



Parvatibai Chowgule College of Arts and Science
Autonomous

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Best affiliated College-Goa University Silver Jubilee Year Award

BEST PRACTICE AREA: TEACHING LEARNING EVALUATION
DEPARTMENT OF ZOOLOGY

BEST PRACTICE: PROBLEM BASED LEARNING

1. Title of the Practice: PROBLEM BASED LEARNING

2. Objectives:

Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. This problem is what drives the motivation and the learning and is practised by teachers of 03 departments viz. Geography, Zoology and Economics extensively and 03 departments partially (Biotechnology, Biochemistry, Botany).

The main objective of the PBL, is improving the learning of our students. In addition to this general objective, we have other more specific objectives:

- i) Development of team skills
- ii) Development of conceptual skills
- iii) Depth and focus of knowledge acquired
- iv) Development of self directed study skills.
- v) Improves critical thinking and problem solving

3. The Context

The present description of the best practice is PBL conducted by department of Zoology. All faculty members use PBL as mandatory T-L-E method. PBL is an instructional method in which students work in small groups to gain knowledge and acquire problem-solving skills. A major characteristic of PBL is that the problem is presented to the students before the material has been learned rather than after, as in the more traditional 'problem-solving approach'. A second notable feature of PBL is that the problems are presented in the context in which students are likely to encounter the given (or a similar) problem in real life. It is this contextualisation of material which makes PBL an attractive strategy for the education of professionals. PBL encourages open-minded, reflective, critical and active learning; it acknowledges that both teachers and students have knowledge, understanding, feelings and a shared interest in the educational process.

4. The Practice

PBL fits best with process-oriented course outcomes such as collaboration, research, and problem solving. It can help students acquire content or conceptual knowledge, or develop disciplinary habits such as writing or communication. After determining whether your course has learning outcomes that fit with PBL, you will develop formative and summative assessments to measure student learning.

Next you design the PBL scenario with an embedded problem that will emerge through student brainstorming. Think of a real, complex issue related to your course content.

We develop a single scenario and let each group tackle it in their own way, or you could design multiple scenarios addressing a unique problem for each group to discuss and research.

Prior to adopting PBL as mode of teaching- evaluation, students are taught 'Steps of Problem Solving' and 'Thinking skills' (Logical thinking, lateral thinking and critical thinking). The students are the divided into groups of 5. Each group has one group leader. The execution follows the process described. PBL research begins with small-group brainstorming sessions where students define the problem and determine what they know about the problem (background knowledge), what they need to learn more about (topics to research), and where they need to look to find data, how to analyse it, how to critically evaluate and how to present the solutions in multiple perspectives. Therefore PBL serves as a very effective means of teaching-learning as students learn to reason, analyse, evaluate and create (Higher order learning – Blooms taxonomy).

PBL can also be used as an effective Evaluation tool. During the PBL assessment step, evaluate the groups' performances. Use rubrics to determine whether students have clearly communicated the problem, solutions.

Example of PBL at department of Zoology:

Given below is the PBL question posed to the students for the Course "Molecular Genetics and Forensic Science". These questions are posed to the students and the groups of students are expected to solve them by following the 'steps of problem solving'.

PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE MARGAO – GOA
(AUTONOMOUS)

SUBJECT: ZOOLOGY
I-IV-E-9: MOLECULAR GENETICS AND FORENSIC SCIENCE

PROBLEM BASED LEARNING ACTIVITY – I (CA- 1) MARKS: 15

ACTIVITY TO BE SUBMITTED ON
29th August 2019 AT CHGRL BETWEEN before 11.30 – 12.30 PM

- 1) What is Phenyl ketonuria? Explain its genetic basis of PKU. A couple with history of PKU in the family is expecting a baby. What are the possible types of genetic tests should the couple opt for? In case their child tests positive for PKU, what measures will enable their child to grow up healthy? If the child is PKU positive, and if the couple plans to go for second child what should be the counselling given to the couple for preventing birth of another child with PKU. (Solve this in 1500 words).
- 2) What is cystic fibrosis (CF)? What are the tests which enable detection of CF? Explain the symptoms and genetic basis. A newborn baby born to a couple is detected with cystic fibrosis disease. Discuss the consequences if there is no intervention in treating CF. What counselling can be offered to the couple to help their child with CF (Solve this in 1500 words).
- 3) A woman is detected with G-G translocation of chromosome 21. She is 8 weeks pregnant. As a geneticist what would you advise her? Explain the tests that can be recommended to her. How would your counselling session differ if she was 14 weeks pregnant? Explain the tests that can be recommended to her if she was 14 weeks pregnant. Comment on her pregnancy outcomes if she plans for future pregnancies and justify your statements. (Answer in 1500 words. Support your discussion with two journal references).
- 4) You are an investigator responding to the scene of a shooting in a hotel room, where you observe the following: A male is sitting on a sofa and appears to be the victim of a shooting. A Crime Scene Investigator has photographed the scene, and is awaiting your instructions regarding the collection of evidence. There is a firearm at his right hand. There is no sign of a struggle, but there are many objects in the room. One of them is a hand written note which is signed with an initial at the bottom and some scattered items on the table next to the victim. Based on the standard protocol for conducting search and analyzing evidence give a detailed report of evidence collection and processing.

PBL AND GOBBET

MOLECULAR GENETICS AND FORENSIC SCIENCE

SAMPLE PBL

Group 1:

Name	Roll No	Sign
Meha Pereira	SU170028	[Signature]
Bernice Dan Augustino	SU170023	[Signature]
Shalmi Kerkar	SU170025	[Signature]
Keethi D'Silva	SU170024	[Signature]
Sarvesh Mesjkar	SU170010	[Signature]

Work Report

The members on the first three questions was done on 29th August 2019. All the members contributed in those questions. The answers to the last two questions were discussed on 29th August 2019. The last two questions was report by Shalmi and Sarvesh. The 2nd and 4th question was typed by Keethi D'Silva and Bernice. The information on the gobblet task contributed by all the members and analysed by Keethi.

We ask team leader to submit report about the interactions and participation of all team members

Well under.

1.1 What is Phenylketonuria? Explain its genetic basis of PKU.

Phenylketonuria (PKU) is an inherited error of metabolism caused by a deficiency in the enzyme phenylalanine hydroxylase. PKU is an autosomal recessive disorder, caused by mutations in both alleles of the gene for phenylalanine hydroxylase (PAH) which is found on chromosome 12. In the body, phenylalanine hydroxylase converts the amino acid phenylalanine to tyrosine, another amino acid. If PKU is not treated then phenylalanine can build up to harmful levels in the body, causing intellectual disability and other serious health problems. If two parents carry the gene, they have roughly a 25 percent chance of having a baby with PKU, a 25 percent chance that their child will not develop PKU or be a carrier, and a 50 percent chance that their child will also be a carrier of the disease.

ii) A couple with history of PKU in the family is expecting a baby. What are the possible types of genetic tests should the couple opt for?

Newborn blood testing identifies almost all cases of phenylketonuria. If the couple have PKU or a family history of it, the doctor may recommend screening tests before pregnancy or birth. It's possible to identify PKU carriers through a blood test. The baby should have a newborn screening test for PKU. Newborn screening checks for serious but rare conditions in birth. It includes blood, hearing and heart screening. With newborn screening, PKU can be found and treated early so babies can grow up healthy. The doctor can recommend another kind of test, called a diagnostic test. This test can check to see if your baby has PKU or if there is some other cause for abnormal test results.

iii) In case their child tests positive for PKU, what measures will enable their child to grow up healthy?

Following are the measures that would enable the child to grow up healthy:

SAMPLE PBL

- A lifetime diet should be followed with very limited intake of protein, since foods with protein contain phenylalanine. As the child lacks PAH, and the phenylalanine might get accumulated, it could result in health problems.

- The child should be taking a PKU formula having a special nutritional supplement. This makes sure that the child gets enough essential protein (without phenylalanine) and nutrients that are crucial for growth and general health.

- There should be regular review of clinic records, growth charts and blood levels of phenylalanine.

- Blood tests need to be conducted frequently to monitor phenylalanine levels as they change over time, especially during childhood growth spurs.

- Other tests to assess growth, development and health should be conducted.

- The amount of phenylalanine that an individual with PKU can safely eat is so low, it's crucial to avoid all high-protein foods, such as milk, egg, cheese, nuts, soybeans, beans, chicken, beef, pork, and fish. Potatoes, grains and other vegetables that have protein should be limited.

- They should also avoid certain other foods and beverages, including many diet sodas and other drinks that contain aspartame (NutraSweet, Equal), since aspartame is an artificial sweetener made with phenylalanine.

- The regular infant formula and breast milk contain phenylalanine. Therefore babies with PKU instead need to consume a phenylalanine-free infant formula.

iv) If the child is PKU positive and if the couple plans to go for second child, what should be the counselling given to the couples for preventing birth of another child with PKU?

Parents should be advised to go for

a) Pre-implantation diagnosis. This is when tests that have been fertilized in vitro (in a laboratory, outside of the womb) are tested for defects at the 4-cell (blastocyst) stage. Only non-affected blastocysts are transferred in the uterus to establish a pregnancy.

b) Using donor sperm or donor eggs. As PKU is an autosomal recessive disorder, the child can inherit it from either of the parents (child could be unaffected, affected or carrier). To avoid the child being affected, the couple can opt for donor eggs or donor sperm.

c) Adoption: the parents can go for adoption. This allows them to have a family without the anxiety of potentially passing on the disease to the next.

d) Becoming pregnant and having specific prenatal testing: prenatal testing will help them to detect any problems that could affect the child, like birth defects or genetic diseases. The results can help you make the best health care decisions before and after the child is born.

e) If the woman is suffering from phenylketonuria, she should continue to a low-phenylalanine diet at least 3 months prior to pregnancy, and continue the diet throughout her pregnancy. This way PKU symptoms can be prevented. In other words, a healthy pregnancy is possible for women with PKU as long as she plan ahead and carefully monitors her diet throughout pregnancy.

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2.1 What is Cystic Fibrosis (CF)?

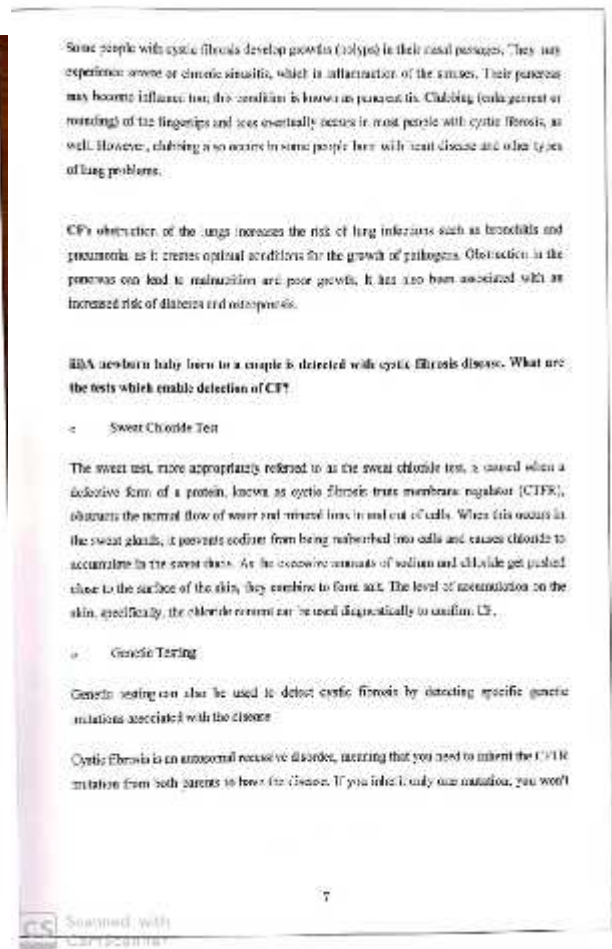
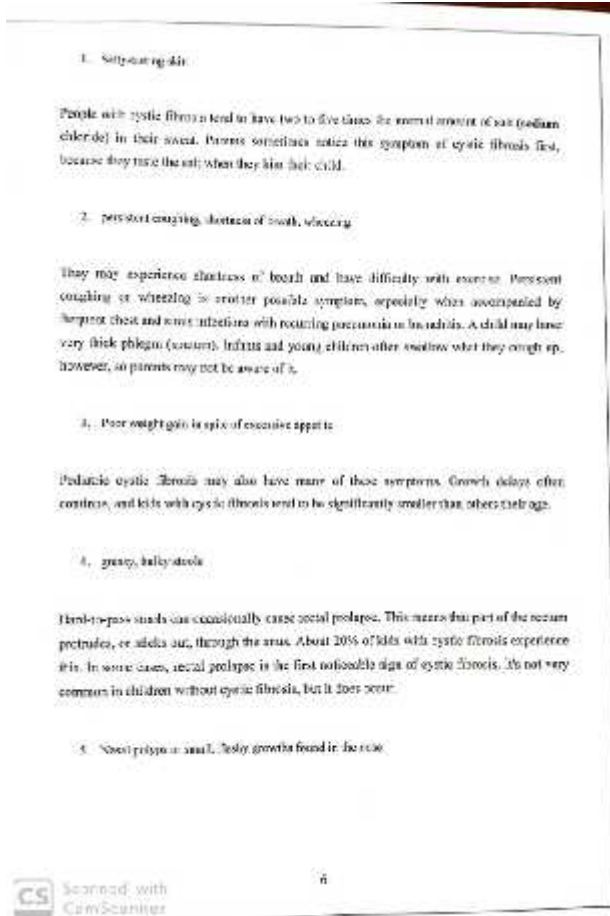
Cystic fibrosis is an inherited disease characterized by the buildup of thick, sticky mucus that can damage many of the body's organs. The disease's most common signs and symptoms include progressive damage to the respiratory system and chronic digestive system problems. The severity of the disorder and their severity varies among affected individuals. Mutations in the CFTR gene in chromosome number 7 cause cystic fibrosis. The CFTR gene provides instructions for making a channel that transports negatively charged particles called chloride ions into and out of cells. This channel is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

ii) Explain the symptoms and genetic basis.

Cystic fibrosis symptoms can vary from person to person, depending on the severity of the disease. For example, one child with cystic fibrosis may have respiratory problems but no digestive problems, while another child may have both. In addition, the signs and symptoms of the disease may vary. The first sign of cystic fibrosis may be that they have difficulty passing their first bowel movement (meconium). This occurs when the meconium becomes so thick that it can't move through the intestines, sometimes causing a blockage. Parents may later notice their baby is not gaining weight or growing normally. The baby's stools may be unusually bulky, foul-smelling, and greasy due to poor digestion of fats. Fibrosis may vary with age.

The most common symptoms of CF are:

SAMPLE PBL



5. Evidence of Success

The evidences of success can be quantified through the following:

- 1) Research publications by faculty in zoology (Dr. Nandini Vaz Fernandes): The department of Zoology has also researched PBL and devised an effective pedagogy of using PBL as effective T-L-E tool.
- 2) Faculty of Chowgule College Invited as Resource persons by other Colleges:
 - a. Dr. Nandkumar Sawant and Dr. Nandini Vaz Fernandes – Conducted hands-on workshop for the faculty members of Gogate Joglekar College, Ratnagiri Maharashtra on 'Problem Based Learning- Pedagogical tool for T-L-E'.
 - b. Dr. Nandkumar Sawant, Dr. Nandini Vaz Fernandes and Mr. Andrew Barreto- Conducted workshop for faculty members of Carmel College, Nuvem Goa on 'Integration of Blooms Taxonomy in T-L-E'
- 3) Students progression in Foreign Universities: 14 students from department of Zoology were selected for PG courses in Foreign Universities in UK, Canada, Australia and USA. The students gave feedback that the PBL method adopted in Zoology department enabled them to adapt to the foreign T-L-E techniques as it was similar.



RESEARCH ARTICLE

STUDENT PERCEPTION OF EFFECTIVE TEACHING METHODOLOGIES FOR UNDERGRADUATE DEGREE COURSES - CASE STUDY FROM INDIA

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ABSTRACT

Many researchers are stressing on the need to change the teaching methodologies to make learning more effective. Various new modes of teaching are suggested especially in the field of medical sciences. The studies mostly focus on the need to adopt Problem-based learning in medical field. The present study was undertaken to see the effectiveness of various teaching methodologies in undergraduate degree college in India. Effectiveness was measured from the students perspective as this study was focused on the response of the students to the questionnaire prepared to evaluate the effectiveness of different modes of teaching. The modes evaluated were Lecture-based learning (LBL), ICT supplemented lectures (ISL), Interactive Classroom method (ICM), Problem-Based Learning (PBL) and Multiple Teaching Mode (MTM). The present study indicated that LBL, ISL and ICM was not very effective method of teaching as it only fostered gaining of knowledge and comprehension. PBL method is good as it enabled triggering higher order thinking of blooms taxonomy in the students. But PBL, if adopted as the only method of teaching did not cater to the diversity of learners in a classroom. Therefore, we recommend MTM as the new effective method of teaching as it has a combination of LBL, ISL, ICM and PBL. On a Five point Likert scale, MTM was indicated to enable students to learn the correct method of data collection and investigation (4.45±0.75), transform data and develop logical argument (4.04±0.79), be more creative (4.33±0.90) and thus helped to improve proactive learning abilities. The present study thus demonstrates that PBL can be used as component of MTM for effective learning even for the undergraduate nonprofessional degree courses of Bachelor of Science or Bachelor of Arts.

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INTRODUCTION

In this era of multiple sources of knowledge gathering, the role of a teacher in undergraduate and postgraduate colleges should reflect a paradigm shift towards making classroom teaching learner centric. The role of a teacher should not merely involve

It is accepted that the feedback from students serves as an effective tool in developing teaching methodology and evaluation methods in undergraduate teaching (Chavda et al. 2011, Bhasale (A et al. 2013) and so the study was focused on the response of the students to the questionnaire. Thus, the

6. Problem encountered and resources required

A change of methodology like this implies difficulties of adaptation for both teachers and students, as it changes the traditional roles.

For teachers

- It can mean an increase in the workload, particularly in the evaluation work.
- Teacher has to devise higher order problems which is time consuming and involves a lot of thinking.

For the students

- Participation and equal involvement and contribution in discussions by all students is an issue. Department devised means to monitor active involvement of all students.
- At first they may become disoriented. However guided learning helps students to channelize their work and learn effectively.

PBL when used as T-L-E mode, enables students to understand, analyze and interpret the result. This practice also helped students to modify the procedures.