Chapter Three  
(Plan and Procedure)

3.1 Introduction
This chapter deals with the design: methodology, collection and analysis of data of the study. The quality of any study is depended on design and methodology. The design and methodology includes operational definitions of some important variables along with some terms used in this study, objectives, sampling and delimitation of the study. This chapter also describes the research tools, collection of data and statistical techniques.

3.2 Operational Definition of Variables

3.2.1 Physical Facilities of Schools
To assess progress of States and Union Territories towards the goal of Universalisation of Elementary Education, an Educational Development Index (EDI), has been developed by National University of Educational Planning and Administration (NUEPA). The EDI has been developed on four board parameters of assess, infrastructure, teacher related indicators and elementary education outcomes. The EDI takes into account 22 indicators. Out of these indicators, the components namely teacher, classroom, pupil teacher ratio, school classroom ratio, status of professional qualification of teachers, building condition, availability of midday meal, co-curricular activities, games and sports in school, library, playground, sanitation arrangement and drinking water arrangement are considered as physical facilities of schools in the present study.

3.2.2 Internal Efficiency of School
Mehta, A.C. (2002) defined the internal efficiency of school as an optional relationship between the input and output. An activity is said to perform efficiently if a given quantity of output is obtained with the minimum inputs or given quantity of input yields the maximum output. Thus, by the internal efficiency of school means to get maximum output. The best system is one which has both the input and output exactly the same, which is known as a perfect efficient system in education. Internal efficiency of school is the ratio of difference of output & input and input multiplied by 100. In the present study this definition has been used.
The indicators of internal efficiency are-  
i) Input-output ratio
ii) Input per graduate

iii) Wastage ratio.

iv) Proportion of wastage on accounts of drop outs and repeaters.

v) Average duration of stay: Graduates, Drop out and Cohort

vi) Cohort survival and dropout rates.

**Cohort:** Refers to group of pupils join the beginning grade of courses in a given years (UNESCO, 1972).

**3.2.3 Primary Education**

The education system of Tripura can be divided into four stages, they are the primary stage which comprises of Classes I-V, the middle stage consisting of Classes VI-VIII and the secondary stage comprising of Classes IX-X. Classes XI and XII are the higher secondary stage of education. So Classes I-V is considered as primary education for this study.

**3.2.4 Dropout**

In case of Tripura the students who have not completed class V and left the school at any class in between class I to Class V have been considered as dropout.

**3.2.5 Wastage**

According to Encyclopaedic Dictionary and Directory of education, Volume I, Biswas, A. and Agarwal, J.C (1971) have given the meeting of wastage as “the term used to imply in fructuous expenditure of time, energy and resources on the students who permanently withdraw from the schools. In this primary stage it is measured by comparing the total number of students enrolled in class I in a particular year to the total number of students reaching class IV in 4 years or class V in 5 years whichever be the final year of the primary stage. In the Statistical Measurement of Educational Wastage, UNESCO (1970) it is defined as “Incidence in a Country’s educational system from the point of view of its efficiency, of factors such as premature school leaving and retardation or repetition.” In the present study wastage for both premature school leaving and for repetition has been considered.

**3.2.6 Repetition**

The Encyclopedic Dictionary and Directory of education, Volume I, Biswas, A and Agarwal, J.C (1971) defined the term stagnation as retention of a student in a class for a period of more than one year. The Education Commission (1994-66) has described the stagnation for a particular class in a year as the excess period spent by the pupil in
that class beyond one year i.e. the normal period. In the present study, repetition is considered as stagnation irrespective of completion or non completion of primary education.

3.2.7 Completion
Completion of primary education successfully is considered as completion in the present study. It is differed from survival. Survival is considered as survival in primary education irrespective of completion or non completion of primary education.

3.2.8 Primary Graduate
The student who has successfully completed class V i.e. primary stage of this study is treated as primary graduate.

3.2.9 Quality of Food
Food quality is the quality characteristics of food that is acceptable to consumers. This includes external factors as appearance (size, shape, color, gloss, and consistency), texture, and flavour. Food quality is an important food manufacturing requirement, because food consumers are susceptible to any form of contamination that may occur during the manufacturing process. Many consumers also rely on manufacturing and processing standards, particularly to know what ingredients are present, due to dietary, nutritional requirements, or medical conditions (e.g., diabetes, or allergies). Besides ingredient quality, there are also sanitation requirements. It is important to ensure that the food processing environment is as clean as possible in order to produce the safest possible food for the consumer.

