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Case Based Learning Versus Traditional Didactic Lectures in Embryology: A Comparison

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ABSTRACT

Retention of knowledge and recall from lecture is less than 5% after 6 months, which results in little or no transfer of information into the long-term memory. Meaningful learning can be defined as a condition that information is understood by the learner. Case based learning in medical education is the tool to foster meaningful learning, which helps in developing analytical and decision making skills. Present study was undertaken to compare learning with traditional didactic lectures and learning with case based learning in embryology. Aim of the current study is to develop critical thinking skill and problem solving skill in phase I MBBS students. Objectives of the present study are to evaluate the didactic lectures as well as case based learning as teaching learning tool, to compare each other as well as to analyse the perception of phase I MBBS students with regards to both these methods. 150 phase I MBBS students were divided randomly into 2 groups (group A and B) of 75 each. Pretest was conducted in the form of single correct answer MCQs as well as case based questions for both the groups. Afterwards group a was exposed to the traditional didactic lecture and group B (after dividing in group of 15) to the case based learning sessions. Post test was conducted for both the groups. Afterwards group a was exposed to the case based learning sessions and group B to the traditional didactic lecture. Similar exercise was conducted for total four topics of embryology. Afterwards feedback was obtained from students as well as faculties with regards to the case based learning sessions. Difference between the post test and pre test scores for both single correct answer MCQs as well as case based questions were more in the group of students who were exposed to case based learning as compared to the students who were exposed to the traditional didactic lectures for all four topics of embryology covered in the study. Case based learning is an effective teaching learning tool which helps students for integration of their knowledge of embryology, better application of basic science subject knowledge for problem solving, improving communication skills, helps students for in depth learning of the topic as well as helps in better retention of the acquired knowledge.

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Key Words
Case based learning, embryology, traditional didactic, lectures

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INTRODUCTION

The effective and efficient delivery of healthcare services requires knowledge as well as technical, analytical and communication skills. Health care professionals need to be trained adequately to fulfill this objective. The teaching learning methods used in medical education should be able to achieve the highest level of Miller's pyramid. Classical teaching methods of lecture-demonstration help in development of knowledge and recall only. Lecture is the most common method of teaching-learning in medical education[1]. However, it is seen that the retention of knowledge and recall from lecture is less than 5% after 6 months[2].

Meaningful learning skills are very important for medical students as they need to keep abreast of the rapid changes in science and the practice of medicine. Thus, in order to have competent doctors, there is a need to train medical students in ways that help them to become life-long meaningful learners[3]. Hence, one of the major goals of medical educators is fostering meaningful and self-directed learning among medical students[4]. Case based learning in medical education is the tool to foster meaningful learning. It helps in developing analytical and decision making skills. It also facilitates learning by doing[5]. 1st year medical students are unable to correlate the structures with the clinical presentation (applied anatomy) of different aspects of embryology. There is a lack of development of self-directed learning. Present study was undertaken to compare learning with traditional didactic lectures and learning with case based learning in embryology.

Aim and objectives

Aim: Development of critical thinking skill and problem solving skill in phase I MBBS students.

Objectives:

- To compare the learning with didactic lectures and learning with case based learning
- To analyse the perception of phase I MBBS students as well as faculties involved in the project with regards to case based learning

MATERIALS AND METHODS

It is a prospective educational interventional study carried out among 150 students of phase I MBBS from admission batch 2020-21 of Banas Medical College and Research Institute, Palanpur, Gujarat. Phase 1 MBBS students who were willing to participate and given informed consent were included in study and students, absent during sessions or during assessment or during both were excluded from study. Written consent was taken from all the students for voluntary participation in the study and the purpose of the study was well explained in advance.

Prior approval was taken from the Institutional Ethics Committee (Ref. No. BMCR/IEC(H)/Approval/A1-/2021/12/22/12) of the Banas Medical College and Research Institute, Palanpur, Gujarat for conduction of study.

