

AN EXPERIMENTAL STUDY ON LEARNING PROCESS REENGINEERING

Jayadeva C T

Professor, Department of Mechanical Engineering, AIT, Chikmagalur – 577102, Karnataka,
INDIA, ctjayadeva@yahoo.co.in

Abstract

New advances in Information and Communication Technologies (ICT) have brought challenges and opportunities for better education delivery. This paper presents results obtained from the experiment carried out on Learning Process Reengineering (LPR). Experiment reveals that, in redesigned education delivery method students learn more effectively with ease compared to the traditional method. In the redesigned class, there was a good interaction among the students, cooperative learning was visible, and team spirit was very high. Correlation and Regression analysis shows that there is a strong relationship and correlation between 'Method of Course Delivery' (X) and 'Learning Outcome' (Y) having correlation coefficient of 0.95940.

Keywords: Education Delivery, ICT Tools, Teaching-Learning Process, LPR

1. Introduction

With the rapid development in information technology, information and knowledge can be disseminated faster than ever before. This has brought enormous changes to the traditional roles of teachers and students. The traditional, approach of teaching may not provide students with valuable skills required in today's competitive environment. In order to improve the teaching - learning process, ICT tools have provided excellent opportunities for solving problems and satisfy the expectations of stake holders. It is prudent to make use of these readily available technologies with the concepts of reengineering and to make students to become active learners. This approach gives students a high degree of ownership of the learning process. Research work is being carried out to use reengineering concepts for better delivery of education through a classroom experiment. It is focused on learning-centered education against teaching-centered education in a mixed mode of traditional-classroom and online-classroom teaching methods.

2. Literature Review

Literature on education presents a variety of teaching strategies and greater amount of learning exercises that takes place in the classroom. A brief review of literature on educational process is presented in this section. Case study carried out by Jerry [6] suggested new paradigms for understanding the teaching process. It reveals that TQM ideas of customer focus and continuous improvement activities help to understand students' motivation and know students' learning requirements. Jack and Laura [4] described the effect of technology in enhancing the quality of students' learning. They have opined that latest information and communication technologies enable the use of easily accessible, real world information, which encourages teacher to shift from a role of information disseminator to a facilitator of learning. Experiments conducted by Satish and Munsung [7] on using co-operative learning in classroom environment reveal that, a section of students taught with teamwork and empowerment approach performed better than the section of students taught with traditional method. Survey conducted by Genie Black [2] identifies effectiveness, advantages, limitations of education delivery through traditional classroom and online classroom.

3. Need for Reengineering

The need for reengineering is essential due to the changing perceptions of higher education in the global scenario. The conventional mode of teaching faces major problems such as;

- Rapid fall in student's' attendance.
- Little interaction among students and teacher to students in the classroom.
- Students are often overly shy and prefer not to ask questions.
- The technology changes so rapidly that the course curriculum quickly becomes obsolete.

It is realized that, above problems can be addressed by reengineering the system of education delivery. Such a radical change in education delivery using ICT tools is a clear case for adopting basic reengineering approaches of streamlining / integrating or transforming depending upon requirement of specific activities. In this direction, using the power of ICT tools, LPR Model was evolved [8] which is presented in Figure1. In these lines, preliminary classroom experiment was carried out which gave promising results [5].

4. Experimental setup

Literature on education and the wisdom of experienced teachers suggest that participative learning in the mixed mode environment of traditional classroom and online classroom will help to improve the technical education delivery. Under this scenario based on LPR model the following

experimental setup was formed. This aims at transforming traditional teaching into participative learning.

Salient aspects of experimental model are;

Students' selected for experimental study: Undergraduate level engineering degree program students.

Course material: Clearly narrated course material prepared as per University syllabus and deployed in the network of computers in the modular form.

Facility: Classroom having the facility of audio and video systems, and network of computers with internet / intranet connectivity.

Experiment duration: One semester, a subject / course taught in 25 periods of 2 hours each, 2 periods per week followed by continuous evaluation through performance measure.

Classroom experiment on education delivery was strictly carried out according to the model depicted in the Figure 1. For lack of space detailed narration of the experiment is not given here. However model given in figure clearly narrates salient aspects of the experimental setup. The education delivery as per the redesigned class was carried out at VIII Semester industrial and Production Engineering class having students' strength of 20 by dividing them in to 6 groups. TQM course was chosen for conducting the experiment.

5. Results and Analysis

Data of students' performance and opinions about the impact of redesigned class was obtained and analyzed using "Minitab" statistical analysis software package. Details of the analyses are given in following sections.