3.3 Significance of the Study
It is revealed from the various studies that the problems of elementary education are mainly non-enrolment, irregular attendance, stagnation, dropout, etc. After non detention policy and Education for all (EFA) mission, non-enrolment and stagnation is not a big problem for Tripura. Many studies as mentioned above were conducted on non–enrolment, stagnation, achievement and dropout but very few were available on the Mid-day Meal programme in the state of Tripura. The study assumes relevance and significance in the context of mid day meal presently provided in various districts of Tripura. Government is encouraging education and fighting classroom hunger in primary levels by these programmes. It has also been found that only very few studies have been done in this important area nationally, and so it is a burning issue in the area of primary education. Therefore, the researcher has taken up this study on the problem
viz. “A Study of the Educational Impact of Mid-day Meal Scheme in Primary Schools of West Tripura District”.

3.4 Objective of the Study

1. To study the infrastructure, which is an essential component for implementing the scheme.
2. To assess the quality of mid-day meal in schools.
3. To study daily attendance of students in primary schools after the introduction of midday meal.
4. To study the school efficiency before and after implementation of midday meal scheme.
5. To study the effect of midday meal on social development of students in primary schools.
6. To find out the role of community and Panchayet to implement the scheme.
7. To identify the problems in the implementation of the scheme and to suggest measures to overcome them.

3.5 Methodology

It is survey type research study. West Tripura District is the population of the study. 20 schools were selected for the study.

3.6 Tools and Their Administration

A research tool plays a major role in any research as it is the sole factor in determining the sound data and in arriving at a perfect conclusion about the problem or study in hand, which ultimately, helps in providing suitable remedial measures to the problem concerned. The research tools used for this study are :

1. Interview schedule on Physical facilities in the school.
2. Interview schedule for teachers, community/Panchayet and cook/helper.
3. Student’s merit and attendance register

Tools 1 and 2 have been prepared by the researcher and finalized on the basis of results of the pilot study and opinion of experts.

3.6.1 Interview Schedule on Physical Facilities in the School

The interview schedule focused on following aspects:-

- Details of Students in school
- Details of Teachers in School
• Number and types of Classrooms
• Toilet facility
• Cooking Place
• Cooking Utensils
• Water facility
• Distribution place of Mid day meal
• Percentage of students take mid day meal daily.
• Management of MDM in School
• Problems in implementation of MDM

3.6.2 Interview schedule for teachers, community/Panchayet and cook/helper.
The interview schedule focused on following aspects:-
• Regularity of MDM
• Percentage of Students taking MDM
• Quality of raw material of MDM
• Quality of Cooked food
• Cooking Place
• Cooking Utensils
• Water facility
• Distribution place of Mid day meal
• Social development of students
• Role in the MDM
• Problems in implementation of MDM

3.6.3 Student’s merit and attendance register
Merit book and attendance register was studied for:-
• Dropout and stagnation rate before and after implementation of MDM
• Seasonal effect on attendance before and after implementation of MDM
• Class wise variation of attendance before and after implementation of MDM
• Effect of MDM on attendance.
• School efficiency.

3.7 Pilot Study
Tools 1 and 2 have been prepared by the researcher and finalized on the basis of results of the pilot study and opinion of experts. The researcher has pooled up several
statements from the primary teachers working in government Primary schools, the literature available in the theme and the discussion with the experts and professors in the department of Education in the University. The pooled up statements in the interview schedule. The preliminary interview schedule was given to five teacher educators and five primary school teachers to express their opinions on the opinionnaire. After getting their opinion on the statements, some were restated and some were deleted.

3.8 Collection of Data

The comprehensive primary data of internal efficiency of the schools, physical facilities available in schools and also quality related data were collected from the headmasters, teachers, cook, community and Panchayet members, students and guardians. The primary data regarding physical facilities available in schools and internal efficiency were collected.

The investigator has visited the schools and collected data through Interview schedule from the teachers after taking permission from the administration. Clean instructions were given to the primary school Headmasters and doubts would be clarified. Students’ attendance register of each class were collected. Daily attendance of the students was counted from the students attendance register. Their merit register was taken into consideration. Then the investigator has taken interview of community and Panchayet members to enquire about the success of midday meal.

3.9 Statistical Treatment.

The regression analysis is carried out to find the causal relationship between attendance and existence of mid day meal. More precisely the method is applied to show how introduction of mid day meal effects the level of student attendance in schools. Regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). More specifically, regression analysis helps one understand how the typical value of the dependent variable (or 'criterion variable') changes when any one of the independent variables is varied, while the other independent variables are held fixed.

Regression models involve the following variables:
• The **unknown parameters**, denoted as \( \beta \), which may represent a scalar or a vector.

• The **independent variables** \( X \).

• The **dependent variable**, \( Y \).

