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Original Article

Introduction of Designing of Problem in Problem Based Learning in Pharmacology for Under-Graduates

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ABSTRACT

Objective: Factual teaching is stressed rather than facilitated teaching in India. Pharmacological textbooks are often drug-centred. Irrational prescribing is a common problem. Application of knowledge to real-life scenarios, therapeutic efficacy/safety monitoring etc., are needed. Learning is a change in the learner's behaviour. Problem (ex: case history) drives learning in Problem-based learning (PBL). Problem (heart of PBL) functions as a content/knowledge organizer, learning motivator etc. Issues surrounding design of problems have received little attention. The 3C3R PBL problem design model considers issues critical to effectiveness of PBL. PBL has many advantages. There is lacuna of PBL in our setup and introduction of PBL will be an innovative effort.

Method: Goal is to establish levels of learning achieved by learners as a result of intervention viz., PBL and traditional Lecture Based Learning (LBL) and adequacy of teaching/learning method in achieving the learning objectives. Conceptual framework consists of 3C3R model comprising of Core components (content, context and connection) and Processing components (researching, reasoning and reflecting), each having specific functions and inter-component relationships. Simultaneously 3C3R model will be evaluated. Present randomised controlled study consists of true experimental design. II-MBBS students are randomly divided into traditional LBL and PBL group. Pre and post (M.C.Qs), attitude (Likert's-type items) and clinical application tests will be conducted. Data analyzed by standard statistical tests ($p<0.05$ = significant).

Result and Conclusion: PBL can be used as an adjunct/replacement for traditional LBL in pharmacology. Present study may become a reference for future research in other disciplines.

Keywords: Learning, Lecture, Pharmacology, Problem, 3C3R-Model, Undergraduates.

INTRODUCTION

Literature survey suggests that most of the teachers in medical colleges in India, stress on factual teaching rather than facilitated teaching[1]. There is a need to encourage the knowledge (of pharmacology) application to real-life scenarios, foster safe practice, monitor the therapeutic efficacy and safety as well as confidence in treating clinical patients who are taking multiple medications[1].

Learning is defined as a change in the learner's behaviour[2].Teaching of pharmacology has a major challenge to teach the students to choose medicines based on the objectives, scientific principles and to use them in a safe and effective manner[3].Problem Based Learning (PBL) promotes integration of knowledge, fosters a deeper approach to life-long learning which can help to integrate the pharmacological knowledge in a professionally relevant clinical context[4].PBL was first implemented by McMaster University medical school in 1969[5]. PBL is specifically aimed at enhancing and optimizing the educational outcomes of learner-centred, collaborative, contextual, integrated, self-directed and reflective learning[5]. The design and delivery of instruction in PBL involves peer teaching and learning in small groups through the social construction of knowledge using a real-life problem case to trigger the learning process[5]. Therefore, PBL represents a major shift in the educational paradigm from the traditional teacher-directed (teacher-centred) instruction to student-centred (learner-centred) learning[5].

Pharmacology is one of the core subjects for further graduation in both preclinical and clinical area[6]. Pharmacological textbooks are often too drug-centred. Irrational prescribing is a common problem. Lecturing is the most common teaching method in the medical education[7]. Traditional pharmacology teaching learning has been criticised for not preparing students for medical practice nor teaching the safe and rational use of medicines[8]. It has focused more on drug or pharmacological knowledge which is ever increasing, instead of therapeutics or practical skills in prescribing in the clinical situations[9-11].

