



## INTERACTIVE LEARNING: CASE BASED AND INTEGRATED TEACHING IN LARGE GROUP OF MEDICAL STUDENTS

### Education

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### ABSTRACT

**Background:** Case based and integrated teaching are methods of teaching learning due to which students have a feel of being doctor from the first day they enter the medical institute in absence of patient dealing. These teaching methods are accepted by the council so as to have focus on achieving skills which make them competent enough to serve the community. The objective of study was to conduct integrated and case based teaching sessions in theory and practical for teaching physiology to first year medical students.

**Material and Method:** After the approval from Institutional Ethics Committee (SVIEC) study was conducted on 150 First MBBS students of 2016-17 batch. Two theory and two practical classes were conducted by case based and integrated teaching approach. Pre-post test scores were recorded for evaluation of students' learning outcome. Feedback from students was taken to elicit their insight about the effectiveness of these strategies.

**Result:** Majority of students were satisfied with these type of sessions and agreed that they had better understanding of the taught topic and clinical implementation of the taught concept. They agreed that such type of sessions should be conducted for most of the physiology topics as well as other medical courses. Difference in the pre-post test score were significant and majority of students scored >75% in post-test after case based session.

**Conclusion:** Case based and integrated teaching proved to be an effective active interactive learning strategy. Although students' suggested to have a combined approach of these two strategies for much greater learning outcome.

### KEYWORDS

Case based teaching, integrated teaching, Practical and theory session, Physiology

### INTRODUCTION

Improvement in Indian curricula, Medical Council of India (MCI) 'Vision 2015'<sup>1</sup> has introduced integrated curriculum coupled with early clinical exposure to students. Main focus is on competency-based approach to skills acquisition and community based approach to learning. Faculties are motivated and updated via revised Basic Medical Educational Training (rBMET) which focuses on competency, goal and objectives. Interactive classroom learning in large or small groups with emphasis on integrated teaching approach at horizontal and vertical level. Even assessment strategies are modified by introducing Objective Structured Clinical Examination (OSCE), One Minute Perception mechanism (OMP). Efforts made by MCI are well placed within many medical institutes of country but still pitfalls need to be addressed in respect to student faculty ratio, interactive teaching facilities. In-order to provide sufficient psychomotor and affective skill domain development for achieving competence contemporary education technology need to be introduced, may be in the form of simulation based programs for demonstration<sup>2</sup>. Format prepared by MCI in 'Vision 2015' focusing on foundation curriculum for a duration of 2 months is a great step as per Indian subcontinent. This was one of the concern, since students admitted to medicine program come from various regional states with English being second language. Its implementation in 497 medical colleges of country, in one go, is a big task?

Traditional teaching approach surprisingly is characterized by poor attendance and attention span due to monotonous lecturing<sup>3</sup>. Those lectures can be made interactive and exciting to motivate students to participate for the sessions. Classroom interaction is an attempt to improve the learning environment in large setting<sup>4</sup>. Thus is helpful for the learner's development<sup>5</sup>. A variety of interactive activities can allow focusing of student's attention towards taught topic, leading to effective learning<sup>6-10</sup>.

With all ups and downs at various levels of medical educational system, we being faculty from pre-clinical departments do find a need for interactive learning for large group, allowing students to move from passive listening to active participation. These interactive methods will expose students towards problem solving and critical thinking approach. It will clarify confusion in students mind by diversifying the extent of topics and its application in real life context. Every medical institute is trying its best to provide different ways to improve teaching learning by introducing various technique's as per

their feasibility. We at our institute are having vertical and horizontal teaching in physiology department and paper based case scenarios for better understanding of clinical approach of basic science.

The aim of using case scenarios, with the knowledge already acquired by teacher- directed learning is to comprehend how and where basic science is applicable in clinical context in simpler and easier manner<sup>11</sup>. Cases have long played a central role in medical education<sup>12</sup>, being an interactive group- based learning, introduced a century ago within economics and the faculty of law<sup>13</sup>. Most important aspect of preparing the case scenario is that they should have a real background, triggers students so as they are motivated to discuss and concomitantly fulfil scheduled learning objectives of the course.

Thistlewaite et al<sup>14</sup> offered a definition of CBL: "The goal of CBL is to prepare students for clinical practice, through the use of authentic clinical cases. It links theory to practice, through the application of knowledge to the cases, using inquiry-based learning methods."

The medical students should have clear understanding of the basic science course i.e., human physiology, so that they will be able to link the pathophysiology with clinical sign and symptoms of the subject to come up to the diagnosis<sup>15</sup>.

