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Six sigma based process capability analysis of learning the ICT concepts by B.Ed teacher trainees

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Abstract
Six sigma based Process capability is a quality tool that is widely used in the industrial units for predicting the Process capability which is the measured, inherent variation of the product turned out by a process. The prime focus of this paper is to predict the process variation, productivity and process capability of the three groups namely self –learning, traditional learning and ICT group which are selected through the purposive sampling with the size of 30 students in each group. The achievement on the ICT concepts are analysed by post-test questionnaire and the learning productivity is more ICT group.

Keywords: Six Sigma, Process Capability Analysis, Learning, ICT Concepts, BED Teacher Trainees.

Introduction

Basic definitions

- Process refers to some unique combination of machine, tools, methods, materials and people engaged in production. It is often feasible and illuminating to separate and quantify the effect of the variables entering into combination.
- Capability refers to an ability, based on tested performance, to achieve measurable results.
- Measured Capability refers to the fact that process capability is quantified from data that, in turn, are the results of measurement of work performed by the process.

$$C_{pk} = \min\left(\frac{\text{USL} - \mu}{3\sigma}, \frac{\mu - \text{LSL}}{3\sigma}\right)$$

where μ = the mean of the process
σ = the standard deviation of the process

The need of the study

Since the process capability studies pertaining to the teacher educative process is meagre, the current study has been under taken to analyse the capability of learning the ICT concepts.

Criterion in the present case study

The prime objective is to find the process capability index of the Bed teacher trainees and based on which the hypotheses are set. The following criteria are set to conduct the research.
The lowest mark of the group = The lower specification limit (LSL)
The highest mark of the group = The upper specification limit (USL)
For this study, Totally 30 students from Dr. Sivanthi Aditanar College of Education, Tiruchendur are selected through the purposive sampling technique.

Capability index: Process capability is measured by the process capability index, *Cp*, which is computed as the ratio of the specification width to the width of the process variability

$$C_p = \frac{\text{specification width}}{\text{process width}} = \frac{\text{USL} - \text{LSL}}{6\sigma}$$

The process width is computed as 6 standard deviations (6 S) of the process being monitored. The reason of using 6 sigma is that most of the process measurement (99.74 per cent) falls within ± 3 standard deviations, which is a total of 6 standard deviations. There are three possible ranges of values for *Cp* that also helps to interpret its value:

Cp = 1: A value of *Cp* equal to 1 means that the process variability just meets specifications that means the process is minimally capable.

Cp ≤ 1: A value of *Cp* below 1 means that the process variability is outside the range of specification which means that the process is not capable of producing within specification and the process must be improved.

Cp ≥ 1: A value of *Cp* above 1 means that the process variability is tighter than specifications and the process exceeds minimal capability.

The Cpk and Cp value in the present case study

The process capability (Cpk) denotes for the process performance and the capability index denotes the potential of the process. The capability index in the present study represents the mean score of learning potential of the individual group and Process Capability refers to the mean score of learning performance in the achievement test of the individual group (Hariharan and Zaščerinska, 2015) [6, 7].

The Process Capability Analysis

Hypothesis – 1 : The process capability (Cpk value) do not attain the maximum value of 1.5 in the self-leaning group, traditional group and ICT group at posttest (terminal) level of achievement in learning the ICT concepts.

The process capability of the achievement test was calculated at the post test level (terminal sigma level) as it is the final level of learning the ICT concepts by the three groups. The Cpk values are as in the table 1.

Table 1: The process capability analysis of the achievement test of the three groups at posttest level.

S.no	self-learning group		Traditional teaching group		ICT group	
1	USL=15	Cpk value	USL=32	Cpk value	USL= 44	Cpk value
2	LSL=9	0.498	LSL =21	0.546	LSL= 35	0.566
3	Mean= 12.633		Mean= 27.1666		Mean= 39.13	
4	S.D= 1.586		S.D= 2.949		S.D= 2.432	
5	Process CPK 0.498		Process CPK 0.546		Process CPK 0.566	

The process capability (Cpk value) does not attain the maximum value of 1.5 in the self-leaning group, traditional group and ICT group at posttest (terminal) level of achievement in learning the ICT concepts.

So it is inferred that the above mentioned null hypothesis is accepted. The process is not capable in the three groups as the process Cpk value falls within one and hence the process should be improved at all levels of learning. The ICT group excels than the other groups as the learning through modern media is more effective.

Capability Index

Process capability is measured by the process capability index, *Cp*, which is computed as the ratio of the specification width to the width of the process variability of 6 standard deviations.

There are three possible ranges of values for *Cp* to interpret its value:

Cp = 1: A value of *Cp* equal to 1 means that the process variability just meets specifications that means the process is minimally capable.

Cp ≤ 1: A value of *Cp* below 1 means that the process variability is outside the range of specification which means that the process is not capable of producing within specification and the process must be improved.

Cp ≥ 1: A value of *Cp* above 1 means that the process variability is tighter than specifications and the process exceeds minimal capability.

Hypothesis – 2 : The process capability index value (Cp index) do not attain the maximum value in the self-leaning group, traditional group and ICT group at posttest (terminal) level of achievement in learning the ICT concepts.

Table 2: The Cp index of the achievement test of the three groups at Post-test level.

S no	Group	Cp value	Remarks	Interpretation
1	self-learning group	0.6305	All the Cp values fall below one	All the processes are not capable
2	Traditional teaching group	0.6216		
3	ICT group	0.6167		

The process capability index value (Cp index) does not attain the maximum value of one in the self-leaning group, traditional group and ICT group at posttest (terminal) level of achievement in learning the ICT concepts and hence the above mentioned null hypothesis is accepted. The process is not capable in the three groups as the process Cp index value falls within one and hence the process should be improved at all levels of learning as the values in the table 2.

Interpretation

Though the process capability index value (Cp index) in three groups are equal, the process outcome of learning varies as the mode of learning varies. ICT group has attained process performance of 0.566 which is more than the self - learning group (0.498) and traditional group (0.546). It is predicted that the ICT based learning can be potentially used to maximize the learning outcome (Hariharan and Zaščerinska, 2015) [6, 7].

Conclusion

The studies related to six sigma in teacher education is almost nil and hence it is the right time to carry out numerous analysis so as to sustain the academic quality and vigor of the teacher educative process which is generally contempt and dubious.

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