

Problem Based Learning In Anatomy – Our Experience

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Abstract: Background: Presently Anatomy is taught in a traditional way through lectures, small group teaching and demonstration. All these are teacher-controlled methods for teaching as per Medical Education Technology. So it was decided to introduce a learner-controlled method for teaching of Anatomy i.e. problem-based learning (PBL) with the following. Objectives: To compare the performance of the students undergoing PBL with the performance of the students taught in a traditional way To compare the perception of the students about PBL in comparison to Traditional way Materials and methods: 32 students who volunteered for the study were divided into two groups. The first group was taught cerebellum by PBL method and the second group was taught cerebrum by PBL method. Cross over method was then applied. Thereafter a theory examination was conducted. A feedback questionnaire was given to the students after the examination. Results: The average score of the students in the PBL group was more than that of the students in the lecture group in 60% questions. The score was same in 20% questions. The score was reverse in 20% of questions. PBL was appreciated and accepted by the students. It can be introduced partly in the existing curriculum. [Yuvaraj b NJIRM 2016; 7(4): 92-97]

Key words: Teaching, learning, Traditional, Problem-based learning

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Introduction: In 1985, Barrows defined Problem-based learning (PBL) in its most fundamental level as an instructional method that uses patient problems as a context for students acquire knowledge and understanding of basic sciences and clinical sciences¹. Students use “triggers” from the problem case or scenario to define their own learning objectives. Subsequently they do independent, self-directed study before returning to the group to discuss and refine their acquired knowledge. Thus, PBL is not about problem solving per se, but rather it uses appropriate problems to increase knowledge and understanding. The process is clearly defined, and the several variations that exist all follow a similar series of steps. Presentation of clinical material as the stimulus for learning enables students to understand the relevance of underlying scientific knowledge and principles in clinical practice². It fosters active and deep learning, improved understanding, and retention and development of lifelong learning skills. PBL facilitates a constructivist approach to learning amongst the students as they activate prior knowledge to identify what they will need to learn further³. PBL motivates students by freeing them from rote learning and also motivates teachers equally. Evidence from cognitive psychology has shown that integration of knowledge facilitates the storage and later retrieval of relevant information. Integrated knowledge should prepare students better for actual clinical practice³.

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methods for teaching as per Medical Education Technology. So it was decided to introduce a learner-controlled method for teaching of Anatomy i.e. problem-based learning (PBL) with the following objectives:

1. To compare the performance of the students undergoing PBL with the performance of the students taught in a traditional way
2. To compare the perception of the students about PBL in comparison to Traditional way
3. To suggest the modifications in the present teaching learning process in Anatomy

Methods: After obtaining permission from the Head of the institution and Ethics Committee, need of student volunteers for the project was announced in the class and students were registered for the project on first come first serve basis. Informed consent was taken from all students who volunteered for the project. Project was started and completed before neuroanatomy and neurophysiology was taught to the students in the routine curriculum. The students were divided into two groups. First group was taught cerebellum by PBL method and the second group was taught cerebrum by PBL method. Subsequently the first group was taught cerebrum by traditional method and second group was taught cerebellum by the traditional way (Cross over technique). After this teaching was completed a theory examination was conducted. The theory paper comprised of multiple choice questions (MCQs) and short answer questions (SAQs) with equal weightage to cerebrum and cerebellum. A feedback questionnaire was given to

the students after the examination to record their perceptions about PBL in comparison with the traditional teaching.

Before implementing PBL, the faculty members involved in the project were given training on the PBL process and the facilitation skills.

Details of the PBL schedule:

PBL of Cerebellum: SESSION 1: The case was administered. Students read the case thoroughly and decided to find out the meanings of all the terms in the signs and symptoms. Each student decided to find out meaning of 5 terms.

SESSION 2: Students discussed the meaning of the signs and got an idea that the organ affected is cerebellum and decided to know everything about anatomy of cerebellum by next session. They divided themselves into 3 groups. Each group was assigned a topic for presentation after the discussion.

Group 1: archicerebellum & Intracerebellar connections

Group 2: paleocerebellum & blood supply of cerebellum

Group 3: neocerebellum & histology of cerebellum

SESSION 3: Students discussed anatomy of cerebellum.

Group 1 made a presentation on archicerebellum and intracerebellar circuits. They also discussed the signs related to archicerebellar syndrome.

Group 2 made a presentation on paleocerebellum and explained the blood supply of cerebellum and signs related to paleocerebellar lesion.