'Vision-2015' of MCI has placed huge focus on the integrated teaching approach; horizontally as well as vertically<sup>1</sup>. Schmidt et al (1996)<sup>16</sup> has reported that students trained within an integrated curriculum made more accurate diagnosis compared to students who had traditional/conventional curriculum. Dulloo et al (2017)<sup>17</sup> specifies that to have in-depth understanding of the application of course content integrated teaching is required even this method encourages students' for the intellectual curiosity. Integrated teaching approach contributes to inter-disciplinary teaching, with the content of all or most subjects combined into a new format. Thus allows learner to have understanding of topics with multi-disciplinary approach, not confined to the stringent borders of subject specialty.

**AIM:** Assessing the learning outcome and insight for traditional teaching, case based teaching and integrated teaching approach for first year medical students in the physiology course.

### OBJECTIVES

- To provide appropriate integrated sessions in theory and practical classes.

- To provide applicable case based teaching sessions in theory and practical classes.
- To find students opinion for case based and integrated teaching sessions conducted for the physiology course.
- To assess the learning outcome after the case based teaching, integrated teaching and traditional teaching sessions for physiology topics.

**MATERIAL AND METHOD**

Study started after taking prior approval from the ethical committee of Sumandeep Vidyapeeth Deemed to be University. 150 first MBBS students enrolling for 2016-17 batch participated in this study, while repeater students were excluded. All the sessions of the case based and integrated teaching were conducted in lecture hall and practical labs of physiology department in Smt.B.K.Shah Medical Institute and Research Center, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara.

This is an observational, cross sectional and questionnaire based study and was conducted for four theory topics (two each from cardiovascular system and central nervous system) with integrated teaching, case based teaching and other topics of these organ system were conducted by conventional traditional teaching approach. Two practical sessions were conducted by case based learning (ECG interpretation, clinical examination of respiratory system) and integrated teaching approach (history taking and general physical examination with medicine department of the institute) for the clinical physiology practical topics. Pre-posttest were conducted before and after each integrated/case based and four traditional theory as well as practical session to assess the learning outcome of students. Data related to students' perception for corrective implementation and its importance for each type of teaching approach was collected using a five point Likert scale<sup>18</sup> based questionnaire after validating it by subject experts. An open ended question was asked to have in-depth expression of their views for the different ways of teaching methodologies. Data analysis allowed us to prepare evaluation matrix

**Table-3: Chi-square analysis for Post-test learning for three different methods**

Percentage Grouping	Post-Test for Integrated	Post-test for Traditional	Post-test for Case based	Chi-square Value	P value
Group-1 <50%	48	28	58	80.3819	<0.00001
Group-2 50-75%	72	62	10		
Group-3 >75%	30	60	82		

Table-3 shows significant difference for the post-test values conducted by three different teaching methods i.e., traditional, integrated and case based between three groups of students as per the percentage attained by the students using Chi-square analysis.

**Table-4: Frequency Distribution for perception of integrated and case based teaching sessions by medical students of 2016-17 batch**

Questions	Frequency in Percentage for Survey questionnaire about integrated & case based teaching sessions					Mean±SD	Ranks
	Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree		
1. Integrated techniques allowed better understanding of the coordinated action of several system	1.4	3.4	14.4	62.3	18.5	3.93±0.77	04
2. IT session increased my interest in the topic taught	0.7	6.8	17.8	52.7	21.9	3.88±0.85	07
3. Case based session enabled me to relate with clinical implication	4.1	5.5	11.0	53.4	26.0	3.92±0.98	06
4. Case based session enhanced interaction between instructor and student	3.4	11.0	26.0	47.3	12.3	3.54±0.96	15
5. The learning acquired through these IT or case sessions allowed me to appreciate human body function	3.4	4.8	23.3	50.0	18.5	3.75±0.93	10
6. Facilitated collaborative learning among students	2.7	14.4	37.0	37.0	8.9	3.35±0.93	20
7. IT and Case based session is advantageous for clinical practical sessions compared to theory	0.00	6.8	8.2	46.6	38.4	4.16±0.85	02
8. IT or Case based teaching should be used for major theory classes	2.1	15.1	27.4	32.2	23.3	3.6±1.07	14
9. IT or Case based teaching should be used for major practical classes	2.1	6.2	11.6	45.9	34.2	4.04±0.95	03
10. Integration should be done using a clinical case	1.4	3.4	9.6	45.2	40.4	4.2±0.85	01
11. The teacher/ teachers provided guidance for self-learning	2.7	11.0	31.5	46.6	8.2	3.47±0.9	17
12. Teacher/ teachers paid enough personal attention to the students	6.8	16.4	21.9	42.5	12.3	3.37±1.11	19
13. As a student I was comfortable with these teaching technique	2.7	8.2	16.4	58.2	14.4	3.73±0.9	11
14. I expect to score better in those topics as a result of interactive teaching	0.0	6.8	23.3	56.2	13.7	3.77±0.77	09
15. The teaching technique encouraged my intellectual curiosity	0.0	8.2	22.6	46.6	22.6	3.84±0.87	08
16. Entire syllabi for three departments should be integrated	5.5	17.8	17.8	38.4	20.5	3.51±1.16	16
17. Module was well organized	8.2	8.2	26.0	52.7	4.8	3.38±1.0	18
18. I think more time should be devoted for conduct of these sessions	4.8	8.2	24.0	47.3	15.8	3.61±1.0	13
19. Integrated and case based teaching are more effective than didactic lecture	2.7	6.8	13.0	50.0	27.4	3.92±0.96	05