In various fields of application, different terminologies are used in place of dependent and independent variables.

A regression model relates \( Y \) to a function of \( X \) and \( \beta \).

\[
Y \approx f(X, \beta)
\]

The approximation is usually formalized as \( E(Y \mid X) = f(X, \beta) \). To carry out regression analysis, the form of the function \( f \) must be specified. Sometimes the form of this function is based on knowledge about the relationship between \( Y \) and \( X \) that does not rely on the data. If no such knowledge is available, a flexible or convenient form for \( f \) is chosen.

Assume now that the vector of unknown parameters \( \beta \) is of length \( k \). In order to perform a regression analysis the user must provide information about the dependent variable \( Y \):

• If \( N \) data points of the form \( (Y, X) \) are observed, where \( N < k \), most classical approaches to regression analysis cannot be performed: since the system of equations defining the regression model is underdetermined, there are not enough data to recover \( \beta \).

• If exactly \( N = k \) data points are observed, and the function \( f \) is linear, the equations \( Y = f(X, \beta) \) can be solved exactly rather than approximately. This reduces to solving a set of \( N \) equations with \( N \) unknowns (the elements of \( \beta \)), which has a unique solution as long as the \( X \) are linearly independent. If \( f \) is nonlinear, a solution may not exist, or many solutions may exist.

• The most common situation is where \( N > k \) data points are observed. In this case, there is enough information in the data to estimate a unique value for \( \beta \) that best fits the data in some sense, and the regression model when applied to the data can be viewed as an over determined system in \( \beta \).

In the last case, the regression analysis provides the tools for:

1. Finding a solution for unknown parameters \( \beta \) that will, for example, minimize the distance between the measured and predicted values of the dependent variable \( Y \) (also known as method of least squares).
2. Under certain statistical assumptions, the regression analysis uses the surplus of information to provide statistical information about the unknown parameters $\beta$ and predicted values of the dependent variable $Y$.

Analysis of variance is performed to find out whether there exist any differences in average monthly and class wise good attendance in the schools. Data from 2001 and 2011 is been analysed. The *two-way ANOVA* compares the mean differences between groups that have been split on two independent variables (called factors). The primary purpose of a *two-way ANOVA* is to understand if there is an interaction between the two independent variables on the dependent variable.

Let us imagine a data set for which a dependent variable may be influenced by two *factors* which are potential sources of variation. The first factor has $I$ levels ($i \in \{1, \ldots, I\}$) and the second has $J$ levels ($j \in \{1, \ldots, J\}$). Each combination $(i, j)$ defines a *treatment*, for a total of $I \times J$ treatments. We represent the number of *replicates* for treatment $(i, j)$ by $n_{ij}$, and let $k$ be the index of the replicate in this treatment ($k \in \{1, \ldots, n_{ij}\}$).

From these data, we can build a contingency table, where

$$n_{i+} = \sum_{j=1}^{J} n_{ij} \quad n_{+j} = \sum_{i=1}^{I} n_{ij}$$

$n = \sum_{i,j} n_{ij} = \sum_{i} n_{i+} = \sum_{j} n_{+j}$, and the total number of replicates is equal to $\sum_{i,j} n_{ij}$.

The experimental design is *balanced* if each treatment has the same number of replicates, $K$. In such a case, the design is also said to be *orthogonal*, allowing to fully distinguishing the effects of both factors. We hence can write $\forall i, j \quad n_{ij} = K$,

and $\forall i, j \quad n_{ij} = \frac{n_{i+} \cdot n_{+j}}{n}$.

Upon observing variation among all $n$ data points, for instance via a histogram, "probability may be used to describe such variation". Let us hence denote by $Y_{ijk}$ the random variable which observed value $y_{ijk}$ is the $k$-th measure for treatment $(i, j)$. The *two-way ANOVA* models all these variables as varying independently and normally around a mean, $\mu_{ij}$, with a constant variance, $\sigma^2$ (homoscedasticity):

$Y_{ijk} \sim N(\mu_{ij}, \sigma^2)$. 

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Specifically, the mean of the response variable is modelled as a linear combination of the explanatory variables:

\[ \mu_{ij} = \mu + \alpha_i + \beta_j + \gamma_{ij}, \]

where \( \mu \) is the grand mean, \( \alpha \)'s the additive main effect of level \( i \) from the first factor (i-th row in the contingency table), \( \beta \)'s the additive main effect of level \( j \) from the second factor (j-th column in the contingency table) and \( \gamma \)'s the non-additive interaction effect of treatment \( (i,j) \) from both factors (cell at row i and column j in the contingency table).

