CHAPTER 3
METHODOLOGY AND DATA SOURCES

3.1: Introduction

The research work entitled “Economics of Education: A Comparative Analysis of Private and Public Schools upto Senior Secondary level of Bodoland Territorial Area Districts in Assam” is carried out with four sets of objectives which is fundamentally based on primary data of the sampled schools in the study area. Again, it has also three sets of hypothesis to make the findings statistically significant. Therefore, the researchers has to rely on the appropriate technique of drawing the sample size and to fulfil the four sets of objectives and hypothesis testing it requires the use of simple statistical tools. To process the collected data and to draw the required results through the use of simple statistical tools, it also involves the use of MS Excel and IBM SPSS version 20.

3.2: Sampling methods and design

For this research study, multistage simple random sampling without replacement has been adopted. For the collection of the primary data, four districts of the BTAD have been considered. The total number of schools operating in the BTAD has been first categorised into private and public schools. The private and public schools has been again sub-categorised into lower primary school (LPS), upper primary school (UPS), high school (HS) and higher secondary school (HSS). Considering the total number of private and public schools in the study area where the total number of private schools is only 786 and that of the public schools is 5909 consisting of all the categories under the study excluding the schools which are not applicable and unrecognised according to the norms of the state government in both the private and public schools. Now, 10 percent of private schools from the total of 55 LPS, 79 UPS, 36 HS and 3 HSS in the district of Chirang are selected randomly, in the same way, 10 percent from the total of 62 LPS, 86 UPS, 37 HS and 3 HSS are selected randomly in the district of Kokrajhar. Following the same procedure, 10 percent from the total of 76 LPS, 134 UPS, 31 HS and 8 HSS in the district of Baksa are selected randomly. Again, from the district of Udalguri also, 10 percent from the

total of 80 LPS, 71 UPS and 25 HS are selected randomly. The private school total population from the four districts for LPS is 273, for UPS is 370, for HS is 129 and for HSS is 14. Out of this total population the sample size as 10 percent of the total population is 28 for LPS, 37 for UPS, 14 for HS and 3 for HSS. Overall the total population from the four districts and from the four categories of private schools is 787 and the overall sample size in the four districts from the four categories of private schools is 82. The existing population in the four districts of BTAD from the four categories of private schools, the sample size, the sample size in each district as well as the overall sample size is shown in table-3.1:

Table-3.1: Sample Private Schools in BTAD Selected for the Study from the existing four categories of private schools.

Type of School	Chirang		Kokrajhar		Baksa		Udalguri		Total Population	Total Sample
	ENOS	SS	ENOS	SS	ENOS	SS	ENOS	SS		
LPS	55	6	62	6	76	8	80	8	273	28
UPS	79	8	86	9	134	13	71	7	370	37
HS	36	4	37	4	31	3	25	3	129	14
HSS	03	1	03	1	08	1	0	0	14	3
Total	173	19	188	20	249	25	176	18	786	82

Source: Calculated from National University of Educational Planning and Administration (NEUPA)[1], 2013-14 accessed from http://schoolreportcards.in on 14 September 2015.

Note: - LPS: Lower primary school, UPS: Upper primary school, HS: High school, HSS: Higher secondary school, ENOS: Existing Number of school, SS: Sample size.

Considering the total number of public schools existing in the BTAD, 5 percent of the public schools from the total of 837 LPS, 120 UPS, 49 HS and 9 HSS in the district of Chirang are selected randomly, in the same way, 5 percent from the total of 1314 LPS, 139 UPS, 106 HS and 14 HSS are selected randomly. Following the same procedure, 5 percent from the total of 1466 LPS, 392 UPS, 80 HS and 11 HSS in the district of Baksa are selected randomly. Again, from the district of Udalguri also, 5 percent from the total of 1095 LPS, 208 UPS, 56 HS and 13 HSS are selected randomly. The public school total population from the four districts for LPS is 4712, for UPS is 859, for HS is 291 and for HSS is 47. Out of these population size the sample size as 5 percent of the total population is 236 for LPS, 43 for UPS,

26 for HS and 4 for HSS. Overall the population size from the four districts and from the four categories of public schools is 5909 and the overall sample size in the four districts from the four categories of public schools is 298. The existing population size in the four districts of BTAD from the four categories of public schools, the sample size in each district as well as the overall sample size is shown in table-3.2:

Table-3.2: Sample Public Schools in BTAD Selected for the Study from the existing four categories of public schools.

