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Meta-Analysis of Effectiveness of Programme Learning

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ABSTRACT

A meta-analysis was performed to synthesize existing research comparing the effectiveness of PLM method versus Lecture method on students' achievement and retention. 25 studies were located from the library of Education Department of Hemchandracharya North Gujarat University, Patan and their quantitative data were transformed into Effect Size (ES). The overall corrected grand mean of the study-weighted ES for all 25 studies was 0.59. The results suggest that PLM method was more effective then the Lecture method both on achievement and retention. In addition, eight variables selected for the study (i.e., Sex, Year of Publication, Grade level, Subject area, Sample size, Population group, Place of Study, Number of Periods) had no statistically significant impact on the mean ES. The implication is that teacher should use more of PLM method compare to Lecture method and all subject teachers should use this method.

KEYWORDS: Meta-analysis, PLM method, Lecture Method, Effectiveness

Introduction

Meta-analysis can be described in the literature as analysis of analyses. Meta-analysis is an analysis of analyses method that analyses, combines and compare the results of multiple independent studies in a specific case. In other words, meta-analysis combines the results of studies which give quantitative results and makes analysis statistical results which are reached in these studies. Meta-analysis allows the outcomes of various studies to be summarized statistically on a common scale of effect size (Glass, 1976). An effect size is a type of standard score that permits the combining of results from studies and is usually determined by dividing the difference between an experimental group and a control group by means the standard deviation of the control group. Summarizing studies in this way reveals which interventions demonstrate the most effects. Keeping in view this theoretical framework and presenter decided to conduct meta-analysis of effectiveness of PLM method compared to Lecture method.

Objectives

1. Meta-analysis of researches conducted in Hemchandracharya North Gujarat University on effectiveness of programme learning material.
2. To know the effect of Sex, Year of Publication, Grade level, Subject area, Sample size, Population group, Place of Study, Number of Periods on effectiveness of programme learning material through meta-analysis.

Research Questions

What is the weighted and unweighted mean effect size dependent on mean of scores obtained in post-test by

1. students of PLM group and lecture group?
2. boys and girls students of PLM group?
3. students of PLM group and lecture group?
4. boy students of PLM group and lecture group?
5. girl students of PLM group and lecture group?
   What is the corrected weighted and unweighted mean effect size dependent on mean of scores obtained in post-test by
6. students of PLM group and lecture group?
7. boys and girls students of PLM group?
8. students of PLM group and lecture group?
9. boys students of PLM group and lecture group?
10. girl students of PLM group and lecture group?

Variables Studied

Variables	Levels
Sex	Boys & Girls
Year of publication	2001-2007, 2008-2009 & 2010-2011
Grade level	6-8, 9-10 & 11-12
Subject area	Science, Commerce & Arts
Sample size	50-100, 101-150 & 151-200
Population group	Patan, Mehsana, Banaskantha & Sabarkantha
Place of study	Department & College
Number of Period	3, 4, 5, 6

Table 1 Coded Variables for the Meta-analysis

Hypotheses

There will be no significant effect of sex (H_{01}), year of experiment (H_{02}), standard (H_{03}), subject (H_{04}), sample size (H_{05}), area of experimentation (H_{06}), place of study (H_{07}) and number of period (H_{08}) on mean effect size dependent on mean of scores obtained in post-test by students of PLM group and lecture group.

Research Methodology

Population & Sample

Studies conducted from year 2001 to 2011 in different colleges and university department of Hemchandracharya North Gujarat University, Patan on effectiveness of PLM method compared to Lecture method was the population for the study. All the studies (25 in number) on this topic were included for the meta-analysis.

Research Method

Research method used in this study is the meta-analytic approach which was similar to that described Glass, McGaw and Smith (1981).

Data Collection

The data was collected from the Departmental library of Department of Education, Hemchandracharya North Gujarat University, Patan.

Data Analysis

To reduce measurements to a common scale Hunter, Schmidt & Jackson (1982) coded each outcome as an Effect size (ES), defined as the difference between the mean scores of two groups divided by the pooled standard deviation of the experimental and control group. For those studies that did not report means and standard deviations, F or t, values were used for estimating the ES.

Thus first of all ES using Hunter et al., formula was calculated. Using the effect size of each study weighted and unweighted mean effect size was calculated. From the mean effect size its standard error, Z-value and 95% confidence interval was calculated. To know whether all the effect sizes are estimating the same population homogeneity analysis was done. In end to know the effect of various variables F-test was used.

Analysis & Interpretation of Data
Effectiveness of PLM method

Que.	No. of ES	Unweighted Mean ES	Weighted Mean ESw	Standard Error of Mean ESw	Z-value	95% Confidence Interval Mean ESw	Homogeneity Value Q
Q1	25	0.66	0.56	0.06	11.00**	0.54 to 0.78	28.41**
Q6	25	0.66	0.59	0.08	7.82**	0.49 to 0.83	16.38
Q2	19	-0.19	-0.27	0.15	-1.22	-0.48 to 0.11	21.31**
Q7	19	-0.19	-0.20	0.39	-0.48	-0.95 to 0.58	3.16
Q3	17	0.66	0.60	0.13	5.12**	0.41 to 0.92	7.26**
Q8	17	0.66	0.64	0.21	3.10**	0.24 to 1.08	2.68
Q4	19	0.33	0.29	0.13	2.45**	0.06 to 0.59	2.51**
Q8	19	0.33	0.25	0.08	4.04**	0.17 to 0.49	2.68*
Q5	19	0.69	0.62	0.12	5.61**	0.45 to 0.94	7.44**
Q10	19	0.69	0.66	0.19	3.65**	0.32 to 1.06	2.96

