WRITING DEFICIENCIES OF TEACHER TRAINEES: AN ANALYSIS BY SIX SIGMA – DMAIC APPROACH

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Abstract

The manufacturing units are systematically employing the six sigma method for the comprehensive and operative quality sustenance. The utility value of six sigma DMAIC strategy in teacher education has been rarely comprehended and the same method can revamp the teacher education system to suit the present day opportunities and challenges (Hariharan, 2013). This experimental study comprises of two groups namely –control and experimental groups with 30 student teachers in each group and the Learning Deficiency Scale (LDS) was used to analyse the writing deficiencies. The findings reveal the relevancy of six sigma-DMAIC methods and influence of the deficiencies are less in experimental group taught by ICT enabled approach. Six sigma calculations reveal that the student teacher's writing strategies are deficient in both the groups but its level is less in the experimental group.

Keywords : Six sigma, DMAIC approach, Learning deficiency and FMEA.

Introduction

Lack of quality learning process is the predominant factor in the classrooms which deliberately slow down the quality skill acquisition of the student teachers. The academic life with poor readability, poor writing ability, lack of self – assessment, lack of note- taking attitude may obstruct the academic growth of the prospective teachers. In this standpoint, the six sigma is a proven quality principle which can be adopted to find the influence of the negative factors of writability of student teachers as the six sigma is widely used in the manufacturing sectors like Motorola which pioneered the six sigma quality strategy.

Six Sigma – Dmaic

The six sigma DMAIC analysis was established by Bill Smith in Motorola in 1986 to foster the industrial quality in all the ways. Now it has been widely used in all the industrial units. However, it is not much used in the academic setting (Hari Haran et al., 2015) Hence, the research on quality of academic service based on the six sigma strategy is very meagre.

Six sigma, defined O'Neill and Duvall (2005), is a disciplined quality improvement methodology that focuses on moving every process that touches the customers - every product and service - towards near perfect quality.

The document on quality assurance in higher education of the NAAC (2007) has stated, "the six sigma as philosophy is concerned with customers focus and creative process improvements. Six sigma philosophies believe that there is a strong correlation between the level of defects, costs and customer (student trainees) satisfaction. If this is spread across the organization as an inherent philosophy, people work in teams with ultimate goal of reducing the defects and aspire to reach the perfection". According to the NAAC document, the six sigma method can be effectively used to improve the quality of academic learning.

The prime focus of this study is to analyse quality of student teachers' performance in the classroom via use of the DMAIC method of the six sigma methodology in the academic process which is underpinning the determination of advantages of the DMAIC method in teacher education and training (Hari Haran et.al, 2015).

The novel contribution of this paper is such advantages of use of the six sigma-DMAIC method of the six sigma methodology in teacher education for analysing their writing for attaining the achievement.

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Table – 1 : Six sigma - DMAIC method in the classroom learning system

D	Define the writing as prime objective of academic outcome
M	Measure writing deficiencies while learning psychology by student teachers
A	Analyse their writing the psychological principles by statistical process
I	Improve learning based on the data analysis in the analyse phase
C	Control plans that institutionalize the improvements for the future to ensure that student learning stay at a desired level.

The psychological concepts are taught through the ICT enabled classrooms by which the learning defects can be minimised.

Need for the study – Failure Mode Effect Analysis (FMEA) on writing

Failure mode and effect analysis, or FMEA, is an attempt to delineate all possible failures, their effect on the system, the likelihood of occurrence, and the probability that the failure will go undetected (Pyzdek, 2010). This technique is a primal attempt to bring out the rational outputs of writing factors encountered by teacher trainees (Hariharan and Mohana sundaram, 2013).

Table- 2: The FMEA on writing of the student teachers

Mode of failure	Effect of failure	S.I	Causes of failure	O	Controls	D	R	Recommended action
Lack of readability	Lack of learning attainments	6	Lack of dynamic ability in moulding the students to write	5	Periodical inspection of authorities	6	180	Resourceful Training process
Hampering The fullest potential in remarkable learning outcome			Lack of parental care in writing	6	Periodical visit of authorities	4	144	Creating infrastructural facilities to meet writing skills
			Poor administrative and academic practices towards textual writing.	7	Effective monitoring by teacher educators and authorities	7	294	Implementation of suitable strategies to Improve the writability
			Lack of skill training of the students in the textual writing	5	Constant Motivation by feedback	7	210	Providing motivational programs– counselling
			Reluctance for continuous evaluation on writing skills	4	Effective monitoring	4	112	Providing motivational programs– counselling
Responsibility	Authorities of nodal agencies, managements, fads of the institutions, Faculty and students							