Type of School	Chirang		Kokrajhar		Baksa		Udalguri		Total Population	Total Sample
	ENOS	SS	ENOS	SS	ENOS	SS	ENOS	SS		
LPS	837	42	1314	66	1466	73	1095	55	4712	236
UPS	120	6	139	7	392	20	208	10	859	43
HS	49	03	106	5	80	4	56	3	291	15
HSS	09	01	14	01	11	01	13	01	47	04
Total	1015	52	1573	79	1949	98	1372	69	5909	298

Source: Calculated from National University of Educational Planning and Administration (NEUPA)[2], 2013-14 accessed from http://schoolreportcards.in on 14 September 2015.

Note: - LPS: Lower primary school, UPS: Upper primary school, HS: High school, HSS: Higher secondary school, ENOS: Existing Number of school, SS: Sample size.

To assess the differences of the impact of private and public schools on the society as well as to bring out their preferences for the school, personal interview is made with the individuals in the 382 numbers of sample villages in which the sample schools are located, where 4 persons in each village was randomly interrogated with the structured questionnaire making a total of 1520 persons as the sample size.

3.3: Data sources

From the selected sampled of private and public schools the information were collected through the structured questionnaire which pertains to the following aspects of the school: (i) Year of establishment, (ii) Type of management, (iii) location of the school, (iv) Category and status of the school (v) Sources of finance and structure of expenditure, (vi) Student profile, (vii) Teachers recruitment and employment profile including non-teaching staff, (viii) Infrastructure, and (x) Problems and prospects of

the private and public schools. The data so collected from the sampled private and public schools are processed with the help of MS Excel. The processed data have been tabulated for further statistical application and analysis for drawing relevant results and conclusions.

For the secondary source, the collection of information is based on the review of relevant literature, journals, magazines, research and survey conducted by various government agents like SSA, RMSA, Census Report and Statistical Handbook, etc.

3.4: Methods for assessing growth and performance

For examining the growth of private and public schools, cumulative growth curve is applied. CAGR is applied to assess the growth of students in the private and public schools. The formula thus used is:

$$^{3}\text{CAGR}\ (t_0, t_n) = \left\{\frac{V(t_n)}{V(t_o)}\right\}^{\frac{1}{t_n - t_o}} - 1;$$

Where V (t_0) is the initial value, V (t_n) is the ending value and $t_n - t_0$ is the number of years.

Percentage method have been used to evaluate the performance of students and compared by using multiple bar diagram between the private and public schools.

$$\text{Performance1} = \frac{\text{Total no. of students passed in board exams of class v + viii + x + xii}}{\text{Total no. students appeared in exams of v + viii + x + xii}} \text{ x } 100$$

$$\text{Performance2} = \frac{\text{Total no. of students passed with 60 \% \& } \textit{above in class } v + viii + x + xii}{\text{Total no. students appeared in exams of v + viii + x + xii}} \text{ x } 100$$

Performance 1 indicated performance in terms of overall pass percentage and performance 2 indicated performance in terms of 1st division pass percentage.

3.5: Model for the determinants of performance

Multiple Linear Regression Model (Gujarati, D. N. *et al*., 2011)[4]: $\mathbf{Y_D = \beta_O + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \mu_i}$

Where, Y_D measures the determinants of performance in private and public school, X_i is a vector of variables assumed to determine performance, βs are the corresponding vector of coefficients to be estimated and μ_i is an error term, is applied to investigate the determinants of the performance of private and public schools in chapter three. The results of the Multiple Linear Regression Model are computed by using the computer software IBM SPSS version 20.

