



Effect of Problem Based Learning Model on Students' Achievement in Biology at Undergraduate Level

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Abstract:

The purpose of the study is to determine the effect of problem based learning model on students' achievement at undergraduate level in Biology (Botany and Zoology). Research questions and hypotheses were formulated to guide the study. Experimental method with equivalent group design was applied for data collection. Sample consists of total 60 students of under graduate level from Science College, Pauni, Dist. Bhandara. Data collection method was carried out by Pre-test and Post-test method, where pre-test was administered on the groups before commencement of the treatment for four weeks. And post-test was conducted at the end of the stipulated duration. Collected data, at the time of both tests, by applying Biology achievement test was analyzed with the help of descriptive and inferential statistical method to draw the final conclusion. The results of the study exhibited significant effectiveness of the problem based learning model over the expository method. Based on the finding of the study some recommendations were made. Conclusion was equally highlighted.

Keyword: *Biology, Problem-based learning, effectiveness*

One of the major concerns of many countries today is that there is a mismatch between graduates' skills, acquired from higher education institutions and the skill sets needed in industry. Many of the current graduates are found to be lacking in creativity, communications skills, analytical and critical thinking and problem solving skill (Teo & Wong, 2000; Tan, 2000). As such there is much need for institutions of higher education to focus on training future graduates to be more adaptable to the needs of the society, various professions and industry.

Present education system is mainly concerned with transferring material to the learner and there for little importance is given on the role of learning activity.

Effective teaching with incorporation of innovative ideas is essentially yield with better understanding of the concepts in any subjects. It also leads to the motivation and creation of student's interest in the subject. As most of the science subjects are practical based, it requires different way of teaching than the subjects of other disciplines. Problem based concepts in science subjects appeared to be tough to the understanding of average students. It can be overcome by applying proper scientific procedures.

Some of the basic aspects such as creativity, communication and analytical skills, critical thinking, etc. are essentially required for understanding the concepts leading to solve the problems. However, unfortunately, it has been observed that most of the students in our country are devoid of these skills. Incorporation of these skills would help not in practical application of the knowledge but also for the understanding of the concept. More efforts are required today, in the student-centred teaching-learning system, to inculcate these skills in the minds of students. Hence, science teachers primarily required to apply different strategies that can coincide with the subject.

Biology, one of the major and practical based subjects of science need to be taught by giving equal weightage to both practical and theory. Theory can be well grasped only when the practical are properly demonstrated. Student's interest in the subject can be developed by maintaining proper collaboration in theory and practical which are either carried out in field or in laboratory conditions. Inculcation of

various skills is equally important for proper understanding. Problem based learning strategy is one which insist learner for acquisition of critical knowledge, problem solving proficiencies, self directed learning strategies and team participation skills.

Problem Based Learning (PBL) was created by Barrows in 1986 as an alternative instructional method by letting the students to solve problems rather than having them learn mainly through lectures. The function of a teacher in PBL is very limited and the teacher is called as facilitator as he/she facilitates the learning by providing a favourable atmosphere for learning.

PBL is an approach to structuring the curriculum which involves confronting students with problems from practice which provides a stimulus for learning. PBL is an approach which focuses more on what students do than what the faculty does. “Not just a method but a way of learning” observes Charles E. Engel in the book The Challenges of Problem Based Learning.

Problem based learning follows four basic phases

Phase I -	Problem Presentation
Phase II -	Problem Investigation
Phase III -	Problem Solution
Phase IV -	Process Evaluation

Rational of the Study:

Biology is an important subject in Bachelor of Science (B. Sc.) which is very vast in its theory, but totally based on field and laboratory practical/concepts. If the students understand those concepts clearly then it becomes very easy for the students to gain the knowledge of the particular topic of the subject. Students studying at undergraduate level found this subject difficult while applying it practically, Problem based learning is considered as a strategy which gives enough opportunity for the students to learn more on their self. It is practical based study that is the learning process of constructing knowledge rather than merely obtaining it. Problem based learning encourages students to think creatively. And so, this study is conducted to know whether PBL model is effective for B.Sc. Students in learning biology subject.

Following research questions guided the study-

1. What are the mean achievement scores of biology students who were taught with problem based learning method?
2. What are the mean achievement scores of biology students who were taught same topics using expository method?

Objective:

1. To develop the teaching material in PBL model on selected teaching materials.
2. To find the effect of PBL model on students' achievement.

Hypothesis –

1. There is no significant difference in the mean score of controlled group and experimental group in 1st session of experiment.
2. There is no significant difference in the mean score of controlled group and experimental group in 2nd session of experiment.
3. There is no significant difference in the mean score of controlled group and experimental group in 3rd session of experiment.
4. There is no significant difference in the mean score of controlled group and experimental group in 4th session of experiment.

Sample – Sample for the study selected from students studying undergraduate level in first year B.Sc. of Science College, Pauni, Dist. Bhandara. Regular 60 students were selected by purposive sample method as sample for study.

Tools –

1. Teaching material of biology subject used for PBL model.
2. Achievement Test on teaching material used for experimental study.

Concepts used as teaching literature are –

1. Session - Ecology
2. Session - Apiculture
3. Session - Taxonomy
4. Session - Entomology

Methodology:

1. After selecting sample, four groups were formed group A, B, C, D adopting 15 students each.
2. The study was conducted in four Sessions and each group (A, B, C, D) played role of control group and experimental group randomly.

Sr. No	Session No.	Control Group	Experimental Group	Observations
1	Session 1	Group A, Group B	Group C, Group D	Test 1
2	Session 2	Group C, Group D	Group A, Group B	Test 2
3	Session 3	Group A, Group D	Group B, Group C	Test 3
4	Session 4	Group B, Group C	Group A, Group D	Test 4

PBL Model for Experimental Group –

1. Introduction to a subject by short lecture.
2. Printed copies of the problem provided to the group with required study material.
3. Allow groups to discuss and solve the problem with the help of study material.
4. Assess progress at regular intervals. If necessary guidance is given by the Teacher during the discussion and to solve the problem.
5. Conclusion will be drawn by the group and present in front of the teacher.
6. Teacher gives more information if necessary or concludes the session.

Students of experimental group were taught by PBL model and lecture method applied on control group in the sessions. Groups were used randomly as experimental group and control group in the sessions. Observations for the study were taken in the form of test which had been given to experimental group and control group on next day after each session.

Statistical Technique –

In present study Mean, Standard Deviation and ‘t’ value were used to analyze the data.

Data Analysis –

Table No – 1
Calculated ‘t’ value for session 1

Sr No.	Groups	N	Mean	SD	t value	Accepted / Rejected
1	Control Group	30	13.73	4.17	9.80	Rejected
2	Experimental Group	30	23.27	3.31		

*for df 58, table value at 0.01 level of significance is 2.66

Table 1 shows that t value for difference between control group and experimental group is 9.80 and it is more than table value, the difference between means found to be significant hence hypothesis no 1 stands rejected. It means experimental group achieved more score than control group in 1st session.

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Table No – 2
Calculated ‘t’ value for session 2

*for df 58, table value at 0.01 level of significance is 2.66

Table 2 shows that t value for difference between control group and experimental group is 10.05 and it is more than table value, the difference between means found to be significant hence hypothesis no 2 stands rejected. It means experimental group achieved more score than control group in second session.

Sr No.	Groups	N	Mean	SD	t value	Accepted/Rejected
1	Control Group	30	14.53	2.82	10.05	Rejected
2	Experimental Group	30	22.56	3.33		

Table No – 3
Calculated ‘t’ value for session 3

*for df 58, table value at 0.01 level of significance is 2.66

Table 3 shows that t value for difference between control group and experimental group is 10.05 and it is more than table value, the difference between means found to be significant hence hypothesis no 3 stands rejected. It means experimental group achieved more score than control group in session 3.

Table No – 4
Calculated ‘t’ value for session 4

*for df 58, table value at 0.01 level of significance is 2.66

Sr No.	Groups	N	Mean	SD	t value	Accepted / Rejected
1	Control Group	30	13.20	3.87	12.81	Rejected
2	Experimental Group	30	24.60	2.95		

Table 4 shows that t value for difference between control group and experimental group is 12.81 and it is more than table value, the difference between means found to be significant hence hypothesis no 4 stands rejected. It means experimental group achieved more score than control group in session 4.

Sr No.	Groups	N	Mean	SD	t value	Accepted / Rejected
1	Control Group	30	15.50	1.33	13.75	Rejected
2	Experimental Group	30	23.30	2.81		

Findings –

1. There is significant difference in the mean score of control group and experimental group in first session of the experiment.
2. There is significant difference in the mean score of control group and experimental group in the second session of the experiment.
3. There is significant difference in the mean score of control group and experimental group in the third session of the experiment.
4. There is significant difference in the mean score of control group and experimental group in the fourth session of the experiment.

Conclusion:

- Problem based learning insists learner for self study.
- Problem based learning insists student to study systematically so, that they can solve the problems.
- Problem based learning is assumed that learning is the process of building knowledge rather than merely gaining it.
- Problem based learning encourages students to construct the knowledge.
- Problem based learning support independent learning and gives students practice in tackling, confusing condition and finding suitable solution to the problem.
- Problem based learning also encourages group learning and gives practice of collaborative work.
- Problem based learning develops creativity in the students.
- Problem based learning can be used one of the policy to on the whole development of the student.
- In problem based learning teacher plays the role of facilitator and guide.

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