In a survey, medical students have expressed the need for more teaching of therapeutics in the undergraduate medical curriculum[12,13]. PBL requires that group members identify learning issues, that is, what needs to be learned to resolve the problem[14,15]. The group must engage in a problem-solving sequence of seeking information from a variety of sources, justifying their decisions, discussing findings and weighing consequences in order to construct a viable and possibly even innovative solution[16].Current areas of emphasis regarding student learning in higher education include student engagement, critical thinking, self-directed learning, authentic learning, team skill development, problem-solving skills and interdisciplinary studies[15,16]. PBL addresses all of these, as students acquire problem-solving skills while critically analyzing contextualized (authentic) problems posed to them in a collaborative (group) setting[17]. The problem serves as a stimulus for students to identify what they need to learn, understand or solve the problem[17]. The PBL approach has been described as an effective learning strategy that can encourage students to become self-directed learners and to develop transferable skills, such as critical-thinking skills, problem-solving skills and teamwork skills[18-20]. PBL has been implemented in many universities worldwide since its beginning[21]. Traditional lecture based teaching/learning is routinely

used to teach and learn pharmacology in our setup since decades. There is a lacuna of PBL in the Department of pharmacology, KLE University's J.N. Medical. College. Hence introduction of PBL will be an innovative effort in this regard. The globalization of PBL has important cross-cultural implications[6]. Present study will analyse the effectiveness of PBL in an Indian set up.

PBL involves a problem (case history etc) which drives the learning. Problems are at the heart of PBL and function as a content and knowledge organizer, learning environment contextualizer, thinking/reasoning stimulator and learning motivator[22]. The issues surrounding the design of problems seem to have received little attention[22]. Present study uses of 3C3R problem design model as the conceptual framework which will be an innovative effort in our set up. The 3C3R PBL problem design model considers the issues critical to the effectiveness of PBL. Research is needed to evaluate and validate the 3C3R model in terms of its comprehensiveness and conceptual soundness in guiding instructional designers and educators to design effective PBL problems[22]. Present study will be evaluating 3C3R model simultaneously.

MATERIALS AND METHODS

Goal is to establish the levels of learning achieved by the learners as a result of the intervention viz., PBL and traditional Lecture Based Learning (LBL) and adequacy of the teaching and learning method in achieving the learning objectives/outcomes in pharmacology subject.

Research Question

Performance of undergraduates trained under PBL differs when compared to that of undergraduates trained under traditional LBL in pharmacology. *"Performance"* means (or includes) undergraduates' scores on cognitive tests, attitude tests, demonstrations of clinical skills and application of knowledge tests. This (performance – which is a dependent variable) will assess learning by the under graduates and/or effectiveness of the instruction method.

Null hypothesis H_0: There is no difference in performance of undergraduates between PBL group when compared to that of traditional LBL group. H_0: $\mu_{PBL} = \mu_{LBL.}$ Alternative hypothesis H_1: Performance of undergraduates in PBL group differs when compared to that of traditional LBL group. H_1: $\mu_{PBL} \neq \mu_{LBL.}$ Descriptive hypothesis H_D: Performance of undergraduates in PBL group is better when compared to that of traditional LBL group or vice versa. H_D: $\mu_{PBL} >$ or $< \mu_{LBL}$ If there is no significant difference in performance (cognitive knowledge, etc) between PBL group and traditional LBL group ***or*** performance is better in former than that of the latter group then the PBL can be acceptable as an alternative(or adjunct) to the traditional LBL.

Present research project involves true experimental design and Randomised, Controlled study and consist two groups (consisting II[nd] MBBS students-sample) exposing to traditional LBL (active control group) and PBL. Tests will be conducted as follows:

R O1 --------- X_{PBL}---------- O2,O3 [O4] [O5]

R O1 --------- X_{LBL} ---------- O2,O3 [O4] [O5]

X_{PBL}= Exposed to Problem Based Learning.
X_{LBL}= Exposed to traditional Lecture Based Learning.

O means outcome.
O1 = Pre-test consisting 50 M.C.Qs (cognitive).

O2 = Post-test consisting 50 M.C.Qs which are used for pre-test.
O3 = Post intervention 100 M.C.Qs.
[O4] = Attitude/feedback test (by using Likert's-type questions/items) for both the groups.
[O5] = Scores on OSCE (clinical application) conducted for both the groups separately.