Another, equivalent way of describing the two-way ANOVA is by mentioning that, besides the variation explained by the factors, there remains some statistical noise. This amount of unexplained variation is handled via the introduction of one random variable per data point, \( \epsilon_{ijk} \), called error. These random variables are seen as deviations from the means, and are assumed to be independent and normally distributed:

\[ Y_{ijk} = \mu_{ij} + \epsilon_{ijk} \text{ with } \epsilon_{ijk} \overset{i.i.d.}{\sim} \mathcal{N}(0, \sigma^2). \]

In this study rate of drop out, stagnation and completion were calculated using ‘True Cohort Method’ which is more accurate method in comparison to ‘Apparent Method’ or ‘Reconstructed Cohort Method’. In this case, enrolment in class I in a given year is considered. Student flow charts are constructed for subsequent seven years showing drop outs and repeaters. This time series data also used to calculate the indicators of internal efficiency of the schools.

The indicators of internal efficiency are calculated as fellow-

(i) \text{Input Output Ratio} \hspace{1cm} \text{No of graduates X 5} \hspace{1cm} \text{Total Student years invested} \hspace{1cm} \text{Input output (in percentage)} = \frac{\text{No of graduates X 5}}{\text{Total Student years invested}}

(ii) \text{Input Per graduate} \hspace{1cm} \text{Total Student years invested} \hspace{1cm} \text{Input per graduate} = \frac{\text{No of graduates}}{\text{Total Student years invested}}

\text{Wastage of Years (in percentage)} \hspace{1cm} \text{Average time taken by the students-5} \hspace{1cm} \text{Average time taken by the students}
(iii) Wastage ratio

\[
\text{Wastage ratio} = \frac{\text{Actual Input output ratio}}{\text{Ideal Input output ratio}} \quad \text{(Ideally it should be 1.00)}
\]

(iv) Proportion of wastage on accounts of drop outs and repeaters

Wastage on account of the repeaters

\[
\text{Student’s years wasted due to repeaters} \times 100
\]

\[
\text{Total student’s years wasted}
\]

Wastage on account of drop out

\[
\text{Student’s years wasted due to repeaters} \times 100
\]

\[
\text{Total student’s years wasted}
\]

(v) Average Duration of stay (Graduates, Drop outs and entire Cohort)

The next indicator of efficiency is the ‘average duration of stay’ in the system, which can be computed separately for the graduates; drop out and also for entire cohort as a whole.

Average duration of stay of Graduates

\[
= \frac{\text{Total time in years taken by the graduates}}{\text{Total no. of primary graduates}}
\]

Average duration of Drop outs

\[
= \frac{\text{Total time in years taken by the drop out students}}{\text{Total no. of drop out students}}
\]

Average duration of entire Cohort

\[
= \frac{\text{Total time in years taken by the entire Cohort}}{\text{Total no. of entire Cohort}}
\]

(vi) Cohort Survival and dropout Rates

Cohort Survival rates = \[
\frac{\text{No. of survival student}}{\text{Total no. students}} \times 100
\]

Cohort Dropout rates = \[
\frac{\text{No. of dropout student}}{\text{Total no. students}} \times 100
\]
**Completion Rate**

\[
\text{Completion rates} = \frac{\text{No. of student completing class V}}{\text{Initial Enrolment in class 5 years back}} \times 100
\]

### 3.10 Delimitation of the Study

Delimitations refer to the scope of the study. The scope of this study covered the following aspects:

The study is delimited to twenty (20) rural Government primary schools of West Tripura District of Tripura having 3896 pupils, 298 teachers, 20 community members, 20 cooks and 20 Head masters/Headmistresses. Data (Class wise attendance) collected by the researcher from the twenty schools of 2001 (21647 students) and 2011 (24138 students) academic years. West Tripura District had 304 primary and 156 upper primary schools. This study was confined to the analysis how the mid day meal scheme affecting rural primary schools of Tripura District.

The internal efficiency variables which the researcher concentrated on were the flow of pupils in terms of dropout and repetition. The study delimited to take place at primary school levels (grades I-V) of twenty (20) selected rural primary school in all West Tripura District of Tripura. The study was delimited technically in the assessment of internal efficiency with particular focus on the educational impact of mid day meal on primary education and the factors affecting them.

### 3.11 Conclusion

This chapter is designed to find out the objective of the study e.g. to find out and to compare the rate of repetition, completion, the internal efficiency of school. Analysis of variance is performed to find out whether there exist any differences in average monthly and class wise attendance in the schools and regression analysis is carried out to find the causal relationship between attendance and existence of mid day meal. Presentation of data and analysis of data, interpretation and discussion were presented in chapter four.