Data collection method: Grouping: 150 students were divided randomly into two group of 75 each, group A and group B. Further the group which was exposed to case based learning was divided in a group of 15 students each. Study participants were sensitized about the study plan beforehand.

Total 4 Topics of embryology were included in the study. Development of Gastrointestinal tract, Development of Cardiovascular system, Development of Urinary system and Development of Reproductive system. Faculties involved in the study were sensitized regarding the study design and the methodology adopted in the current research project.

Interventions: Pre validated pretest questionnaires (single correct answer MCQ as well as case based questions validated from the faculties of Department of Anatomy as well as faculties of Medical Education Unit, Banas Medical College and Research Institute, Palanpur) were given to both the groups:

- **Group A:** Exposed to didactic lectures (3 sessions of 1 hrs each) covering all relevant specific learning objectives of the development of the system involved in the study
- **Group B:** 2 sessions of case based learning 2-3 days apart in a group of 15 students each. Self-learning literature was distributed to the students beforehand

1st session: 2 hrs of case based learning

2nd session (2 hrs): 1 hrs (embryology model demonstration) and 1 hrs (case based learning with advanced case of same topic)

In these sessions of case based learning, students had discussed the clinical case based problem statement among themselves to fill their learning gaps and the faculties facilitated them.

Post- test questionnaires: Single correct answers MCQ as well as case based questions were given to both the groups. Group A at the end of 2nd session of didactic lecture and Group B at the end of 2nd session of case based learning.

After post-test: group A was exposed to case based learning and group B was exposed to traditional didactic lecture for the same topic.

Similar sessions of didactic lectures and case based learning were conducted in cross over session for all 4 topics included in the study.

Feedback was obtained from all the students as well as all the faculties involved in the study project with regards to case based learning through questionnaires based on 5 point likert scale. These questionnaires were validated from the faculties of Department of Medical Education as well as Department of Anatomy beforehand.

Limitations of the study: Present study was conducted in a single institution with 75 sample size in each group. Further only four topics of the embryology were covered in the present study.

Statistical analysis: Statistical analysis was done on the data obtained with the help of Microsoft Excel software to find out the mean as well as standard deviation. Independent sample t-test was applied to find out any significant difference in the marks obtained by students.

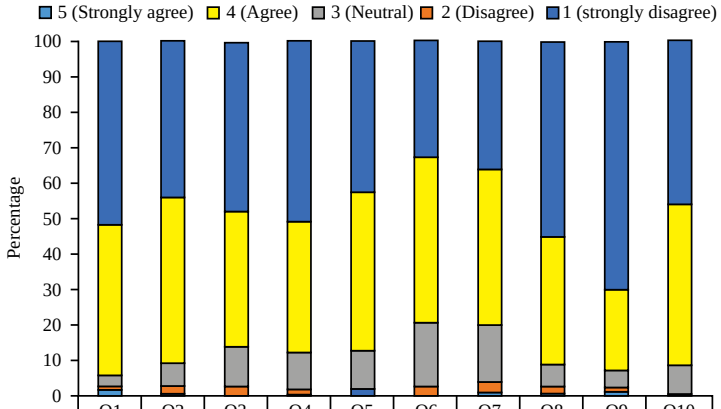
RESULTS/OBSERVATIONS

As shown in Table 1, 2 and Fig. 1, most of the participants enjoyed case based learning in embryology. Further the case based learning in embryology has created interest in the subject among the participants, motivated them to read more about the topic, helped them to correlate the basic sciences of embryology with clinical cases, helped them in better retention of topic, pre-tests and post tests conducted were interesting and encouraging, participants would like to learn other topics of embryology also by case based learning. According to the responses of most of the participants, all the sessions of case based learning were completed in stipulated time. During the sessions, faculty's interaction was precise, to the point and related to the topic only.