Group 3 made a presentation on neocerebellum and explained histology of cerebellum. They also discussed signs related to neocerebellar syndrome.

SESSION 4: Students discussed the various tracts passing through the superior, middle and inferior cerebellar peduncles and revised all about cerebellum discussed earlier. They classified all the signs and symptoms as being related to either archicerebellum or paleocerebellum or neocerebellum.

PBL of cerebrum: Session 1:

The case was administered. Students read the case thoroughly and decided to find out the meanings of all the terms in the signs and symptoms. Each student decided to find out meaning of terms.

Session 2: The meanings of each sign in the given case were discussed.

The students concluded that the lesion is on the left Hemisphere (Parietal Lobe) of Cerebrum.

The students now divided themselves into smaller groups to learn various aspects of cerebrum and decided to present the same in the next session.

Session 3: Anatomy of cerebral cortex was discussed.

Borders, surfaces, poles, lobes, important gyri & sulci were mentioned. The physiologic significance of each lobe & division according to Brodmann’s classification were discussed.

Session 4: The students discussed blood supply of the cerebrum and correlated it with the functional loss according to the areas of cerebrum affected.

Lecture: Students from group 1 were taught anatomy of cerebrum in a traditional way by a lecture which included applied anatomy

Students from group 2 were taught anatomy of the cerebellum in a traditional way by a lecture which included applied anatomy

A photograph of students engaged in PBL activity is depicted in Figure 1.

Result: The average score of the students in the PBL group was more than that of the students in the lecture group in 60% questions, the score was same in 20% questions and the score was reverse in 20% of questions (Refer Graph 1-6). 90% students agreed that there is active self-learning in PBL. 72% students felt that there is improved understanding in PBL. 78% students felt that there is easy retention of things learnt in PBL. 94% students agreed that PBL integrates anatomy with clinical subjects. 78% felt PBL was enjoyable. 84% felt that PBL motivates the student to learn more. 90% students agreed that there is interactive learning in PBL. (Details in Table 1)

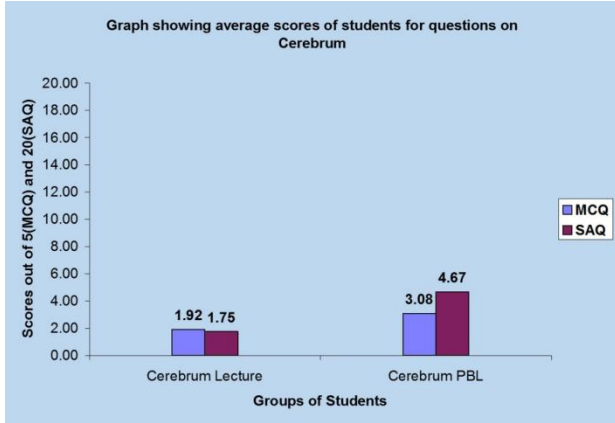
Table 1: Students’ perception regarding PBL

N o.	Questions	Percentage of Students (%)		
		Disagreed	Uncertain	Agreed
1	There is active self-learning in PBL	6.3	3.1	90.6
2	There is improved	15.6	12.5	71.9

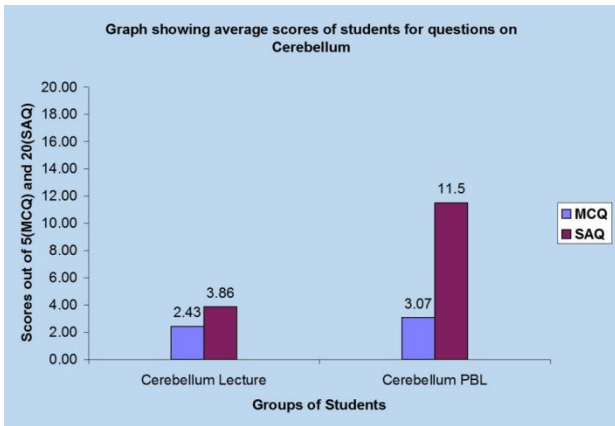
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	understanding in PBL				12	PBL promotes interactive learning	4.6	5.0	90.4
3	There is easy retention of things learnt in PBL	6.3	15.6	78.1	13	PBL does not allow teacher to pass on the required knowledge to the students	25.0	18.8	56.3
4	There is development of lifelong learning skills in PBL	6.3	21.9	71.9	14	In PBL, all students gain the same amount of knowledge irrespective of who the teacher is	9.4	0.0	90.6
5	PBL helps students to develop attitudes required in future practice	21.9	15.6	62.5	15	Roles were assigned to each and every student of the group in PBL	37.5	28.1	31.3
6	PBL motivates students to learn more	6.0	9.8	84.2	16	PBL is enjoyable	9.4	12.5	78.1
7	All students are engaged in PBL	15.6	9.4	75.0	17	PBL is time consuming	21.9	18.8	59.4
8	There is fortification of learning in PBL	50.0	6.3	43.8	18	PBL allows students to learn at their own pace	12.5	12.5	75.0
9.	PBL integrates anatomy with clinical subjects	2.8	2.9	94.3	19	Doubts are not cleared in PBL	6.3	0.0	93.8
10	Students were unsure of how much information collected is relevant	6.3	6.3	87.5	20	In PBL, students are deprived of access to inspirational teachers	3.1	12.5	84.4
11	There was problem in access to resources to collect information	62.5	9.4	28.1					