Conceptual framework

PBL has been described as the learning that results from the process of working towards the understanding or resolution of a problem[23]. While there is no categorical definition of PBL a number of ground rules have been formulated[24].Indeed Kaufmann has argued that we should expect wide variation in the models of PBL implemented with the only key criteria being 'the use of case problems, small group tutorials and self-directed learning activities'[25]. This paper involves the 3C3R PBL problem design model as a conceptual framework for systematically designing optimal PBL problems. Well-designed problems are crucial for the success of PBL[22]. To optimize and maximize the effects of PBL, the quality of the problems is vital. 3C3R model considers the issues critical to the effectiveness of PBL[22]. PBL problems that are designed using the 3C3R model, a more reliable form of instruction, may reflect more precisely and be systematic and effective [22].These problems can be in line with: curriculum standards; learning goals; learners' characteristics and implicit clinical constraints, instead of leaving these aspects entirely to the students' or tutors' interpretations[22]. This precision helps to guide the students to achieve learning goals as designed and desired[22]. The 3C3R model comprises two classes of components: core components and processing components **(Fig 1[22])**.

Core components—including content, context and connection—support content and conceptual learning, while processing components—consisting of researching, reasoning and reflecting—concern students' cognitive processes and problem-solving skills[22]. The 3C3R model provides a conceptual framework for evaluating the appropriateness and effectiveness of PBL problems[22]. Each of the six components has specific functions, inter-component relationships and specific issues to be considered.

Content

When designing PBL problems, several aspects of the content component must be taken into consideration[26]. First step in designing PBL problems is to set goals and objectives in accordance with the course or curricular standards[27] and balancing the breadth and depth of the content[22]. Complexity and ill-structuredness are the two key parameters in designing PBL problems with appropriate depth[28,29]. Complexity should contribute to enriching the subject area rather than general problem-solving skills. The ill-structuredness of problems helps to understand the domain in more depth because of the nature of multiple reasoning paths and multiple solutions[30,31].

Context

The knowledge and skills will be recalled and retained more easily when the content is learned in the same or similar context in which it will be applied[32].The contextual information of the problems helps learners link the knowledge constructed and skills acquired to related situations in real life[33]. Contextual validity, degree of contextualization and students' motivation are three important PBL design elements.PBL problem's context must be valid for its intended instructional goal[34]. Over-contextualized PBL problems may

overwhelm the learners with unnecessary information or considerations, while under-contextualized problems may cause the students to fail to consider the implicit but critical issues. Thus appropriate context should be used.

Connection

PBL students are expected to organize their knowledge base around problems. Students must interlink the diverse sources and knowledge into an effective knowledge base network and be able to cross-reference related concepts[35,36]. This cross-referencing ability is a critical element for devising viable solutions to ill-structured problems[31].The PBL problem's connection component should be in a conceptually logical order from simple/basic/sequential to complex/advanced/ hierarchical[37]. The overlapping approach helps students to link related concepts within a particular domain or context, while the multi-facets approach takes it to the next level and enables students to integrate their conceptual networks more fully by interlinking concepts among different domains and contexts[22]. Thus connection should facilitate domain knowledge and related knowledge integration.

The main function of the *processing components* is to serve as an activator which guide students' learning towards the intended learning goal(s), adjust the level of cognitive processing, alleviate the issue of students' initial unfamiliarity and/or discomfort with PBL[38-41].

Researching

The first stage of the problem-solving process is understanding the problem[42,43], also termed as problem space construction[44]. The main task in this stage is researching necessary information within the domain. Therefore goal specification and context specification are two design issues in crafting an effective researching component of a PBL problem that can direct learners toward intended content and contextual knowledge. Learners' awareness of the goal state of the problem (goal specification) significantly directs their learning[45]. This step involves calibrating problem-solving researching process to learner-appropriate level by adjusting appropriate amount of information provided in the problem.