up to the level II i.e., we could find reaction as well as learning of the students.

**RESULTS**

**Table-1: Descriptive and paired sample statistics for three different teaching methodologies**

Teaching Method (N=150)	Pre-test Mean±SD	Post-test Mean±SD	df	Sig.
Integration based session (Theory)	4.35±4.3	9.3±3.0	264	.000*
Integrated based session (Practical)	6.42±7.4	15.98±4.4	258	000*
Case based teaching session (Theory)	3.17±3.4	8.27±1.3	268	.000*
Case Based teaching session (Practical)	1.93±2.1	8.28±1.2	258	000*
Traditional teaching session (Theory)	2.03±1.9	6.43±2.0	264	.000*
Traditional teaching session (Practical)	1.73±1.6	5.73±1.4	270	000*

Table-1 shows significant difference \*(2-tailed <0.0001) for pre and post-test for three different ways of teaching methodologies i.e., traditional, integrated teaching and case based teaching in theory and practical classes.

**Table-2: ANOVA test for learning outcome by three different teaching strategies in theory and practical session.**

Source of Variation	SS	df	p-value
Between Groups in theory session	347.3164	2	0.00001
Within Groups in theory session	619.4173	393	
Between Groups in practical session	524.4001	2	0.00001
Within Groups in practical session	500.3954	398	

Table-2 shows significant difference for the post-test values conducted by three different teaching methods i.e., traditional, integrated and case based during theory sessions as well as practical classes.

20. Session allowed me to integrate topics across the disciplines	3.4	6.8	23.3	53.4	13.0	3.66±0.91	12
21. Session was time consuming	19.2	38.4	17.8	17.1	6.8	2.54±1.19	22
22. Interactive session confused me at theoretical level	28.8	49.3	14.4	6.8	0.7	2.01±0.88	27
23. It was difficult to focus throughout the session	21.2	51.4	11.6	11.0	4.1	2.38±1.94	25
24. It was not an interactive session	22.6	52.1	13.0	8.9	3.4	2.18±1.0	26
25. Topic was not given before hand	22.6	42.5	15.8	17.1	2.1	2.34±1.1	23
26. Huge content was covered in a short time	8.9	31.5	19.2	32.2	8.2	2.99±1.15	21
27. Some of the content were irrelevant and unnecessary	22.6	46.6	15.1	9.6	5.5	2.12±0.88	24

Table-4 shows frequency distribution for various teaching methods via 5 point Likert scale items for undergraduate medical students for the questions posed as 1 to 20. Although more disagreement was for the questions related for time consumption or confusion created by these sessions or difficulty to focus or not being interactive or irrelevance of topics.

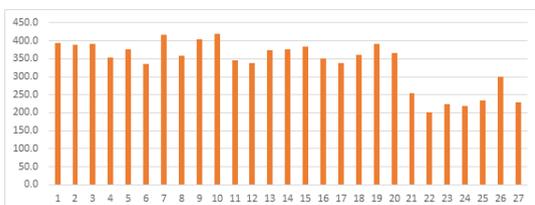


Figure-1: Ranking for each questions

Figure-1 shows highest ranking for the question related to coordination and clinical understanding by integrated teaching and case based session. Even they were considered better for practical classes. Students accepted that these interactive sessions should be used for major practical classes. These sessions were accepted as better and effective than didactic lecture. Last rank was given to question 22 specifying that those interactive sessions confused the students at theoretical level.

The response to the open ended question, by the participants, regarding suggestions for improving the program highlighted that more such type of sessions should be conducted and in various other courses too. Some mentioned that it is a good interactive approach but time consuming. Some talked about providing the topic details before hand and said that it is more important for practical sessions rather than theory. While a small number of students revealed that attendance should not be taken for those sessions it should be voluntary, even while conducting the session all the students' attention should be focused rather than specific once. The sessions should be more interactive and less dominating. Few said that collaboration of the technique helped them to a great extent to relate the topics, even clinical examples via case session's generated interest for the topic as well as subject. Some of the students supported that it should be done daily while other asked for once in a week time and should be in cooperated within the first MBBS syllabi i.e., before students enter clinical patient setting. Although few of the students did specified that it was hectic for them.