5.1 Feedback on Redesigned Classroom

Student satisfaction is important for the continued success of the courses. It is therefore necessary to understand the feelings of the students about the learnability in redesigned class. Hence feedback of students was obtained about their experiences with regard to delivery of education in a mixed mode of traditional and online environment in a redesigned class. The experiences of students are summarized in three statements and the level of agreement with each statement in percentage is given in Table 1.

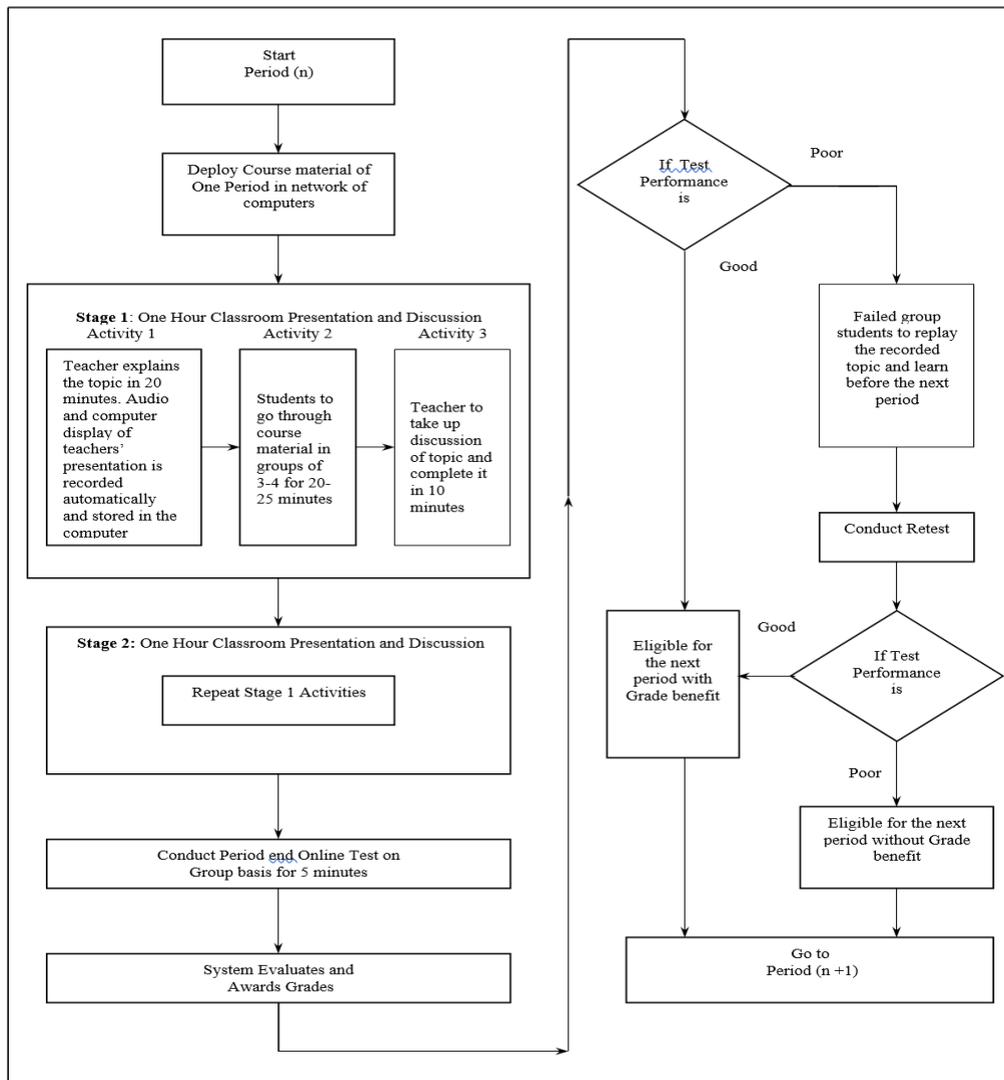


Figure 1. Learning Process Reengineering Model

Table 1. Percentage of Agreement

Statements	Level of Agreement			
	Agree	Disagree	Neutral	Total
1. Redesigned class helped me to improve my learning skills	62 %	24 %	14 %	100 %
2. The delivery of course content is very effective	68 %	27 %	5 %	100 %
3. I would prefer mixed mode of traditional and online study to alternative delivery methods	76 %	21 %	3 %	100 %

Feedback of students on (i) Method of course delivery (ii) Learning outcome was also obtained through questionnaires which are given in Table 2. This feedback was quantified using 4 Point Likert Scale ranging from Strongly Agree (4) to Strongly Disagree (1). The independent variable used in this study is the 'Method of Course Delivery' (X) and the dependent variable is 'Learning Outcome' (Y).