Reasoning

To determine appropriate levels of researching and reasoning components in the problems Barrows's PBL taxonomy may be used[46].Reasoning is the processing component that promotes application of knowledge acquired from researching related information and the development of the learners' problem-solving skills[46]. By being required to analyze information, generate, test hypotheses and solutions to the problems and/or eliminate implausible solutions. Reasoning process enables problem solvers to deepen and expand their conceptual understanding. Researching and reasoning processes occur simultaneously, reiteratively and they complement each other in enabling an effective and efficient problem-solving process[22].

Students' researching and reasoning abilities could be roughly categorized as high, medium or low. Problems should be highly ill-structured and contain relatively little information about the concepts or knowledge needed for solving the problems for higher levels. Conversely, PBL problems for learners who have lower levels of researching and reasoning abilities should lean towards more case-based types of problems[22]. This step involves guiding reasoning process to comprehend, analyze and apply the intended content into practice.

Reflecting

By reflecting on the knowledge they have constructed throughout the problem-

solving process, learners have an opportunity to organize and integrate their knowledge into a more systematic conceptual framework. The cognitive activities of abstracting, summarizing[47,48] and organizing knowledge[49] enhance learners' conceptual integration and retention of the topic under study. Traditionally, reflection is accomplished with guidance given by the tutors[50]. Incorporating a reflection component into PBL problems can promote learner independence, meta-cognitive skills and cultivate their habits of mind to reflect on their own learning and reach the goal of developing self-directed learning skills. The reflecting component optimizes the PBL processes by ensuring the maximum effects of other components in the PBL problems[22]. When designing the reflecting component in PBL problems, two types of reflective processes, formative and summative may be considered[22].

PBL comes in a variety of forms. Problems for PBL will be designed according to the model 3C3R as mentioned earlier. Following points, regarding six competencies, will be taken care while designing the problem viz.,

Content

Scope of the problem sufficiently supports the curriculum standards (or learning goal and objectives).The knowledge involved in solving the problem should correspond to intended content. The scope of the problem is appropriate i.e., not too large[22].

Context

Problem's contextual information is correct and sufficient to make the problem authentic. The problem's context should be relevant to learners' future professional setting and learners personal needs or lives (motivation issue)[22].

Connection

Select the most appropriate approach for PBL problem to help learners to integrate the domain knowledge (prerequisite, overlapping or multifaceted).The PBL problem in the curriculum must be logically and conceptually interconnected[22]. All the concepts and basic knowledge involved in the PBL problem in a curriculum should be sufficient to form a sound conceptual framework of the subject[22].

Researching

Learners': information researching ability, familiarity/comfort level with PBL(suitability of amount of information provided in the problem), unique concerns in future professional setting, ability to get directed towards research information (the primary concerns in the field) by the adequacy of contextual information which is specific and explicit of the problem will be considered[22].

Reasoning

Learner's: proficiency in information interpretation, familiarity/comfort level with PBL, level of reasoning ability and unique primary concerns in the future professional setting will be taken into consideration[22].

Reflecting

Selecting the suitable type of reflective process (formative, summative or both) for the targeted learners. The requirement for the reflection component (statement in the PBL problem) will be looked as a part of the problem, project or task i.e., it is a natural part of the problem[22].

Problem will be progressively disclosed to the tutorial groups of 8 students with the help of a tutor. In the first tutorial students are given a short scenario, followed by the progressive disclosure of the patient's history, physical examination findings and investigation results. Students spend the week between tutorials researching a set of agreed learning issues. In the second tutorial students apply the knowledge and understanding

gained from their self-directed study to the problem. They are given further information on the patient's progress and the results of investigations. This information is used to finalize their hypotheses and to resolve outstanding questions. At the end of the second tutorial students are given the patient's prognosis and follow-up treatment. At this point that many drugs can be introduced.