Table 2 Numbers of ES, unweighted and weighted mean ES, Z-value, 95% confidence interval and homogeneity value for the Meta-analysis

* Significant at 0.05 level

** Significant at 0.01 level

Question 1 & 6: Of the 25 studies 22 of the study-wighted ES were positive and favoured the PLM group while 3 were negative and favoured Lecture group. The obtained weighted ES value 0.56 was more than 0.50 therefore according to the criteria given by Cohen (1986) the PLM method was effective compared to lecture method. The significance of Z-value also suggests that PLM method was effective. But looking the homogeneity of ES they were heterogeneous. Therefore corrected weighted mean ES and all were recalculated which also suggests that PLM method was effective.

Question 2 & 7: Of the 19 studies 13 of the study-wighted ES were negative and favoured the females group while 6 were positive and favoured male group. The obtained weighted ES value -0.27 was less than 0.50 therefore according to the criteria given by Cohen (1986) there was no difference of effectiveness of PLM method on males and females. The non significance of Z-value also suggests that PLM method was equally effective on males and females group. But looking the homogeneity of ES they were heterogeneous. Therefore corrected weighted mean ES and all were recalculated which also suggests that PLM method was equally effective on male and female group.

Question 3 & 8: Of the 17 studies 17 of the study-wighted ES were positive and favoured the PLM group. The obtained weighted ES value 0.60 was more than 0.50 therefore according to the criteria given by Cohen (1986) the PLM method was effective with reference to retention compare to lecture method. The significance of Z-value also suggests that PLM method was effective. But looking the homogeneity of ES they were heterogeneous. Therefore corrected weighted mean ES and all were recalculated which also suggests that PLM method was effective with reference to retention.

Question 4 & 9: Of the 19 studies 17 of the study-wighted ES were positive and favoured the PLM group while 2 were negative and favoured Lecture group of males. The obtained weighted ES value 0.29 was less than 0.50 therefore according to the criteria given by Cohen (1986) the no difference of effectiveness of PLM method compare to lecture method on males. The non significance of Z-value also suggests that PLM method was not effective on males. But looking the homogeneity of ES they were heterogeneous. Therefore corrected weighted mean ES and all were recalculated which also suggests that PLM method was not effective on males.

Question 5 & 10: Of the 19 studies 15 of the study-wighted ES were positive and favoured the PLM group while 4 were negative and favoured Lecture group of females. The obtained weighted ES value 0.62 was more than 0.50 therefore according to the criteria given by Cohen (1986) the PLM method was effective compare to lecture method on females. The significance of Z-value also suggests that PLM method was effective on females. But looking the homogeneity of ES they were heterogeneous. Therefore corrected weighted mean ES and all were recalculated which also suggests that PLM method was effective on females.

Effect of variables on Effectiveness of PLM method

Hypotheses	Variables	N	%	ES	df	F-value
H_{01}	Sex				1, 17	1.23
	Boys	19	100	0.29		
	Girls	19	100	0.62		
H_{02}	Year of publication				2, 22	0.98
	2001-2007	07	28	0.65		
	2008-2009	10	40	0.56		
	2010-2011	08	32	0.48		
H_{03}	Grade level				2, 22	0.67
	6-8	07	28	0.63		
	9-10	11	44	0.57		
	11-12	07	28	0.68		
H_{04}	Subject area				2, 22	0.89
	Science	10	40	0.53		
	Commerce	6	24	0.85		
	Arts	09	36	0.64		
H_{05}	Sample size				2, 22	0.38
	50-100	12	48	0.62		
	101-150	06	24	0.78		
	151-200	07	28	0.42		
H_{06}	Population group				3, 21	0.37
	Patan	06	24	0.84		
	Mehsana	08	32	0.73		
	Banaskantha	05	20	0.56		
	Sabarkantha	06	24	0.36		
H_{07}	Place of study				1, 23	0.08
	Department	08	32	0.74		
	College	17	68	0.66		
H_{08}	Number of Period				3, 21	0.84
	3	4	16	0.88		
	4	6	24	0.65		
	5	8	32	0.57		
	6	7	28	0.68		

Table 3 Results of ANOVAs for Coded Variables

For ANOVA, all variable, showed statistically non significant impact. This suggest that Sex, Year of Publication, Grade level, Subject area, Sample size, Population group, Place of Study, Number of Period did not affect significantly on the effectiveness of PLM method.

Results

The results of the study were following.

1. The PLM method was effective compared to lecture method with reference to students' achievement and retention.
2. PLM method was equally effective on both males and females with reference to students' achievement and retention.
3. The year of study, grade level, subject, sample size, population group, Place of study, length of programmevariable did not affect the effectiveness of PLM method.

Conclusion

The results of this study provide accumulated research-based evidence in support of effectiveness of PLM method compared to Lecture method with reference to achievement and retention of learning. So, it could be concluded that teachers should use this method frequently in their classroom to achieve better results and retention of learning.

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