions', and 'were your queries properly addressed by faculty members'. It was all communicated to the faculty members and they were commended for their efforts. Understanding the mechanisms of the body functions requires high level of interaction and integration, not just a descriptive approach.²⁰

When asked about 'strong points of laboratory work', their answers were: it helps in better understanding of subject, hands-on activity to help learning, helps in developing clinical skills, helpful faculty members, interesting, revision classes are helpful. There must be mutual stimulation and excitement communicated between faculty member and student in teaching laboratory process. And there must be positive sense of 'teaching and learning something worthwhile' for the time, money and power invested.¹⁹

The weaknesses pointed out by the students were real eye opener. They openly showed their displeasure in making practical files, long duration of laboratory work, boring, most of laboratory work cannot be performed (amphibian experiments), outdated apparatus and less equipment. The weak points were discussed in departmental meeting and satisfactory measures were taken to remove these shortcomings.

Students want the introduction of multimedia during practical demonstrations and showing video clips of practical demonstrations. Other forms of technology use in laboratories such as watching experiments as animation, computer simulation can also be introduced.^{21,22}

Instead of demonstrations students wanted to perform animal experiments, but use of animals in teaching laboratories is decreasing gradually all over the world due to various reasons such as higher costs and animal rights. Although computer models have started to be used extensively, discussion continues whether they can replace living tissues.²³

CONCLUSION

Majority of students were pleased with the content and methodology employed in the existing laboratory-based sessions in physiology. Some of the suggestions given by students could straightforwardly be implemented for improving the curricula, while others require added infrastructure and logistic support.

ACKNOWLEDGEMENT

We thank faculty members of Physiology Department, and students of 2014 MBBS Batch, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar for their valuable feedback. We are especially thankful to Mrs. Harpreet Kaur, Department of Social and Preventive Medicine, for doing statistics.

REFERENCES

1. Beinstock JL, Katz NT, Cox SM, Hueppchen N, Erickson S, Puscheck EE. To the point: medical education reviews—providing feedback. *Am J Obstet Gynecol* 2007;196(6):508–13.
2. Branch WT Jr, Paranjpe A. Feedback and reflection: teaching methods for clinical settings. *Acad Med* 2002;77(12):1185–8.
3. Ende J. Feedback in clinical medical education. *JAMA* 1983;250(6):777–81.
4. Brukner H, Altkorn DL, Cook S, Quinn MT, McNabb WL. Giving effective feedback to medical students: a workshop for faculty and house staff. *Med Teach* 1999;21(2):161–5.
5. Bing-You RG, Bertsch T, Thompson JA. Coaching medical students in receiving effective feedback. *Teach Learn Med* 1998;10(4):228–31.
6. Ammons RB. Effects of knowledge of performance: a survey and tentative theoretical formulation. *J General Psychol* 1956;54(2):279–99.
7. Kern DE, Thomas PA, Howard DM, Bass EB. Curriculum development for medical education: a six step approach. Baltimore (MD): The John Hopkins University Press; 1998.

8. Van de Ridder JM, Stoking KM, Mc Gaghie WC, Ten Cate OTJ. What is feedback in clinical education? *Med Educ* 2008;42(2):189–97.
9. Hewson MG, Little ML. Giving feedback in medical education: verification of recommended techniques. *J Gen Intern Med* 1998;13(2):111–6.
10. Shute V. Focus on formative feedback. *Rev Educ Res* 2008;78(1):153–8.
11. Mann KV, Sutton E, Frank B. Twelve tips of preparing residents as teachers. *Med Teach* 2007;29:301–6.
12. Dantas AM, Kemm RE. A blended approach to active learning in a physiology laboratory-based subject facilitated by an e-learning component. *Adv Physiology Edu* 2008;32:65–75.
13. Rao SP, DiCarlo SE. Active learning of respiratory physiology improves performance on respiratory physiology examination. *Adv Physiol Educ* 2001;25:55–61.
14. Vashe A, Abraham RR, Terke S, Pallath V, Kamath A. A Student and faculty perspectives on Laboratory based Learning (LBL) sessions in Physiology. *South East J Med Educ* 2012;6(2):1–7.
15. Lata H, Walia L. Appraisal and improvisation of undergraduate practical curriculum in physiology. *South East Asian J Med Educ* 2010;4:55–8.
16. Prayoonwong, T. & Nimnuan, C. Dental students' perceptions of learning environment. *South-East Asian J Med Educ* 2010;4(1):55–8.
17. Moni RW, Hryciw DH, Poronnik P, Lluca LJ, Moni KB. Assessing core manipulative skills in a large, first year laboratory. *Adv Physiol Edu* 2007;31:266–9.
18. Sefton AJ. Charting a global future for education in Physiology. *Adv in Physiol Edu* 2005;29:189–93.
19. Randall WC, Burkholder T. Hands on laboratory experience in teaching-learning physiology. *Adv Physiol Edu* 1990;259:S4–S7.
20. Fyrenius A, Silen C, Wirell S. Students' conceptions of underlying principles in medical physiology: an interview study of medical students understanding in a PBL curriculum. *Adv Physiol Edu* 2007;31:364–9.
21. McGrath P, Kucera R, Smith W. Computer simulation of introductory neurophysiology. *Adv Physiol Edu* 2003;22:120–9.
22. Samsel RW, Schmidt GA, Hall JB, Wood LDH, Shroff SG, Schumacker PT. Cardiovascular System Physiology Teaching: Computer simulation and animal demonstration. *Adv Physiol Edu* 1994;11:36–46.
23. Griffith JD. Technology in the teaching of neuroscience: enhanced student learning. *Adv Physiol Edu* 2003;27:146–55.

Address for Correspondence:

Dr Parminder Kaur Sandhu, 1192 New Mohani Park, Opposite Khalsa College for Women, Amritsar, India. **Cell:** +91-946-4751900.

Email: sandhugillp@rediffmail.com