Following aspects of learning will be considered in PBL learning viz., to engage students in a search for knowledge about the basic physiology, molecular structures, mechanism of action of pharmacological agents at those molecular structures, the drugs they will prescribe, why this dose?, why this frequency?, designing a management plan, assessment of factors that can interfere with the management plan, drug selection, patient education, warning of adverse effects, monitoring of therapeutic efficacy and safety, clinical response, laboratory findings, drug assays, assessment of the need to continue/modify/terminate therapy etc[51-55].

In the present study, students will: 1) Explore the problem: clarify terms and concepts that are not understandable, create hypotheses, identify issues.2) Identify what is known already that is pertinent. 3) Identify what is not known. 4) As a group, prioritize the learning needs, set learning goals and objectives, allocate resources and members, identify which task they will do.5) Engage in a self-directed search for knowledge. 6) Return to the group and share their new knowledge effectively so that all the group members learn the information.7) Apply the knowledge; try to integrate the knowledge acquired into a comprehensive explanation and 8) Reflect on what has been learned and the process of learning[22]**.** Students will initially analyze a problem as a group (e.g., a patient case history) by brainstorming (10-15 min) possible solutions/hypotheses based on the available knowledge or information and then decide, what further information is needed to solve the problem and to test the hypotheses. These ideas and suggestions are subsequently refined into learning issues (1 wk). Independent study follows, as each group member is motivated to find the desired information (2-3wk). The group reconvenes to share gathered information, discuss the problem further, receive additional information and test previous hypotheses in light of the new information obtained (3-4 wk). This process has also been described as the seven classical steps of PBL viz., understand the situation/clarify terminology; identify the problem; suggest possible causes (hypothesize); connect problems and causes; decide what type of information is needed; obtain information and apply the information[56].

Depending on the complexity of the problem, additional research may be required as the group narrows the possible solutions. Therefore, these PBL steps could be repeated several times and a single PBL case could be tackled in a series of three or more class sessions[21]. The instructor uses guiding questions to ensure that students identify learning issues that are appropriate to the case and consistent with the learning objectives of the course. The role of the instructor is limited to conducting the order of discussion, helping to identify problems and making sure that the case objectives are discussed. The instructor does not supply students with any information or answer to case-related questions.

Assessment in a PBL curriculum may include scenario-based multiple-choice, extended matching, essay questions (cognitive knowledge), OSCE for assessing clinical competence (clinical knowledge, professional judgment, communication, interpersonal skills, problem-solving skills and resolution development)[56-60]. It may include facilitator, group, peer and self-evaluations. Participants will be scored on their ability to: i) generate questions, ii)identify the problem, iii)state the problem

definition, iv) relate the solution to the problem, v) evaluate the solution, vi) provide a solution, vii) use the literature to support that solution and viii) use other resources to support that solution. Although participants will be permitted to work with their group members or peers, each student will be required to submit his/her own analysis. Since assessment is known to drive student learning, the assessment method and the assessment instrument used can influence what and how students learn[61-64].

Sampling and data collection

MBBS (second phase) students in medical colleges in India (generalisability) will be the target population. Almost all medical colleges in India follow the rules and syllabus defined by the Medical Council of India (MCI), a regulating authority. Undergraduate students of KLE University will be the sample population. Sample consists of second year MBBS students. Sample size will be calculated with the help of a statistician. Smallest meaningful difference (range 7±1.5), confidence interval (95%), effect size, correlation co-efficient (-1/+1), power (80%) etc will be considered. Confounding variables like pre-intervention knowledge, blindness of pre and post intervention tests, differences between instructors, equal treatment of both groups, drop outs for follow-up studies etc will be considered. Second phase MBBS students (n=126) will be learning pharmacology subject for 1 and 1/2 years. Routinely they will be learning the pharmacology subject in traditional LBL spread throughout the year. A pre (intervention) test of 50 MCQs will be administered to all the students. Depending on the scores, students will be categorised into high and low scorers. After randomisation, these students will be equally distributed in to two groups' viz., PBL and traditional LBL group. The PBL group will be again subdivided into groups of eight members each. Post (intervention) test will be consisting 50 MCQs + 100 MCQs **(Table-1).**