Table 2. Feedback of students

Observation Criteria	Method of Course Delivery (X)	Average ratings	Learning Outcome of Students (Y)	Average ratings
1	Clarity in course objectives	3. 15	Enhancing analytical skill	3. 20
2	Effective delivery of course	3. 25	Ability to work in teams	3. 10
3	Effective utilization of time	2. 70	Improving creativity	2. 60

4	Overall rating of the course	3.30	Motivation for self learning	3.25
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5.2. Correlation and Regression Analysis

The data was subjected to Pearson coefficient of correlation analysis to find whether there is a correlation between the learning experiences in the redesigned class against delivery of the course. The correlation coefficient of 0.9590 indicates a relatively strong relationship between the variables. The result of the correlation analysis is presented in the Table 3.

Table 3. Correlation analysis: C1 and C2

Variable	Mean	SD	Sum of Squares	SE Mean	r	R ²
Y	3.100	0.274	0.075	0.137	0.9590	0.9196
X	3.038	0.298	0.089	0.149		

5.2.1. Testing the significance of correlation coefficient using 't'-test

The significance of correlation was tested by calculating the value of 't' and comparing with the critical value of 't' obtained from statistical tables [1]. The calculated value of 't' is 4.78 and the

critical value of 't' is 2.920 for (n-2) degrees of freedom at the significance level of 0.05 Since the calculated value is greater than the critical value ($4.78 > 2.920$), the correlation is significant [3].

5.2.2. ANOVA for testing the significance of regression coefficients

Based on the results presented in the Tables 3 and 4, it is found that there is a statistical evidence of linear relationship between variables. The regression coefficients given in Table 4 are used to fit a linear model to describe the relationship between the two variables. The equation of the fitted model and the corresponding graph is shown in Figure 3.

Table 4. Regression Analysis: X versus Y

Parameter	Least Squares Estimate	Standard Error	t -Value	P -Value
Intercept	-0.200278	0.678484	-0.295184	0.7957
Slope	1.04444	0.218228	4.78602	0.0410

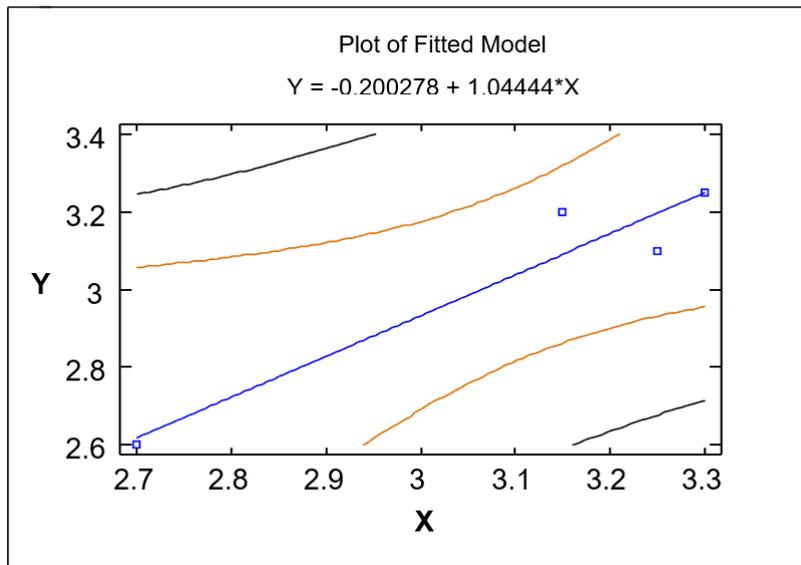


Figure 3. Line of Regression

Since the P-value in the ANOVA Table 5 is less than 0.05, there is a statistically significant relationship between the variables X and Y at the significance level of 0.05. From the results it is observed that, the associated probability under t-statistic is significant at the confidence level of 95%. This clearly indicates that, the method of course delivery has influence on the learning outcomes.

Table 5. ANOVA Summary Table

Source	Sum of Squares	DF	Mean square	F-ratio	P- Value
Regression	0.2454444	1	0. 245444	22. 91	0. 0410

Residual Error	0.0214306	2	0.0107153		
Total	0.266875	3			

6. Conclusion

LPR experiment revealed that,

- The results of ANOVA, 't' tests and correlation analysis shows that, there is a strong linear relationship and correlation between the method of course delivered and learning outcome of students in the redesigned class.
- In the redesigned class, there was a good interaction among the students, cooperative learning was visible, and team spirit was very high.
- Education delivery in redesigned classroom makes the students to learn more effectively with ease compared to the traditional method.

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