Impact of Educational Institutions on Literacy Rate in Dakshin Dinajpur, West Bengal, India: A Statistical Analysis

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Abstract

The present research is focused on impact of educational institutions on literacy rate. Traditionally literacy has been commonly defined as the ability to read and write at an adequate level of proficiency that is necessary for communication. According to 2011 census literacy of Dakshin Dinajpur district is 73.86 %, whereas national literacy is 74.04 % which is near to national literacy. There is 1169 primary and 302 upper primary school which create a vital role on literacy. This study reveals that literacy rate is proportionally linearly related to the educational institutions. In this paper analysis is the dependent and two independent data by matrix technique and multiple correlation. It has been found that there is a very strong correlation between literacy rate and educational institutions.

Keywords: Literacy rate, educational institutions, multiple regression, multiple correlation, partial correlation.

Education is the fundamental method of social progress and reform (Dewey). In any society education is a reasonably good indicator of development. Spread and diffusion of literacy is generally associated with essential traits (characteristics) of today's civilization such as modernization, urbanisation, industrialisation, communication and commerce. Therefore to acquire a better quality of life, education is highly essential. Countries throughout the world invest large amount of time, money and other resources to provide formal education for the citizens. Most countries consider education as one of the most important areas of public life. "Literacy for all" is the Indian vision and government has initiated various plans of action for implementing the literacy mission. It is an important demographic element and a

good indicator of human progress. If the rate of literacy transition was low, the economic development slowed down, while the economic development was rapid if the literacy transition was fast.

Study Area

The study is enclosed between latitudes 25°10'55"N and 26°35'15"N and longitudes 87°48'37"E to 89°00'30"E, covering an area of 2162 sq.km. it is surrounded on the three sides ; north east and south, by Bangladesh, on the west by Uttar Dinajpur and Malda district. It is comprised of 2 subdivisions namely Balurghat and Banshihari. Population of the district is 1670931 as per the census of India 2011 and literacy is 73.86 %. (Male 79.63 % and Female 67.81%).

Data Base snd Methodology: the present study is based on secondary data from different sources:-

1. Literacy data (block level) from D.M office, Dakshin Dinajpur.
2. Data of school from D.I and S.I. office, Dakshin Dinajpur.

Some statistical techniques have been taken up as furnished below:

1. Multiple regression analysis (matrix solution):
   Multiple regression equation assumes the form $Y_c = a + b_1 x_1 + b_2 x_2$
   Where x_1 and x_2 are two independent variables and y being the dependent variable, and the constants a, b_1 and b_2 can be solved by solving the following three normal equations:

$$\Sigma Y = an + b_1 \Sigma X_1 + b_2 \Sigma X_2 \tag{1}$$

$$\Sigma X_1 Y = a\Sigma X_1 + b_1 \Sigma X_1^2 + b_2 \Sigma X_1 X_2 \tag{2}$$

$$\Sigma X_2 Y = a\Sigma X_2 + b_1 \Sigma X_1 X_2 + b_2 \Sigma X_2^2 \tag{3}$$

2. Multiple correlation coefficients:

$$R^2 Y X_1 X_2 = \frac{\Sigma (Y - Yc)^2}{\Sigma (Y - \tilde{Y})^2}$$

Where,

$$Y_c = a + b_1 x_1 + b_2 x_2$$

$$\Sigma(Y - Y_C)^2 = \text{Explained variance of } Y \text{ by all repressor}$$

$$\Sigma(Y - \tilde{y})^2 = \text{Total variance}$$

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3. Partial correlation:

(a) $r_{YX1.X2} = \dfrac{R2Y.X1X2 - r2Y.X2}{1 - r2Y.X1}$ (This measures the effort of X_1 on Y)

(b) $r_{YX2.X1} = \dfrac{R2Y.X1X2 - r2YX1}{1 - r2Y.X1}$ (This measures the effort of X_2 on Y)

where, R = Multiple correlation coefficient, r = Karl pearsons' correlation coefficient.

Results and Discussion

Educational institutions: The educational institutions are those organizations, which impart primary, secondary education to the illiterate and uneducated persons of the country. The educational institution is the backbone of the whole education system. In Dakshin Dinajpur there are many primary and upper primary schools. Table 1 shows block/municipality wise distribution of primary and upper primary level school. Educational institutions have greater impact on literacy as they serve as "The Base of the Educational Structure". In Dakshin Dinajpur there are 1169 primary schools in a whole. The maximum and minimum concentration of primary school is found in Balurghat block, Hili and Harirampur block respectively. Numbers of upper primary school are less as compared to primary schools which are 300 in number. However with high concentration of educational institutions literacy rate of Balurghat is also high as compared to the other block.

Table 1: Block/Municipality wise literacy rate and educational institutions in Dakshin Dinajpur District

Block/ Municipality	Literacy rate %(Y)	Number of Educational Institutions	
		Primary school (X_1)	Upper primary school (X_2)
Balurghat Municipality	86.60	34	14
Gangarampur municipality	77.60	32	9
Hili	64.90	72	14
Balurghat	78.90	220	48
Kumarganj	66.80	139	42
Tapan	59.50	200	39
Gangarampur	62.60	164	44
Banshihari	59.50	96	25
Kushumandi	56.30	140	41
Harirampur	53.90	72	26
Total		**1169**	**302**

Source: District Statistical hand book, S.I and D.I office of Dakshin Dinajpur, March 2013.

Literacy Rate: UNESCO defines literacy as "the ability to identify, understand, interpret, create, communication and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of teach individuals to achieve their goals, to develop their knowledge and to participate fully in their in their community and wider society".

The population commission of United Nations considers the ability to both read and write a simple message with understanding in any language a sufficient basis for classifying a person as literate. The Indian census has adopted this definition.

Literacy rate is the total percentage of the population of an area at a particular time aged seven years or above who can read and write with understanding, taking the total population aged seven years or more as the denominator.

Literacy in Dakshin Dinajpur is key for socio-economic progress and the district literacy rate grew to 73.86%. The analysis of the table 1 reveals that in Dakshin Dinajpur literacy rate of block Kushumandi, Harirampur, Banshihari, Tapan is low. Literacy rate of block Balurghat, Hili are moderate and municipality Balurghat and Gangarampur is slightly high.

Multiple Regression Analysis (Matrix Technique) :

Table 2 : Calculation table for multiple Regression Analysis

Y	X_1	X_2	X_1Y	X_2Y	X_1X_2	X_1^2	X_2^2
86.60	34	14	2944.4	1212.4	476	1156	196
77.60	32	9	2483.2	698.4	288	1024	81
64.90	72	14	4672.8	908.6	1008	5184	196
78.90	220	48	17358.0	3787.2	10560	48400	2304
66.80	139	42	9285.2	2805.5	5838	19321	1764
59.50	200	39	11900	2320.5	7800	40000	1521
62.60	164	44	10266.4	2754.4	7216	26896	1936
59.50	96	25	5712	1487.5	2400	9216	625
56.30	140	41	7882	2308.3	5740	19600	1681
53.90	72	26	3880.8	1401.4	1872	5184	676
Y =	X_1 =	X_2 =	X_1Y =	X_2Y=	X_1X_2 =	X_1^2 =	X_2^2 =
666.6	1169	302	76384.8	19684.3	43198	175981	10980

*Source :*calculated by the author

Multiple Regression Analysis (Matrix Technique): Any rectangular arrangement of arrays arranged in columns or rows is known as matrix. It can also be defined as a system of *m*n* numbers arranged in an ordered set of m rows, each rows consisting of an ordered set of n numbers. Such a matrix is called an *m*n* matrix. (Mahmood, 1998).

Thus the normal equation of multiple regression analysis are:

$$666.6 = 10a + 1169\,b_1 + 302\,b_2 \qquad (1)$$

$$76384.8 = 1169a + 175981\,b_1 + 43198\,b_2 \qquad (2)$$

$$19684.3 = 302a + 43198\,b_1 + 10980\,b_2 \qquad (3)$$

This set of matrix equations can also be written in matrix form:

$$\begin{bmatrix} 666.6 \\ 76384.8 \\ 19684.3 \end{bmatrix} = \begin{bmatrix} 10 & 1169 & 302 \\ 1169 & 175981 & 43198 \\ 302 & 43198 & 10980 \end{bmatrix} \times \begin{bmatrix} a \\ b_1 \\ b_2 \end{bmatrix}$$

Or, $C = AX$

Where, $A = \begin{bmatrix} 10 & 1169 & 302 \\ 1169 & 175981 & 43198 \\ 302 & 43198 & 10980 \end{bmatrix}$, $\qquad C = \begin{bmatrix} 666.6 \\ 76384.8 \\ 19684.3 \end{bmatrix}$

And unknown vector, $X = \begin{bmatrix} a \\ b_1 \\ b_2 \end{bmatrix}$ Therefore, $X = A^{-1} C$

The above equation can be solved manually by matrix algebra and find out the value of unknown vector X. Hence, $a = 74.6135$, $b_1 = 0.0613$ and $b_2 = -0.5010$.

Therefore, in this case the regression equation according to matrix method can be expressed as:

$$Y_c = 74.6135 + 0.0613b_1 - 0.5010b_2$$

It is clear estimate that the estimated value of literacy rate increases by 0.0613% for each additional unit in primary school and it decreases by 0.5010% for each unit change of upper primary school.

Multiple Correlation Coefficient:

$$R^2{}_{YX1X2} = \frac{\Sigma(Y - Yc)^2}{\Sigma(Y - \tilde{Y})^2}$$

The multiple correlations are the strength of the relationship between a literacy rate (dependent variables) and primary and upper primary school (independent variables). The value of multiple correlation coefficients is 0.9369. It is indicated that there is very strong correlation between the literacy rate and primary and upper primary school in Dakshin Dinajpur district.

Table 3 : Calculation table for Multiple Correlation Coefficient

Y	Y_c	$(Y - Y_c)^2$	$(Y - \tilde{Y})^2$
86.6	69.68	286.2864	397.6036
77.6	72.07	30.5809	119.6836
64.9	72.01	50.5521	3.0976
78.9	64.05	220.5225	149.8176
66.8	62.09	22.1841	6.0196
59.5	67.33	61.3089	51.2656
62.6	62.62	0.0004	16.4836
59.5	67.97	71.7409	51.2656
56.3	62.65	40.3225	107.3296
53.9	66.00	146.41	162.8176
Y = 666.6		$(Y - Y_c)^2$ = 929.9087	$(Y - Y)^2$ = 1059.3840

Source: Calculated by the Author.

Partial Corrélation: Partial correlation we aim at measuring the relationship between a dependent variable and a particular independent variable by holding all other variables constant. Thus each partial correlation coefficient measures the effect of its independent variable on the dependent variable. In this paper the partial correlation coefficient value is 0.8639 (when the effort of primary school on literacy rate and upper primary is constant) which indicates the high positive effect of primary school on literacy rate and 0.8703 (when the effort of upper primary school on literacy rate, and primary school is constant), which indicates high positive effect of upper primary school on literacy rate.

Conclusion

Literacy is proportionally related to educational institution in Dakshin Dinajpur. But block wise literacy is remarkably low. The right of every individual to education is one of the first provisions of the Universal declarations on Human Rights. But education is often neglected in societies struggling to meet the many needs of their people. Recently education has received greater priority as planners and policy makers finally recognized it as a key factor in determining the pace of development.

The main strategies adopted by the government for increasing literacy in the country including (National Literacy Mission, 1988):

1. National Literacy Mission for imparting functional literacy.
2. Universalization of Elementary Education (UEE)
3. Non-Formal Education
4. District Primary Education Programme.

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