Students' attitude/perception towards both the type of intervention or instruction methods (PBL and LBL) will be obtained. The respondents are required to indicate their agreement or otherwise with the modified Likert's-type scale items by ticking one of the five alternatives (5 point scale) viz., strongly agree, agree, neither agree or disagree, disagree and strongly disagree[65] **(Table-2)**.Care is taken so that both interventions should meet with the learning objectives. Problems for PBL **(Table-3)** will be designed with the help of experts. For both the groups, initial instruction classes will be conducted in the classrooms. This can be used to create a knowledge base. Handouts with detailed learning objectives will be given to the students.

Ethical clearance will be obtained from the Institutional Review Board (IRB) for Human Research.

Statistical Tests

Data will be obtained after correction of all the answer papers. Data will be expressed as Mean ± S.E.M. Scores of post-test (O2 of each group) will be compared with that of pre-test (O1 of each group) [50 MCQs] by using (student's) paired 't' test for both the intervention group respectively. Difference between post-test and pre-test (Mean± S.E.M) of both (PBL and traditional LBL) groups will be compared by using unpaired 't' test. Similarly, *only* post (intervention) test scores (100 MCQs) of both the groups (O3) will be compared by using unpaired't' test. OSCE scores of both the groups can be compared by using unpaired't' test. Scores of attitude tests conducted by using Likert's-type items/questions (O4 and educator's test) will be analysed by using Chi-square test. $P<0.05$ will be considered as significant for all the tests.

RESULTS AND DISCUSSION

PBL can be acceptable as an alternative (or adjunct) to the traditional LBL. Follow up will be done after four or six months. Some studies have provided descriptive and qualitative evidence for the effectiveness of elements of the PBL approach, but fell short of an objective and quantitative comparison of PBL with a didactic teaching approach[66-68]. Indeed the importance of realistic, multidimensional problems to the success of PBL has been widely acknowledged[69-73] with good problems even being associated with improved tutor performance[74]. Under the guidance of a probing mentor, members of small problem-solving groups work at identifying the central issue in the case, an essential initial phase in the problem-solving process[75,76]. That is, they define the problem and the basis for its identification as the problem. Understanding a problem allows the problem solver to see underlying patterns and the big picture[16].

There are many advantages of PBL that it: is adaptable/flexible, accommodates linguistic diversity, encourages intellectual excitement/a sense of involvement both for students and teachers, promotes critical appraisal and self-directed learning skills[77], engages students in active/meaningful learning, results in deeper understanding and longer retention[78-80], helps to develop problem-solving skills while constructing a domain knowledge base[22], transforms the student's role from passive to active, enhances the communication skills, encourages the independent responsibility for learning as well as ability to work in a team[81-84].

There is an important need to train doctors in: self-directed learning to cope up with the information explosion[85], key 'transferable skills' in Pharmacology like solving problems in therapeutics, prescribing appropriate drugs for a disease condition and delivering drug and disease-related information in a meaningful way to patients[86-91], rational prescription etc[92,93]. Under the guidance of an expert facilitator, who has an important function of drawing solutions from the literature and practice, group members engage in questioning, revising and entertaining various views of the issues they uncovered within the case. These processes are critical for connecting possible solutions to the problem and evaluating those solutions, two components of problem solving that both prospective and new teachers find difficult[94]. During PBL, students develop problem-solving skills, formulate evidence-based decisions and enhance their communication skills[95-98] all of which are abilities essential to achieving core competencies[99,100]. PBL will be a better alternative to the traditional LBL to satisfy these needs. Initial investment in terms of efforts, cost, training of human resources in PBL, time etc will be really useful on a long run to the University policy makers, administrators, faculty and of course to the students.