[(R=SI×O×D) S.I–Severity Index; O–opportunity; D–Detection possibility; R-Risk priority number]

Since the reading skills are the essential for the student teachers, it is need of the hour to evaluate their writing the psychological concepts. Further the FMEA analysis shows that the Lack of dynamic ability in moulding the students, Poor administrative academic practices (294) and in Lack of skill training of the students (210) are the most negative dominant factors which may negatively influence the student teachers. Hence it is obligatory to take on the current study entitled"Writing Deficiencies of Teacher Trainees – An Analysis by Six Sigma-DMAIC Approach". Since the learning deficiency will be wholly seen as academic failure of teacher education that may create irresistible effect on the positive development of the school children of their respective schools and hence the present study was conducted to analyse the learning deficiencies of the secondary teacher trainees in terms of the reader (HariHaran&Zaseerinska, 2015).

Study Design

The design of the present empirical study comprises the research question and purpose, variables, samples and methodology of the present empirical study.

The guiding question of the present empirical study is: Does the teaching strategy and six sigma –

DMAIC method influence the writing pattern of student teachers?

Objective of Study

1. To find the sigma values of learning deficiencies and achievement test score of control and experimental group in reading skills.
2. To find out the effectiveness of ICT program in psychological teaching in the class room of student teachers.

Methodology

In this experimental study totally 60 student teachers were purposely selected from the Department of Education, Indira Gandhi National Tribal University, Amarkantak and allotted equally in two groups – control and experimental and the self-prepared pre-test and post-test questionnaire was adopted to collect the data. The learning deficiency scale (LDS) was used to collect the data regarding the real conditions of writing while learning the concepts of psychology in the classrooms. The validity of both pre-test, post-test questionnaire and leaning deficiency scale (LDS) were 0.86 and 0.79 respectively.

Results of Hypothesis testing – 1

There is no significant difference in the control and experimental group with regard to pretest sigma mean value in writing skills. The 't' test was adopted in the present study.

Table-3: 't' value in the writing of two groups in the pretest

Group	N	Sigma Mean	S.D	Std. Error	t value	p value	Remarks
Control	30	1.2867	0.2473	0.05272	2.044	0.054	Non - Significant p<0.05
ICT	30	1.3011	0.2395	0.05106			

The table 3 reveals that the sigma mean value of control group and experimental group are similar and hence the hypothesis above stated is accepted.

Since the pre-test attainments is similar in each group, the post test is conducted so as to find the effectiveness of ICT based learning as well as the reduction of the DPMO (Defects per Million opportunities) and increase of sigma value in two groups.

The below table 4 shows that the variation in DPMO value in traditional group (504000) is higher than the ICT group (359000) and sigma process outcome is more in the ICT group. The deficiencies in writing are lesser in ICT group (2.071).

Table – 4: The deficiency level in writing of the two groups

Deficiency Factors	Factor mean		Norm fit value		DPMO (4 weeks)		SigmaValue	
	T.G	ICT	T.G	ICT	T.G	ICT	T.G	ICT
Problems of Describing events/Objects	48.4	30.6	0.484	0.306	484000	306000	1.54	2.007
Unintentional to write the content efficiently	50.4	32.7	0.504	0.327	504000	327000	1.49	1.948
Unable to assimilate the content fully while writing	47.6	35.9	0.476	0.359	476000	359000	1.56	1.861
Dislikes/Avoids written work in the class room	44.1	31.7	0.441	0.317	441000	317000	1.648	1.976
Inadequate sentence structure in the written work	42.6	33.7	0.426	0.337	426000	337000	1.687	1.921
Untidy Written work	45.2	28.4	0.452	0.284	452000	284000	1.621	2.071

T.G. - Traditional group (Control)
ICT - ICT group (Experimental)

The below table 5 reveals the achievement of the ICT group (2.291) is higher than the traditional group (1.609) in terms of sigma process outcome. It is determined that the six sigma strategy is of much use to determine the quality learning process while reducing the DPMO substantially.