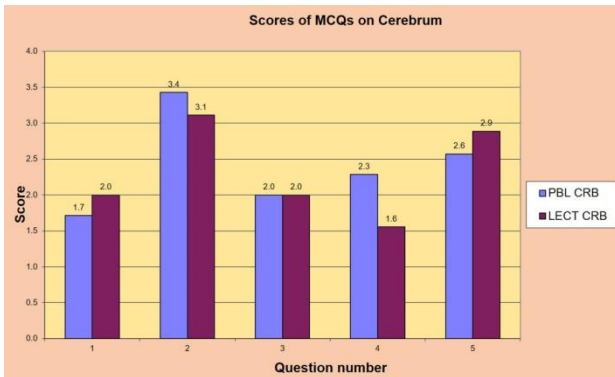
Graph- 1: Average scores of students on questions of cerebrum



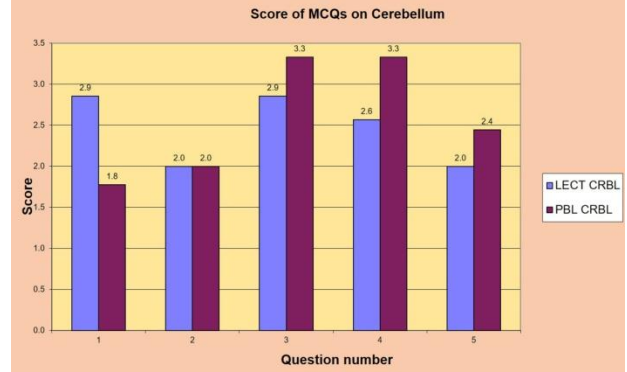
Graph- 2: Average scores of students on questions of cerebellum



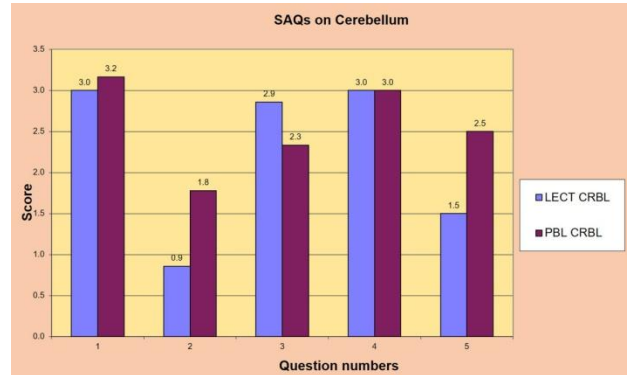
Graph – 3: Scores obtained by students on MCQs of Cerebrum



Graph – 4: Scores obtained by students on MCQs of Cerebellum



Graph – 5: Scores obtained by students on SAQs of Cerebellum



Graph – 6: Scores obtained by students on SAQs of Cerebrum

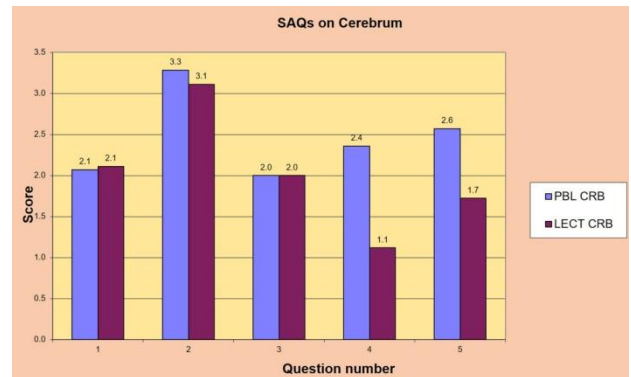


Figure 1: Photograph of students engaged in PBL activity



Other comments from students on PBL were as follows:

- Guidance needed on information collection
- Everyone should come prepared
- Only common doubts must be cleared
- Must be considered for formative evaluation
- Debating, quizzing must be done

When students were asked to specify what they felt were advantages and disadvantages of learning from lectures, we got following responses from them:

Advantages:

- Inspirational teachers
- Concept clear
- Learn quickly
- Relevant teaching
- Organized
- Collected knowledge
- Condensed knowledge
- Specific doubts cleared
- Easier to remember
- Gives idea of books
- AV aids make learning easy
- Understands everything
- Exact information
- Right direction
- Subject made clear
- New concepts taught
- More knowledge obtained
- Good teacher can make it lively
- Reading after lecture reinforces learning

Disadvantages:

- Monotonous
- Distraction
- Sleepy
- Boring
- Need 100% attendance
- Prevents reinforcement
- Level of understanding of students is not reached
- Time consuming
- No active participation
- Prior reading needed
- Fast pace
- No emphasis on making students remember
- Cannot link topics after lapse in concentration
- Teacher dependent
- Doubts not cleared
- Difficulty in retaining
- Just accept without understanding

Discussion: Medical education continues to evolve with more emphasis on integration of knowledge and focus on the ability of graduates to deal with problems successfully. Educators are constantly attempting novel approaches to prepare students for their professional lives. Anatomy is fundamental science which forms the foundation for the learning of clinical sciences. If students' understanding of anatomy is inadequate, they may be ill equipped for clinical courses. Thus constant efforts have to be made in teaching to simplify the understanding of the subject. In recent years many researchers worked on PBL and found that PBL inculcates better understanding, self-directed learning and analytical skills in students⁴. However, there have been queries as regards the need for PBL in basic sciences like Anatomy. Faculty members have expressed doubts about the wisdom, effectiveness, and educational efficacy of such a format to teach the sciences basic to medicine⁵.

Since the available data about PBL in Anatomy is minimal in literature, comparisons with other studies is quite limited. In their study on comparison of topics taught by PBL versus traditional didactic lectures, Gowri et al found a statistically significant difference in the scores obtained by the students in MCQ tests⁶. Gowri et al⁶ also reported that scores obtained by students after PBL were higher in studies conducted by Cowan et al, Loffler et al and Vasan et al. Khaki et al also found similar observations in their study⁷. In our study we found higher scores in 60% of the questions though not statistically significant. In their study on PBL in Anatomy, Dope et al found a significant difference in pre and post PBL scores obtained by students⁴. In our study we scored the students on a test only after PBL since we considered the students had no knowledge about the topics taught.

In our study, the students' gave a positive feedback on PBL. They felt that there is active self-learning, improved understanding, easy retention of things learnt, and integration of anatomy with clinical subjects. They also commented that PBL was enjoyable, it motivates the student to learn more and that there is interactive learning in PBL. All these points were reiterated in studies conducted by other researchers^{4,6}.

Problem-based learning uses real or simulated case scenarios and so is close to experiential learning. PBL makes the students get a feel of real situation so that they engage with the case if they are learning from

their own experience, developing critical thinking skills as suggested by other researchers. PBL also enables students to develop qualities like cooperation, communication and working in a team. PBL encourages students to actively engage with their learning through questioning, discussing and researching the problem in hand. These skills prepare students to be lifelong learners. Problem-based learning also encourages reflective practice⁶. In a metaanalysis of PBL, it was shown that the general approach of PBL was much more effective than traditional methods⁸. In a study on teaching anatomy through a PBL approach, it was found that learning of basic sciences suffered. Hence to increase the effectiveness of PBL for learning, a hybrid method should be used⁹.

Summary and conclusions: Understanding of basic sciences can be improved by making learning clinically relevant. This can be done by introducing PBL in the curriculum. The present study was conducted in premiere medical college in Mumbai where 32 First MBBS students participated. They were divided into two groups. The first group was taught cerebellum by PBL method and the second group was taught cerebrum by PBL method. Cross over method was then applied. Thereafter a theory examination was conducted. The paper consisted of MCQs and SAQs with equal weightage to cerebrum and cerebellum. A feedback questionnaire was given to the students after the examination. The average score of the students in the PBL group was more than that of the students in the lecture group in 60% questions. The score was same in 20% questions. The score was reverse in 20% of questions. PBL was appreciated and accepted by the students. It can be introduced partly in the existing curriculum

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