CONCLUSION

PBL can be acceptable as an alternative or as an adjunct to the traditional LBL. When the students in our set up move to their next phase/class, where they will be learning clinical subjects which involve diagnosing and prescribing the treatment to the patients, they may feel the accomplishment of getting trained in handling the real world cases through the PBL. PBL can be introduced to the postgraduates in future. Present study may become a reference for the future research or scholarly activities in other disciplines.

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Table 1. Example of MCQs

Sl. No	Stems and options
1]	An antihypertensive that acts directly on the vascular smooth muscle is: a) Alpha methyl dopa. b) Hydralazine c) Trimethaphan d) Propranolol.
2]	Protamine Sulphate is preferred in the following toxicity: a) Warfarin b) Heparin c) Vitamin K d) Streptokinase

Table 2. Likert's scale questions/items for students.
Please indicate your response to each item below regarding the instruction methods viz., PBL and LBL on the following scale.
(5- Strongly agree, 4- Agree, 3-Neither agree or disagree, 2-Disagree, 1- Strongly disagree)

Sl. No	Items: The instruction method has	PBL	LBL
1	helped me to achieve the goals and objectives of the topic.		
2	increased my confidence towards own understanding of pharmacology		
3	increased my knowledge which will help me to pass the final examinations.		
4	increased my motivation to participate in class		
5	enhanced my communication skills		
6	enhanced my retention of course content		
7	assisted my learning in other courses		
8	increased my comfort level in through-out the intervention		
9	the appropriate number of sessions		
10	listed useful resources for the sessions		
11	listed useful objectives of the sessions		
12	the exposure to the current trends in pharmacology.		
13	the cases emphasizing the clinical relevance of basic concepts.		
14	the sessions that have taught me the basics of rational prescribing.		

15	the appropriate timing for the sessions.		
16	the well organized sessions.		
17	the small-group discussions which are beneficial		
18	the whole-class discussions which are beneficial		
19	the listed resources for the session which were appropriate.		
20	the listed objectives of the sessions which were appropriate		
21	the readiness of assessment questions which were appropriate.		
22	increased my understanding of the course content		
23	information about the structure of the teaching method was supplied		
24	enhanced my self-directed learning skills		
25	enhanced my critical appraisal skill about the subject		
	Please indicate your choice to the following item		
26	If given a choice I would choose courses that use PBL over traditional lecture format		

Table 3. Example of Problem/Case Study (PBL group).

PBL Group 1- Case Study 1 (June / July, 2015)
Farmers use insecticides for the crops in their fields to prevent insects affecting the crops. These insecticides are the chemical compounds which have pharmacological properties viz., they are organo-phosphorous compound. Your group is part of a medical team that is working in the Accident and Emergency department of the Hospital. Your task is to manage a patient who comes with a history of organo-phosphorous compound poisoning. You have to find the details of the following: 1. What are organo-phoshorous compounds?. 2. How organo-phosphorous compounds are classified? Each member has to supply the following information: (a) A description of the mechanism of action of organo-phosphorous compounds. (b) A description of the pharmacological actions of these compounds. (c) What are adverse drug reactions of the organo-phosphorous compounds.
A man aged 45 years comes to the Emergency department in unconscious state with history of consumed an insecticide. How do you approach the problem? You need the following information: 1. General reasons for organo-phosphorous poisoning. 2. What are signs and symptoms of the organo-phosphorous poisoning? 3. What are the medico legal liabilities of the poisoned cases?
The answer to the case study is due in three parts, on the dates indicated below. For each deadline, the list below gives the required parts of the answer and a suggestion of the number of pages for each section. Answers should be written in Arial, 12 point font, single spaced. All material should be presented in electronic form only and e-mailed to Dr. Suneel (suneelmajagi@yahoo.co.in) by 9 p.m. on the deadline date.
June,15th :

(a) A comparison of the mechanisms of action of reversible and irrereversible anti-cholinesterases. (0.5 pages) (b) What are the pharmacological actions of anti-cholineesterases. (1 pages) (c) What are adverse drug reactions of the anti-cholinesterases (1 page)
June, 22nd:
(a) A discussion on the history taking of the patient including the paper procedures required at the time of admission of the patient (1 page) (b) A discussion on the initial management of the patient in the emergency department.(1 page)
June, 28th :
(a) A discussion on the drugs used in the organo-phosphorous poisoning including the monitoring of the drugs. (1 page) (b) A discussion on the prognosis of the patient including note on ageing. (1 page) (c) A discussion on the general management of the patient.