Table-5: Achievement of ICT group

Defective Score (X)		DPU		DPMO (one opportunity)		Sigma value	
T Group	ICT Group	T Group	ICT Group	T Group	ICT Group	T Group	ICT Group
24	8	0.48	0.16	480000	160000	1.55	2.494
23	11	0.46	0.22	460000	220000	1.6	2.272
20	9	0.40	0.18	400000	180000	1.753	2.415
22	9	0.44	0.18	440000	180000	1.651	2.415
26	12	0.52	0.24	520000	240000	1.45	2.206
25	10	0.50	0.2	500000	200000	1.5	2.342
22	9	0.44	0.18	440000	180000	1.651	2.415
28	15	0.56	0.30	560000	300000	1.349	2.024
25	9	0.50	0.18	500000	180000	1.5	2.415
21	10	0.42	0.2	420000	200000	1.702	2.342
27	11	0.54	0.22	540000	220000	1.4	2.272
22	14	0.44	0.28	440000	280000	1.651	2.083
20	6	0.40	0.12	400000	120000	1.753	2.675
24	15	0.48	0.3	480000	300000	1.55	2.024
29	12	0.58	0.24	580000	240000	1.298	2.206
26	8	0.52	0.16	520000	160000	1.45	2.494
18	10	0.36	0.2	360000	200000	1.853	2.342
23	11	0.46	0.22	460000	220000	1.6	2.272
24	8	0.48	0.16	480000	160000	1.55	2.494
18	11	0.36	0.22	360000	220000	1.858	2.272
23	14	0.46	0.28	460000	280000	1.6	2.083
22	10	0.44	0.2	440000	200000	1.651	2.342
25	9	0.50	0.18	500000	180000	1.5	2.415
19	12	0.38	0.24	380000	240000	1.805	2.206
18	13	0.36	0.26	360000	260000	1.858	2.143
24	8	0.48	0.16	480000	160000	1.55	2.494
22	15	0.44	0.3	440000	300000	1.651	2.024
21	13	0.42	0.26	420000	260000	1.702	2.143
19	14	0.38	0.28	380000	280000	1.805	2.083
25	10	0.50	0.2	500000	200000	1.5	2.342
Mean		0.4566	0.217	456666	217333	1.609	2.291

The results of the hypothesis - 2

Table – 6 :'t' value in the wringing deficiencies level of two groups.

Group	N	Sigma Mean	S.D	Std. Error	't' value	p value	Remarks
Control	10	1.4373	0.12011	0.028178	7.427*	0.000	Significant p<0.05
ICT	10	1.7810	0.07252	0.019889			

The table 6 indicates that the means of two groups have the perfect significant difference as the value of two tail significance is less than 0.05 (p< .05) and hence the hypothesis which has been stated as There is no significant difference between the sigma means of control and experimental group the based on the reading has been rejected.

The results of the hypothesis - 3

Table - 7 : 't' value in the achievement of two groups

Group	N	Sigma Mean	S.D	Std. Error	't' value	P value	Remarks
Control	30	1.612	0.1517	0.282	16.328*	0.000	Significant p<0.05
ICT	30	2.292	0.0305	0.023			

The DPMO (Defects Per Million Opportunities) noted in the table 7 of two groups are optimum, its level is less 217333.3 in the ICT group than the control group (456666) as the ICT mode of teaching of psychological concepts enhanced the learning. Further the hypothesis above stated is rejected as there is significant difference between the control and experimental group exist with regard to the process sigma mean. (Control - 1.612; ICT - 2.292).

Discussion

The results of Kuldeep Nagi and Srisakdi Charmonman (2010) who reported that Six Sigma methods can help in analysing the reasons for the lack of activity during the course of studies and it gives a clear identification of instructional problems collected through data. This case study reveals that Six Sigma based DMAIC technique can improve the quality learning process of the secondary teacher trainees. It is in concurrence with the findings of Chlaidzeand I. Linde (2006) who reported that the Six Sigma pertains to improving the quality of matter taught, the character generated of the students, and the quality of study and student's life.

Due to the lack of writing, reading, note taking and writing strategies, the achievement tests may have reduced score. It is concurrence with the findings of Mirko Savic (2006) who indicated that a control chart can reduce the common cause variation which is usually a student's responsibility, for instance, poor preparation for exams, concentration, tiredness, etc. Further, they have stated that, a control chart can reduce our chances of making possible errors.

Conclusion

Thus the six sigma – DMAIC approach has its relevancy in terms of enhancing the teacher education systems as the discussions of the previous literatures determine the same.

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