3.6 Average method

Average method is applied in chapter four to evaluate the average income and expenditure. The following average formulae have been used to calculate average annual income and expenditure, average annual total income and expenditure during a year and over the years, expenditure per school, PPE, net income per school and net income per student.

3.6.1: Average income

1. $AAI/S_{\text{From a source}}$

$$= \frac{\text{Total income from a source in each category of sample school during a year}}{\text{Total no. of sample school in each category during a year}}$$

Where AAI/S is average annual income per school from a source during a year.

2. $AAI/S(t_{2009}- t_{2014}) = \frac{\text{Sum of } AAI/S(t_{2009-10 \text{ to to } 2013-14})}{5}$

Where $AAI/S(t_{2009}- t_{2014})$ is average annual income from a source over the period 2009-10 to 2013-14.

3. AATI/S =

$$\frac{\text{Total income from all source in each category of sample school during a year}}{\text{Total no.of sample school in each category during a year}}$$

Where AATI/S is average annual total income per school during a year

4. $AATI/S(t_{2009}- t_{2014}) = \frac{\text{Sum of } AAI/S(t_{2009-10 \text{ to to } 2013-14})}{5}$

Where, $AATI/S(t_{2009}- t_{2014})$ is average annual income per school from all source over the period 2009-10 to 2013-14.

3.6.2: Average expenditure

1. AAE/S

$$= \frac{\text{Total expenditure on a head in each category of sample school during a year}}{\text{Total no. of sample school in each category during a year}}$$

Where AAE/S is average annual expenditure per school on a head during a year

2. $AAE/S(t_{2009}- t_{2014}) = \frac{\text{Sum of } AAE/S(t_{2009-10 \text{ to to } 2013-14})}{5}$

Where $AAE/S(t_{2009} - t_{2014})$ is average annual expenditure on a head over the period 2009-10 to 2013-14.

3. AATE/S =

$$\frac{\text{Total expenditure on all heads in each category of sample school during a year}}{\text{Total no.of sample school in each category during a year}}$$

Where AATI/S is average annual total income per school during a year

4. $AATE/S(t_{2009}- t_{2014}) = \frac{\text{Sum of } AAE/S(t_{2009-10 \text{ to to } 2013-14})}{5}$

Where, $AATE/S(t_{2009}- t_{2014})$ is average annual expenditure per school on all heads over the period 2009-10 to 2013-14.

3.6.3: Net Income (Profit)

1. AANI (or Profit)/S = AATI/S – AATE/S

Where AANI/S is average annual net income per school, AATI/S is average annual total income per school and AATE/S is average annual total expenditure per school.

2. NI (Profit)/ST = $\frac{\text{AANI/S}}{\text{ANS/S}}$

Where NI/ST is net income per student, AANI/S is average annual net income per school and ANS/S is average number of student per school.

3. AAPPE=$\frac{\text{AATE/S}}{\text{ANS/S}}$

Where AAPPE is average annual per pupil expenditure, AATE/S is average annual total expenditure per school and ANS/S is average number of student per school.

3.6.4: Average employment

In chapter 6, average method has been used and to facilitate comparisons sub-divided bar diagrams are also used.

1. $\text{ANOT/S}_{\text{LPS/UPS/HS/HSS}}$=

$$\frac{\text{Total no. of teachers employed in different category of school}}{\text{Total no. of schools in each category}}$$

Where ANOT/S is average number of teachers per school in LPS, UPS, HS and HSS categories of school.

2. $\text{ANOT/S}_{\text{PQ}}$ =

$$\frac{\text{Total no. of teachers employed with PQ in different category of school}}{\text{Total no. of schools in each category}}$$

Where $\text{ANOT/S}_{\text{PQ}}$ is average number of teachers with professional qualification in different category of school.

3.TANT/S=

$$\frac{\text{Total no. of teachers employed in all categories of school}}{\text{Total no. of schools in all category of school}}$$

Where TANT/S is total average number of teachers per school.

4. ANONTS/$S_{LPS/UPS/HS/HSS}$=

$$\frac{\text{Total no. of NTS in different category of school}}{\text{Total no. of schools in each category}}$$

Where ANONTS/S is average number of non-teaching staff per school in LPS, UPS, HS and HSS categories of school.

5.TANONTS/S=

$$\frac{\text{Total no. of NTS employed in all categories of school}}{\text{Total no. of schools in all category of school}}$$

Where TANONTS/S is total average number of non-teaching staff per school in all category of school.

3.6.5: Gender balance in employment:

$$1.\ \text{ANMTS/S} = \frac{\text{Total no. of MTS employed in different categories of school}}{\text{Total no. of schools in each category}}$$

Where ANMTS/S is average number of male teaching staff per school in each category of school.

$$2.\ \text{ANFTS/S} = \frac{\text{Total no. of FTS employed in different categories of school}}{\text{Total no. of schools in each category}}$$

Where ANFTS/S is average number of female teaching staff in each category of school.

3.6.6. Share of employment by gender:

$$1.\ \text{GB} = \frac{\text{Total no. of MTS employed in all categories of school}}{\text{Total no. of teaching staff in all categories}} \text{x}100$$

Where GB is gender balance in employment in the total teaching staffs of sample schools.

$$2.\ \text{GB} = \frac{\text{Total no. of FTS employed in all categories of school}}{\text{Total no. of teaching staff in all categories}} \text{x}100$$

3.6.7. Employment Generation by type of school

$$1.\ \text{EPGRS} = \frac{\text{Total no. of employment in PRS}}{\text{Total no. of employment in total sample school}} \text{x}100$$

Where EPGRS is employment generation by private school

$$2.\ \text{EGPUS} = \frac{\text{Total no. of employment in PUS}}{\text{Total no. of employment in total sample school}} \text{x}100$$

Where EPGUS is employment generation by public school.

3.7: Method of testing the Hypothesis

For testing the stated hypotheses:

(1) H_a: $\mu_1 \neq \mu_2$; There is a significant difference between the growth of private and public schools in the study area;

(2) H_0: $\mu_1 = \mu_2$; There is no significant difference between the performance of private and public schools; and

. (3) H_0: $\mu_1 = \mu_2$; There is no significant difference in the generation of employment between the private and public schools.

We apply Z test for two sample means by applying the following formula:

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^{\,2}}{n_1} + \frac{\sigma_2^{\,2}}{n_2}}} \sim N(0, 1)$$

Where x_1 and x_2 are the mean of sample group 1 and 2, n_1 and n_2 are the number of sample group 1 and sample group 2, σ_1 and σ_2 are the sample variances(Gupta, S. C, *et al*. Pp.14.30)[5]. For test statistic we took the help of IBM SPSS version 20.

3.8: Conclusion

The research work does involves the use of multi-stage random sampling without replacement for the sampling design, cumulative growth curve, CAGR,

percentage, multiple bar diagram, multiple linear regression model, average, subdivided bar diagram and pie diagram. The use of these simple statistical tools has given the fruitful results and findings fulfilling the objectives of the research programme.

References

[1] National University of Educational Planning and Administration (NEUPA, 2013-14)' accessed from http://schoolreportcards.in on 14 September 2015.

[[2] *ibid*

[3] Gujarati, D. N. and Sangeetha (2011), *Basic Econometrics*, New Delhi: Mc Graw hill, Pp. 262.

[4] Compound Annual Growth Rate, accessed at https://an.m.wikipedia.Org /wiki/Compound-annual-growth-rate on June 2018.

[5] Gupta, S. C. and Kapoor, V. K (2010), Mathematical Statistics, New Delhi: Sultan Chand & Sons, Educational Publishers, Pp.14.30.