## DISCUSSION

Interactive teaching in many ways have always been appreciated by various researchers world-wide. Present study shows significant difference (2-tailed <0.0001) for pre and post-test to assess the learning outcome of students by traditional, integrated and case based teaching sessions (Table-1). While ANOVA statistical test for post-learning outcome analysis shows statistical significance ( $p < 0.00001$ ) values for theory as well as practical class sessions conducted by case based teaching, integrated teaching and traditional teaching method (Table-2). Although the mean value for post-test with case based or integrated teaching is much higher than traditional teaching. Chi-test analysis (Table-3) for post-test learning by three ways of teaching shows that majority of students in group 3 with >75% of grades are from case based teaching session although least for integrated teaching session. Bansal and Goyal<sup>19</sup> (2017) showed high statistical score by pre-post-test when students of first year were introduced to case based learning in physiology course. Similar results for learning outcome by case based teaching in physiology course were observed by other researchers<sup>11,20,21</sup>. Bhattacharya et al<sup>22</sup> (2017) study showed significant learning for case based teaching conducted with horizontal integration. Positive results were also obtained by other researchers for pre-post test score by integrated teaching session in physiology and other medical courses for undergraduate students<sup>17,23-26</sup>.

Frequency distribution for students perception for integrated and case based teaching shown in Table-4& Figure-1, observed higher ranks for the question like integrated teaching should be conducted using a clinical case, these sessions are advantageous for clinical practical classes compared to theory. Even majority of students agreed that these sessions should be used for majority of practical classes. This has been highlighted by Hansen (2005)<sup>27</sup> that case based learning is better able to connect theory to clinical practice. Present study also observed high rank for case based and integrated teaching by the student as per the question related to better understanding of organ system in coordinated style with integrated teaching. They also agreed that case based sessions enhanced their interaction with the instructor. Engagement of students, by case based learning and integrated teaching fostering more active and collaborative learners was observed by other researchers<sup>28,29</sup>.

Participating students in present study also accepted that these teaching techniques encouraged their intellectual curiosity even they agreed that these sessions were more effective than traditional teaching. Researchers have specified the case based learning promotes, deep learning approach<sup>30</sup>, with active<sup>28,31</sup> and meaningful learning<sup>31,19-22</sup>. Similar observations were reported by other researchers<sup>11,19-22</sup>. Kate et al (2010)<sup>24</sup> and others<sup>17</sup> showed that students were enthusiastic about integrated teaching and feel that they had a better clinical pathological correlation. Basu et al (2015)<sup>32</sup> and other researchers specified that students and faculties showed positive attitude about integrated teaching by having enhanced understanding of topic.<sup>26,33,34</sup>

In present study, participants disagreed that these interactive sessions confused them or were difficult to focus upon or were irrelevant to taught topic or time consumed was less. Even majority disagreed that sessions were time consuming. Results were in agreement with other researchers<sup>11,17,21,22</sup>.

Students suggested that integrated teaching and case based teaching should be conducted collaboratively for much better clinical understanding which has also been accepted by Bhattacharya's et al (2017)<sup>22</sup> study. Suggestions from students stated that these interactive case based and integrated sessions should be conducted frequently and for many more topics of physiology courses as well as other medical courses during first year of medical education.

Some of the students did suggest to look for the interest of students' as well as how to motivate dull or dis-interested one too. This really needs to be looked once further such session are introduced, so that ever participant have feeling of ownership.

Large portion of pre-clinical curriculum is under constant threat, since it focuses more on science rather than its application in clinical side<sup>35</sup>. Thus there is a need for re-visiting learning strategies, which would include problem solving, critical thinking and interdisciplinary approach. Thus will incorporate behavioral science, communication, ethics and professionalism etc in the curriculum from first year<sup>35</sup>.

## CONCLUSION

Case based learning and integrated teaching are tools which allow matching of clinical cases in medical education related fields to a body of cognitive domain in that field, so as, to improve and enhance clinical performance and attitude. These interactive teaching learning approaches showed improved team work, motivation towards learning of basic science course which subsequently will improve clinical skill and thus patient's outcome. It is appropriate to have case based integrated teaching for teaching basic science curriculum in medical institutes. This will make students feel to be a part of their own learning thus this learning self-directed and full of excitement and fun so as to complete the quest.

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