As shown in Fig. 2, total 10 faculties provided their feedback (2 associate professor, 3 assistant professor and 5 tutors). Most of the faculties enjoyed case based

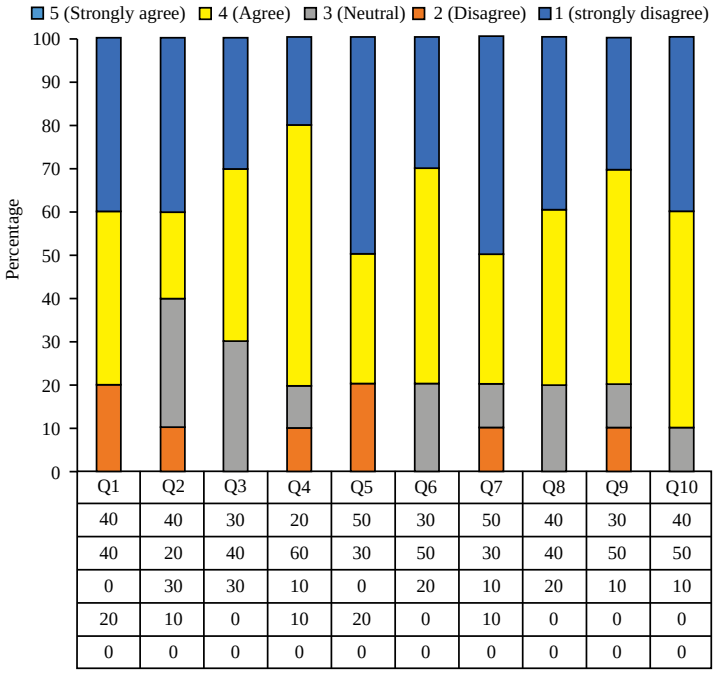
Table 1: Statistical analysis of pre-test and post-test

Topic	Group of students exposed to	Type of questions	No of students	Mean±SD (Marks) Pre-test score	Mean±SD (Marks) Pre-test score	p-value for Post-test score
Development of gastrointestinal tract	Didactic lecture	Single correct answer MCQ	75	3.26±1.54	5.47±2.10	<0.05
	Case based learning	(Out of 10 marks)	75	3.23±1.48	6.31±2.34	
	Didactic lecture	Case based questions	75	4.91±1.87	8.12±2.29	<0.05
	Case based learning	(Out of 15 marks)	75	4.87±1.91	9.45±2.53	
Development of cardiovascular system	Didactic lecture	Single correct answer MCQ	75	3.91±1.68	6.98±2.03	<0.05
	Case based learning	(Out of 10 marks)	75	3.95±1.13	7.19±2.45	
	Didactic lecture	Case based questions	75	5.76±2.01	9.97±2.86	<0.05
	Case based learning	(Out of 15 marks)	75	5.89±1.77	10.18±2.97	
Development of urinary system	Didactic lecture	Single correct answer MCQ	75	3.02±1.45	6.11±1.58	<0.05
	Case based learning	(Out of 10 marks)	75	3.13±1.57	6.48±1.93	
	Didactic lecture	Case based questions	75	4.53±1.26	9.22±2.78	<0.05
	Case based learning	(Out of 15 marks)	75	4.61±1.19	9.73±2.88	
Development of reproductive system	Didactic lecture	Single correct answer MCQ	75	4.37±1.46	7.96±1.50	<0.05
	Case based learning	(Out of 10 marks)	75	4.33±1.32	8.44±2.44	
	Didactic lecture	Case based questions	75	6.48±2.09	11.27±3.16	<0.05
	Case based learning	(Out of 15 marks)	75	6.45±2.80	12.02±3.23	



Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
52	44	48	51.3	42.7	32.7	36.7	55.3	70	46
42	46.7	38	36	44	46.7	43.3	36	22.7	45.3
3.3	6.7	11.3	10.7	11.3	18	16	6	4.7	8
0.7	2.0	2.7	1.3	0	2.7	2.7	2	1.3	0
2	0.7	0	0.7	2	0	1.3	0.7	1.3	0.7

