

## Teaching anatomy in a problem-based learning (PBL) curriculum

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### ABSTRACT

Anatomy is one of the important basic science subjects in the medical curriculum. The studies on problem based learning (PBL) curricula have shown that teaching/learning of basic sciences (especially anatomy) suffer. Our evaluation of a PBL curriculum, using documentary analysis method showed that embryology, histology and osteology were not covered adequately through clinical problems. We recommend a hybridized approach for teaching/learning anatomy in the PBL schools. The important topics which are not covered through health problems could be taught through lectures. *Neuroanatomy; 2006; 5: 2–3.*

**Key words** [anatomy] [learning] [teaching] [problem-based] [curriculum]

### Introduction

Anatomy and physiology are the foundation sciences for the medical curriculum. Understanding anatomy and physiology is essential to understand other subjects in the medical curriculum. Hence, anatomy and physiology have to be taught/learned effectively. In the conventional curriculum, anatomy is taught methodically, where basic anatomy is taught first and then the various regions of the body. The related histology, embryology and osteology are taught together. It gives a holistic approach with a good understanding of the regions of the body and the mutual relationship of the organs and systems. In a problem-based curriculum, teaching/learning anatomy suffers just like the other subjects of basic sciences. Previous studies have shown that the students, who have learnt in a conventional school, have a better knowledge of anatomy than their PBL counterparts [1]. We have made an attempt of evaluating the anatomy taught in a PBL school at Manipal, India with reference to teaching/learning of anatomy. This study focuses mainly on how much of anatomy was actually covered through PBL sessions.

### Methodology

The methodology used was a case-study method, which was non-experimental and qualitative. The relevant data was collected through ‘documentary analysis’. In the current research, ‘documentary analysis’ refers to the study of curricular details, time schedules, evaluation methods and the health problems obtained from the case

study school. The case study school was the International Center for Health Sciences Manipal, India. This school had a PBL curriculum which was divided into *Phase I* (preclinical phase) and *Phase II* (clinical phase). *Phase I* was of two years duration, where anatomy, physiology, biochemistry, pharmacology, pathology and microbiology were integrated. *Phase II* was of two and a half years, and had clinical subjects. In the *Phase I*, there were three PBL sessions per week, where the clinical problems were discussed. The curriculum was divided into 12 blocks (Table 1).

In this study, the health problems given to the *Phase I* students were analyzed with reference to the anatomy objectives and for the distribution of its various subdisciplines (gross anatomy, histology, embryology osteology).

### Results

In *Phase I*, 37 problems had anatomy learning objectives. Among them, 32 had gross anatomy component; 10 had histology component; 4 had embryology component and 1 had osteology component. The total number of the problems given in each block and the anatomy content is given in the Table 1.

From the Table 1 it is evident that anatomy learning objectives are minimal or absent in Blocks 1, 2, 3, 7; moderate in blocks 4, 5, 6, 8, 9, 10, 12 and abundant in block 11. It is also evident that not much of embryology and osteology are learnt through the problems.

**Table 1.** Distribution of anatomy learning objectives in PBL blocks.

	Block 1: Organism and environment	Block 2: Infection, Inflammation and Neoplasia	Block 3: Blood and Immune System	Block 4: Respiratory System	Block 5: Cardiovascular System	Block 6: Gastrointestinal System	Block 7: Hepatobiliary System	Block 8: Kidney and Electrolytes	Block 9: Endocrine and Reproduction	Block 10: Nervous System	Block 11: Special Senses	Block 12: Musculoskeletal System
Duration (weeks)	9	8	8	8	8	8	4	6	10	11	6	5
Total number of problems	7	4	9	9	9	9	5	7	8	12	7	5
Gross anatomy	2	0	0	4	4	3	1	3	4	6	7	3
Histology	0	0	0	1	1	3	0	1	2	0	1	1
Embryology	0	0	0	0	1	0	0	1	1	0	0	0
Osteology	0	0	0	0	0	0	0	0	0	0	0	1

## Discussion

The results of this study indicated that anatomy was not covered adequately and uniformly through the PBL sessions. For example, problems in the Blocks 2 and 3 did not have anatomy learning objectives at all. In the Blocks 1 and 7, there were very few anatomy objectives. This indicates that anatomy was not taught/learned uniformly as in the case of conventional curriculum. In the PBL curriculum, anatomy has a systemic approach where the various body systems are studied. It is rather difficult to study systemic anatomy than regional anatomy. McKeown et al [2] have shown that systems-based course had a negative impact on medical students' knowledge of surface anatomy. In conventional curriculum, first the basic idea of the body systems is given to the students and then the various regions of the body are taught. The general embryology is taught in the beginning of the year, which will help the students to understand the embryology of organ systems. When the histology, osteology, embryology and gross anatomy are integrated while learning, it is easier to understand the concepts. The results of our analysis showed that embryology, osteology and histology were not covered adequately through

clinical problems. The studies in the past have shown that PBL is stressful for the students. With reference to anatomy, the stress may be because of not covering all the learning objectives through clinical problems. The anatomy learnt through problems is very less. There is a lot to be learnt by students for themselves other than that learnt through the PBL sessions. In a PBL curriculum, for effective integration of the subjects, various departments have to be involved with a good understanding. While choosing the problems for the block, it has to be seen that objectives from all the disciplines are included. The cardiovascular, musculoskeletal and nervous systems are big blocks for anatomy. The amount of anatomy covered in these blocks by PBL sessions is very little. Students might neglect studying anatomy during those blocks in order to concentrate on the learning objectives from other disciplines. A study by Becker et al [3] showed that certain aspect of integration is difficult in a PBL system. In this study the students indicated that the subjects were not related, and the scenarios were not realistic.

The PBL method is one of the novel methods in education. Some of the conventional schools in India are incorporating components of PBL in their existing conventional curricula [4]. We fully agree that PBL curriculum has several advantages over the conventional curriculum but study showed that a lot of important issues in anatomy can not be taught through clinical problems alone. Such areas have to be taught through lectures. We recommend a *hybrid approach* to learning anatomy in a problem based curriculum. We disagree with the previous studies [5] that PBL can be as efficient as lectures in content coverage. We agree that the clinical problems help the students to integrate various disciplines and understand the subject well. Since all the regions/structures of the body can not be taught/learned through PBL tutorials, the topics like general embryology, osteology and histology must be taught in a conventional way. Either the actual PBL tutorials should start after the students acquire basic anatomy knowledge or the anatomy that can not be covered through PBL discussions must be taught through lectures. So our recommendation to the PBL schools is to incorporate certain aspects of conventional teaching in the subject anatomy. Attempts towards this have been started already [6] and such modification of PBL curriculum into a hybrid curriculum has been welcomed by faculty and students. We believe that the future medical curriculum will be a hybrid of PBL and conventional curricula.

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