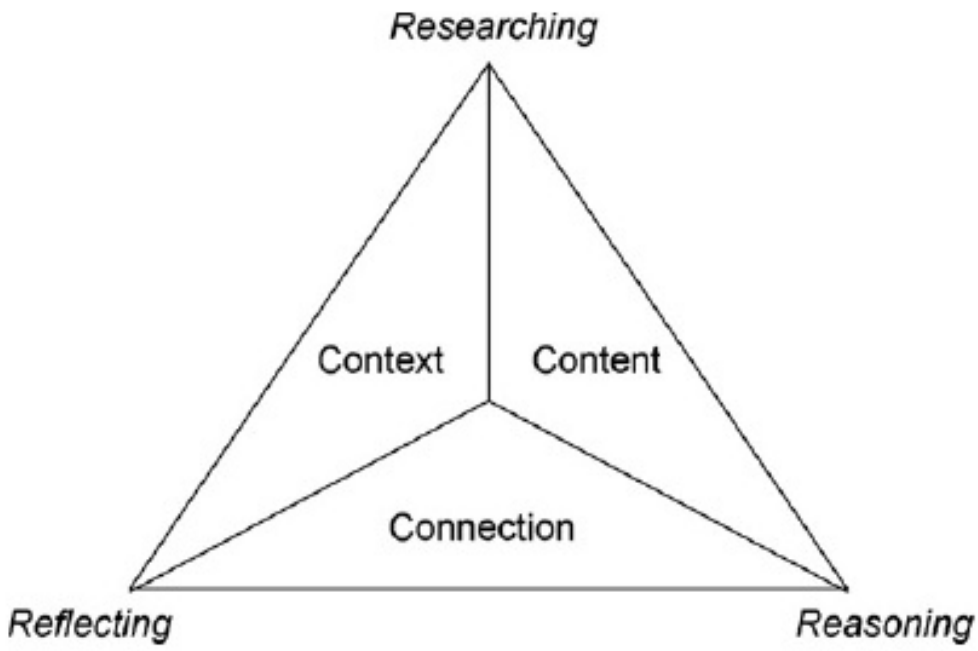

Fig. 1: 3C3R PBL problem design model.

Annexure

Informed consent

Title of Research Study: Introduction of designing of problem in problem based learning in pharmacology for under-graduates.

Objective/purpose of the study: The objectives of the study will be explained to the students/participants.

Procedure: Procedure of the study will be explained to the participants.

Risk: -Nil-

Benefits: Benefits of the study will be explained to the participants**.** How the results of the study/research project will contribute towards improvement in teaching and learning in future will be explained.

Withdrawing/removal from the study: Students have the freedom to answer or not to answer the questionnaires.

Privacy and Confidentiality: Necessary confidentiality will be maintained. Students' names who have answered the questionnaires will not be revealed.

Financial incentives for participants: No monitory benefits will be given to the participants. Interventions will be carried out during routine teaching hours in the regular time table.

Contact details: Address and phone numbers of principal investigator will be given.

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Consent statement

(To participate in the study)

I, the undersigned, have been explained in detail about the study. I am aware that my participation in this study is voluntary and I can withdraw at any time. Also I had been given enough time to comprehend and clarify my doubts about the study and my rights as a study participant.

Participant's name: _____

Signature of Participant: _____

Principal Investigator's name: _____

Signature of the principal investigator: _____

Place:

Date: