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EFFECTIVENESS OF PROBLEM BASED AND LECTURE BASED LEARNING METHODS ON PERFORMANCE AND LEARNER ATTITUDES IN UNDERGRADUATE ARTS PROGRAM

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Abstract:-Problem based learning is an instructional strategy that has gained much support in the west. The main advantage of this method lies in its motivational value as also application to real life situation. In this research a study of effectiveness of Problem Based Learning (PBL) method in comparison to Lecture Based Learning (LBL) method was undertaken. Two courses of first year undergraduate program following Problem based learning were compared with two courses following lecture based learning. Thus two-groups post test design was followed. Three variables were studied namely Attitude; performance; and study habits of students. Attitude towards the course was measured using the Course Interest Survey by Keller J (1995). A comparison was made between attitude of students in PBL and those in LBL. A t test was done and the t-value revealed that students in PBL had a significantly favourable attitude towards their course. Performance of students was measured in terms of scores obtained in examination requiring recall of information. A comparison was made between performance of students in PBL and students in LBL over past four years. The t-test done revealed a significantly higher performance of students in PBL method.

Keywords:problem based learning method; lecture based learning method; attitude; performance.

INTRODUCTION

Education imparted in schools and colleges in India has always been a teacher centric activity. This basically means that the teacher acquires and disseminates information to students. In such an environment the teacher plays a more active role while the students play a passive role of recipients of information. With technological advancements information is just a click away from the students. This has necessitated the shift in the centre of learning from teachers to students. A much appreciated method today is Problem Solving Method also known as Problem Based Learning. This method was originally tried with medical students and has over the years been adopted in High schools as well. Two factors play a very important role in deciding the effectiveness of any new method of instruction. One is the way it is perceived by the learners that is, learner's attitudes toward the method. The other is the impact of the method on their performance that is, retention of information. This research is aimed at studying the effectiveness of Problem Based Learning (PBL) in comparison to Lecture Based Learning (LBL) along two variables: Performance and learner attitudes.

PROBLEM BASED LEARNING

Possessing knowledge is not sufficient unless one knows how to apply it to real life situations. In contrast to the traditional learning where teacher is the giver of information, "PBL is an instructional method in which students learn through facilitated problem solving that centres on a complex problem that does not have a single correct answer" (Hmelo-Silver, 2004, 235). PBL as an instructional method helps to bridge the gap between factual knowledge and real life problems. The focus of PBL is on experiential learning wherein learners investigate problems that are related to the real world (Torp & Sage, 2002). In PBL, learning occurs from solving of the problem.

In PBL students work in collaborative groups to identify what they need to learn in order to solve a problem, engage in self directed learning, apply their new knowledge to the problem and reflect on what they learned and the effectiveness of the strategies employed (Hmelo-Silver, 2004). PBL is an instructional method that is said to provide students with knowledge suitable for problem solving (Schmidt, 1983). It facilitates learning when used in addition to conventional instructional methods.

Specific procedure followed in PBL may vary from context to context. However, the typical learning process followed in a problem-based learning environment is as follows (Visser, 2002, pg 3):

1. Students begin the problem cold - without any prior experience in dealing with similar problems. Each group of students (usually consisting of between five and twelve students) meet with the facilitator to discuss the problem.
2. The facilitator gives a brief introduction to the topic. It is then meant for the group to ask questions to the facilitator to elicit information relevant to the problem i.e. to identifying the different aspects of the problem.
3. Students generate and refine hypothesis related to the problem with the help of the facilitator.
4. Students determine the aspects of the problem that they need to investigate to find a solution to the problem.
5. The groups then divide the task of investigating the problem amongst its members.
6. Group members engage in self-directed learning by gathering information from a variety of different sources.
7. After the group members have researched the topic, they report their findings to each other.

They re-examine the problem, and apply newly acquired knowledge and skills to generating a formal solution to the problem.

8. Once the formal solution has been presented to the class and the facilitator, students reflect on what they have learned from the problem and on the process used to resolve the problem presented.

LITERATURE REVIEW

Research findings on effectiveness of PBL are mixed. Norman and Schmidt (1992) found that PBL enhances intrinsic interest in the subject matter. Further, they observed that there are small differences between overall knowledge or competence of students trained by PBL and by conventional curricula. However, there are substantial differences related to the retention of knowledge and learning skills that may be attributable to the PBL. Colliver (2000) in his review of medical education literature concluded that there is no convincing evidence that PBL improves knowledge base and clinical performance. PBL and traditional methods did not differ on tests of factual knowledge and tests of clinical knowledge (Vernon &

Blake, 1993). However, when students were asked to evaluate their programs that is, PBL and traditional method, PBL was found to be significantly superior in terms of attitudes and opinions about the programs. Smits, Verbeek and deBuisonje (2002) found no evidence to indicate that PBL in medical education was superior to other educational strategies in increasing doctor's knowledge and performance. Nonetheless, there is moderate evidence that it led to higher satisfaction. In a meta-analysis type review done, it was found that in comparison to conventional instruction, PBL is more nurturing and enjoyable. Faculty also was found to enjoy teaching using PBL. PBL students however, in a few instances scored lower on basic sciences examinations and viewed themselves as less well prepared in the basic sciences than were their conventionally trained counterparts (Albanese & Mitchelle, 1993).

The University of Toronto, Faculty of Medicine implemented the PBL method in its undergraduate curriculum. A study was conducted by Bernstein, Tipping, Bercovitz, and Skinner (1995) to evaluate shifts in students' attitudes after initial direct experience with problem-based learning. It was found that PBL was perceived to be more stimulating and enjoyable, and that it teaches students how to learn rather than to memorize. The students rated traditional methods as better for knowledge acquisition, whereas PBL methods were rated better for improving teamwork.

Kaufman and Mann (1996) found that students in the PBL class had more positive attitudes toward their learning environment on the subscales for enthusiasm and authoritarianism (i.e., they rated their curriculum more favourably for democratic decision making). The PBL students reported more positive attitudes toward their curriculum.

Research Questions

The research report presented in this paper was conducted to study the effectiveness of problem based and lecture based learning methods on performance and learner attitudes in undergraduate Arts program. The specific research questions dealt with were:

1.What are the effects of problem based and lecture based learning methods on the performance of students enrolled in First Year BA class?
2.What are the effects of problem based and lecture based learning methods on the attitudes of students enrolled in First Year BA class?

RESEARCH DESIGN

This study follows a two groups' post test design. In this two groups namely students in problem based learning method and traditional lecture based method were studied.

Independent Variable

The independent variable for the research study is the learning method. There are two levels of this namely Problem based learning method and Lecture Based learning method.

The lecture based learning method involves a combination of teacher-centred lecturing and student-oriented activities like experiments and assignments. The general nature of the course design is as follows: The teacher will conduct a lecture in which critical components of the topic will be presented to the students. This involves imparting knowledge and skills relevant to the topic as also providing examples for students to relate to. The class is concluded with a summary.

The problem based learning method incorporates the following steps (a) Identify the problem (b) Analyze the problem and gather information (c) Generate potential solutions (d) Select and test the solution (e) Analyze/Evaluate the results.

The teacher plays the role of a facilitator who provides limited amount of information. Thus students are presented with challenges in accordance to the Blooms Taxonomy. This leads students' thinking from tasks that involve Remembering (define, duplicate, list, memorize, recall, repeat, reproduce state) to Understanding (classify, describe, discuss, explain, identify, locate, recognize, report, select, translate, paraphrase) to Applying (choose, demonstrate, dramatize, employ, illustrate, interpret, operate, schedule, sketch, solve, use, write) to Analyzing (appraise, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test) to Evaluating (appraise, argue, defend, judge, select, support, value, evaluate) and finally Creating (assemble, construct, create, design, develop, formulate, write).

Students work in small groups and report their findings to each other and present a final report to

the facilitator. Students are then asked to reflect on what they have learned from the problem.

Dependent Variable

Performance:

As a dependent variable, performance was measured in terms of scores on a test containing problems that require recall of information. Performance was compared along two dimensions:

1.Performance was compared across groups that is, students offering Problem based method and lecture based method in the same academic year.
2.Performance was compared across years that is, performance of students in Semester end examination in 2012-2013 was compared with mean performance of students in the lecture based treatment across past four years.

Attitudes:

Learner attitude was measured using Keller's (1995) Course Interest Survey (CIS). The CIS consists of four components namely:

1.Attention: students' attitudes toward the strategy's effectiveness in attaining and sustaining their attention
2.Relevance of the instructional content being offered to the students
3.Confidence: in the ability of the learner to successfully meet the course objectives
4.Satisfaction with the instructional method: as an effective means of attaining the course objectives levels.

The course interest survey provides a situational measure of learner motivation in a specific classroom setting (Keller 1995). The CIS has been developed on the basis of Keller's ARCS model and requires students to report their degree of agreement with a variety of different statements concerning their attention, relevance, confidence and satisfaction.

RESEARCH HYPOTHESIS

Attitudes:

1.The overall attitude of students will be better among students receiving problem based method than those receiving lecture based method.

1.1 Attention of students will be better among students receiving problem based method than those receiving lecture based method.
1.2 Relevance of the course will be better among students receiving problem based method than those receiving lecture based method.
1.3 The confidence of students will be better among students receiving problem based method than those receiving lecture based method.
1.4 The overall attitude of students will be better among students receiving problem based method than those receiving lecture based method.

PERFORMANCE:

2.1 Learners receiving the lecture-based treatment will demonstrate significantly higher performance than learners receiving problem based method.
2.2 Mean performance of learners over past four years receiving lecture based treatment will be significantly higher than that of learners receiving problem based method.

RESEARCH METHOD

Participants:

Participants in the study were First Year Bachelor of Arts students of Parvatibai Chowgule College. Two courses namely Geography and Economics followed the problem based instructional

strategy. Thus students offering these courses were administered the first level of independent variable. The second group constituted of students offering History and Psychology in which the traditional lecture based instructional strategy was followed. The study took place during the regularly scheduled class periods. Participants were in the age range of 17-18 years.

Instructional Materials:

The instruction was centred on the instructional objectives for a one-semester course having its syllabus outlined by the Goa University.

Procedure:

Participants in the study were divided into two groups on the basis of the learning methods followed in specific courses. Thus one group consisted of students who offered Geography and Economics and the other group of students who offered Psychology and History. The first group (offering Geography and Economics) were administered the first level of the independent variable that is, Problem Based learning method. The second group (offering History and Psychology) were administered the second level of the independent variable that is, Lecture Based learning method.

The treatments were administered over the course of one academic semester and students dedicated four hours of instructional time to participating in the study each week. During this time participants received the instructional treatment that they have been assigned to at the regularly scheduled class times. In addition, they completed the assignments and tests associated with the instructional content.

The CIS was administered at the mid-term point. At the end of the semester, students were evaluated on content based examination conducted by the college.

RESULTS AND DISCUSSION:

Table no: 1. Indicating t Value for Overall Attitude

Variables	Groups	N	Mean	SD	t value
CIS Total	Lecture Based Method	64	112.96	18.99	2.28*
	Problem Based Method	41	121.65	19.22	

*p < .05: Significant

In order to test the significance of mean difference in the overall attitude of learners in PBL and learners in LBL a t test was computed (Table 1). The t value of 2.28 was found to be significant (p < .05) thus indicating a significant difference in the means of overall attitude between students receiving problem based method and those receiving lecture based method. Therefore, we accept the hypothesis that the overall attitude of students will be better among students in PBL than those receiving LBL. Review of the past research reveals that learners evaluate problem solving to be a superior method of instruction over the other learning methods (Vernon & Blake, 1993). It was also seen that learners in the problem solving method are more motivated and interested in the course (Norman & Schmidt, 1992).

Table: 1.1 Indicating mean and standard deviation of the two groups along four components of CIS

Descriptive Statistics				
		N	Mean	SD
Attention	Lecture Based Method	64	24.25	6.35
	Problem Based Method	41	27.87	5.93
Relevance	Lecture Based Method	64	31.82	7.03
	Problem Based Method	41	34.19	5.78
Confidence	Lecture Based Method	64	27.78	4.99
	Problem Based Method	41	28.80	5.10
Satisfaction	Lecture Based Method	64	29.10	5.67
	Problem Based Method	41	30.78	6.86

The overall attitude of students was measured using the Course Interest Survey which has four components: attention, relevance, confidence and satisfaction. Mean and standard deviation was computed for the two groups along these four components (Table 1.1). An observation of the above table reveals that the mean values for PBL was found to be higher than the mean values of LBL.

Table 1.2 Indicating t values for Problem Based Learning and Lecture Based Method along the four components of CIS

Groups	Variables	t Value
Lecture Based Method	**Attention**	**2.93****
Problem Based Method		
Lecture Based Method	Relevance	1.8
Problem Based Method		
Lecture Based Method	Confidence	1.01
Problem Based Method		
Lecture Based Method	Satisfaction	1.36
Problem Based Method		

**p < .01: Highly Significant

One tailed t test was used to test the significance of the difference of the means of the two groups namely, students using PBL and students using LBL (Table 1.2). The t value of 2.93 for attention was found to be significant ($p < .01$). We thus accept Ha1.1 and reject Ha1.2, Ha1.3 and Ha1.4. Therefore along the component of attention the PBL was found to be better than the LBL.

To understand the specific items along which PBL was found to be better over LBL, mean difference was tested for individual items of the CIS. Accordingly, in the attention component, along four items PBL was rated higher than LBL. They are:

1.Suspense created by the instructor
2.Unusual and surprising things done by the instructor
3.Interesting variety of teaching techniques used by the instructor
4.Enthusiastic approach of the instructor

There was no significant difference in the means of the two groups along the remaining three components of CIS namely relevance, confidence and satisfaction ($p > .05$). However, analysis of individual items revealed significant difference in the means of the two groups for the following items:

In the relevance component three items make PBL better than LBL. They are:

1.Usefulness of the course
2.Importance of the course (as portrayed by the instructor)
3.Participation in the class

In the confidence component, significant difference was observed in:

1.Feedback about performance

In the satisfaction component, significant difference was observed in:

1.Overall satisfaction with the course.

Problem based learning enhances intrinsic interest in the subject matter, and is perceived to be more stimulating and enjoyable (Norman & Schmidt, 1992; Bernstein et al 1995).

The second dependent variable – Performance – was measured in terms of scores on a test containing problems that require recall of information. Performance was compared along two dimensions:

1.Performance of students in PBL method was compared with the performance of students in LBL method in the same academic year.

2.Performance was compared across years i.e. mean performance of students in Semester end examination in 2012-2013 was compared with mean performance of students in the lecture based treatment across past four years.

Table 2.1 Comparison of groups with respect to performance in the Semester End Examination

Groups	N	Mean	Std. Deviation	**t value**
Lecture Based Method	53	54.66	14.65	0.71
Problem Solving Method	70	56.70	16.55	

A t-test was computed to study the significance of differences in the mean scores of the two groups (Table 2.1). It is seen that there is no significant difference in the performance of two groups ($p > .05$). Thus the hypothesis stating that learners receiving the lecture-based treatment will demonstrate significantly higher performance than learners receiving problem based method is rejected. This hypothesis was based on the assumption that students in PBL are trained to investigate problems by accumulating information and analysing the same. The emphasis then is not on recall of information but application of the same. However, it was seen that students in the PBL did equally well as students in LBL.

Table 2.2 Indicating mean, standard deviation and t values of learner performance across four years in lecture based method and learner performance in problem solving method

Groups	N	Mean	Std. Deviation	**t value**
Lecture based method across four years (2008-2012)	249	51.51	13.34	2.72**
Problem Solving Method (2012-13)	70	56.70	16.36	

**p < .01: Highly significant

PBL is a new method of instruction followed by the instructors as also the students of the two courses namely Geography and Economics. Thus a comparison was made between performance of students in PBL and that of students over past four years in LBL in these two disciplines. Mean and standard deviation of performance of learners in LBL across past four years and that of learners in PBL is shown in Table 2.2

A t-test was computed to test significance of the difference of mean performance of learners in PBL and learners across past four years in LBL (Table no 2.2). The statistical analysis showed learners in PBL had significantly higher mean performance scores than learners across four years in LBL. This rejects the hypothesis that mean performance of learners over past four years receiving lecture based treatment will be significantly higher than that of learners receiving problem solving method. This finding contradicts the earlier findings of Colliver (2000) and Albanese and Mitchelle (1993).

CONCLUSION:

The study has revealed two findings showing differences between problem based learning method and traditional lecture based learning method.

It is seen that learners have a more favourable attitude toward Problem based learning whereby novelty of the approach as put forth by the instructor makes the method more interesting. Thus learners in Problem based learning rate attitude to be better than learners in lecture based method.

Performance (in terms of retention of information) of learners is also seen to be significantly higher in problem based method.

LIMITATIONS:

The study was carried out only on students of Parvatibai Chowgule College, Margao, Goa, not taking into consideration students of other colleges with similar problem based learning method so that the study could be generalized.

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REFERENCES:

1.Albanese, M. A., & Mitchell, S. (1993). Problem-based learning: A review of literature on its outcomes and implementation issues. Academic Medicine, 68 (1), 52-81. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8447896

2.Colliver, J. A. (2000). Effectiveness of problem-based learning curricula: research and theory. Academic Medicine, 75, 259-266. Retrieved from http://www.med.uni-frankfurt.de/lehre/fam/literatur/container_journal_club/effectiveness_Colliver_Volltext.pdf

3.Hmelo-Silver, C.E. (2004). Problem Based Learning: what and how do students learn? Educational Psychology Review, 16 (3), 235-266. Retrieved from http://kanagawa.lti.cs.cmu.edu/olcts09/sites/default/files/Hmelo-Silver_2004.pdf

4.Kaufman D.M., & Mann K.V. (1996). Comparing students' attitudes in problem-based and conventional curricula. Academic Medicine, 71(10), 1096-9. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9231134

5.Norman, G.R., & Schmidt, H.G. (1992). The Psychological Basis of Problem Based Learning: A review of the evidence. Academic Medicine, 67 (9), 557-565. Retrieved from http://www.unige.ch/medecine/udrem/Education/Formation-1/APPNiveauI/norman_schmidt.pdf

6.Savery, J.R., & Duffy, T.M. (2001). Problem-based learning: An instructional model and its constructivist framework. CRLT Technical Report no.16-01, Bloomington, Indiana University. Retrieved from http://www.faculty.umb.edu/john_saltmarsh/.../problem%20based.rtf

7.Schmidt, H.G. (1983). Problem Based Learning: Rationale and Description. Medical Education, 17, 11-16. doi: 10.1111/j.1365-2923.1983.tb01086.x

8.Smits, P.B.A., Verbeek, J.H.A.M., & de Buisonje, C.D. (2002). Problem Based learning in continuing medical education: A review of controlled evaluation studies. British Medical Journal, 324 (7330), 153-156. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC64518/

9.Torp, L., & Sage, S. (2002). Problems as Possibilities: Problem based learning for K-16 education, Alexandria, VA: Association for supervision and curriculum development, 2nd edition.

10.Vernon, D.T., & Blake, R.L. (1993). Meta-Analysis, Comparative study. Academic Medicine, 68(7) 550-563. DOI: 10.1097/00001888-199307000-00015

11.Visser, Y.L. (2003). Effects of Problem-Based and Lecture-Based Instructional Strategies on Problem Solving Performance and Learner Attitudes in a High School Genetics Class. Dissertation Abstracts International, Florida State University, Volume: 64-10, Section: A, 3656. Retrieved from http://digitool.fcla.edu/

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