Fig. 1: Percentages of responses (5 = Strongly agree, 4 = Agree, 3 = Neutral, 2 = Disagree and 1 = Strongly disagree) of students' feedback questionnaire



	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
5 (Strongly agree)	40	40	30	20	50	30	50	40	30	40
4 (Agree)	40	20	40	60	30	50	30	40	50	50
3 (Neutral)	0	30	30	10	0	20	10	20	10	10
2 (Disagree)	20	10	0	10	20	0	10	0	0	0
1 (strongly disagree)	0	0	0	0	0	0	0	0	0	0

Fig. 2: Percentages of responses (5 = Strongly agree, 4 = Agree, 3 = Neutral, 2 = Disagree and 1 = Strongly disagree) of faculties' feedback questionnaire

Table 2: Percentages of responses (as agree and disagree) of students' feedback questionnaire

Questions	Disagree responses [1+2]	Agree responses [4+5]
I enjoyed the case based learning in embryology	2.7	94.0
Case based learning in embryology created interest in the subject	2.7	90.7
Case based learning in embryology motivated me to read more about the topic	2.7	86.0
Case based learning in embryology helped me to correlate the basic sciences of embryology with clinical sciences	2.0	87.3
Case based learning in embryology helped me in better retention of topic	2.0	86.7
Case based learning in embryology helped me to be responsible for my own learning	2.7	79.4
All the sessions of case based learning were completed in stipulated time	4.0	80.0
During case based learning in embryology, faculty's interaction was precise, to the point and related to the topic only	2.7	91.3
Pre- tests and post tests conducted during the case based learning in embryology were interesting and encouraging	2.6	92.7
I would like to learn other topics of embryology also by case based learning	0.7	91.3

learning in embryology. According to them "must know" areas were covered during the sessions, students feel less stressed during case based learning sessions as compared to didactic lectures, time management was satisfactory during the sessions. Further the faculties opine that the case based questions in embryology should be asked in the various exams conducted in Phase I of MBBS, traditional didactic lectures in embryology can be replaced by case based learning.

DISCUSSIONS

Competency based medical education (CBME) adopted by National Medical Commission (NMC) has given more emphasis to the small group teaching, interactive lectures, problem based learning, early clinical exposure as compared to the traditional didactic lectures to make Indian Medical Graduate more competent[6]. Further the learner centric approach has been encouraged more instead of teacher centric. Case based learning stimulates students to apply their cognitive skills more efficiently and helps in improvement of problem solving skills[7,8]. Case based learning promotes deeper learning of the given topic which will go beyond simple justification of the problems and will develop critical thinking ability of the learner[9]. Case based learning provides opportunity to interact with the peers, seniors, juniors as well as teachers which will develop their ability to work as a team as well as improve the communication skills also[10].

Many studies have been done for assessing the effectiveness of case based learning over the didactic lectures. Few studies concluded that there is better performance with case based learning as compared to didactic lectures few concluded on opposite side saying that the didactic lectures are more useful than the case based learning and few concluding that there is no difference between these two methods[11-16]. These variations might be due to the variability in the implementation of the case based learning session and as well as the sample size of the group.

In the present study difference between the post test and pre test scores for both single correct answer MCQs as well as case based questions were more in the group of students who were exposed to case based learning as compared to the students who were exposed to the traditional didactic lectures for all four topics of embryology covered in the study. This indicates that the case based learning is an effective teaching learning tool which helps students for integration of their knowledge of embryology, improving ability of self-learning, better application of basic science subject knowledge for problem solving, improving communication skills, helps students for in depth learning of the topic as well as helps in better retention of the acquired knowledge. Similar encouraging findings in favor of case based learning as compared to traditional didactic lectures were reported by Nair and Rai[17], Singhal *et al*.[18], Diwan *et al*.[19] and Sangam *et al*.[20] as well as Rustagi *et al*.[21].

CONCLUSION

To make Indian Medical Graduate more competent and to improve their critical thinking ability as well as problem solving skills, case based learning is an effective tool for teaching learning in embryology.

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