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ANALYSIS OF EDUCATIONAL DEVELOPMENT INDEX (EDI): A BLOCK LEVEL ANALOGY IN UTTAR DINAJPUR DISTRICT, WEST BENGAL

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Abstract:

Education is a man-making process that nurtures an individual's fullest development. In this sense, education is referred to as developing the intellect, essential thinking abilities, social and intellectual understanding, and acceptance of one's self (Basics in Education, NCERT, 2014). The role of education should not cease at imparting learning and skills. It should further aim to empower a future citizen to perform expected roles and challenges with higher-order quality and perfection. Every country develops its system of education to express and promote its unique socio-cultural identity and also meet the challenges of times. According to UNESCO (1996), quality education must be supported by the four pillars of learning: learning to know, learning to do, learning to be, and learning to live together. They are still unable to avail their right to education as a fundamental right due to lack of awareness, economic provision, guidance, government support, etc. The male literacy rate is 65.52 per cent and the female literacy rate is 52.17 per cent in the district (Census of India, 2011). In this present paper, an attempt has been made to identify the education scenario and explain its basic index of the district by Principal Component Analysis Index (PCAI).

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1.0 Introduction:

Education is a man-making process that nurtures an individual's fullest development (Wellstone, 2016). The role of education should not cease at imparting learning and skills. It should aim to empower a future citizen to perform expected roles and challenges with quality and perfection. Every country develops its system of education to express and promote its unique socio-cultural identity and also meet the challenges of times. The child of today is the citizen of tomorrow. According to UNESCO (1996), quality education must be supported by the four pillars of learning: (i) Learning to know, (ii) Learning to do, (iii) Learning to be, and (iv) Learning to live together. Uttar Dinajpur is the most educationally, socially, economically backward district of West Bengal (Human Development Report 2010, Uttar Dinajpur). Most of the people cannot get educational facilities due to insufficient institutions near the home (DISE 2016, Uttar Dinajpur). Uttar Dinajpur is a diffident district in education since post-independence. They are still unable to avail their right to education as a fundamental right due to lack of awareness, economic provision, guidance, government support, etc.

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During the post-independence period, in particular, the district had not made phenomenal progress. The level of literacy in the district of Uttar Dinajpur District in 2011 was much below the state average. In the state of West Bengal, the percentage of literacy rate in 2011 was 78.26 percent but the corresponding figure of the district is 59.07 percent (District Census Hand Book, Uttar Dinajpur, 2011). Educational development is the main source that helps to develop in other fields, such as agriculture, industry and infrastructure. Educated farmers especially those with high school and above education, can contribute more towards the processes of mechanization and biochemicalization at the farm (Ojha et al. 1991). Though education facilities exist, what concerns them most is the quality of education being provided by these schools. The Teacher-Pupil Ratio (TPR) is fairly bad; the type of product produced in the form of students is poor quality. In 2010-11, the teacher-pupil ratio was 38 and it has increased to 49 in 2015-16 (School Directory Report, Uttar Dinajpur). Although most of the schools are in rural areas, the education provided in those schools is not comparable to the one provided in the private schools. Because the EDI values are high in private schools than the Government school in the district (EDI value calculate by the author depends on said Positive and Negative parameter). Quality of education can redress the effect of broader social and economic inequalities. In the context of learning, it allows personalities to take full improvement of education and irrespective of their background (Faubert, 2012).

2.0 The Study Area:

The district of Uttar Dinajpur (Fig. 1) located in the northern part of West Bengal in India was selected as the study region. For administrative purposes, West Bengal has been divided into 23 Districts. Uttar Dinajpur is one of the most important districts of West Bengal, comprising an area of about 3,140 km² and accommodating 3,007,134 inhabitants with an average population density of 958 persons per km² with a population growth of 23.15 per cent per annum (Census of India, 2011). The district lies between 25°17'10"N to 26°35'15"N and 87°48'37"E to 88°20'10"E longitudes. The study area consists of 9 Community Development (C.D.) Blocks covering 1,577 Villages, 99 Panchayats, 4 Legislative towns, and 5 Census towns (Human Development Report, 2010, Uttar Dinajpur). The level of educational attainment with rural literacy rates is 55.77 per cent and urban is 80.28 per cent in the district. The male literacy rate in rural areas is 62.82 per cent and the female literacy rate is 48.72 per cent (District Statistical Hand Book, 2015). Uttar Dinajpur District is located in the northern tract of Bengal Plain lying north of Ganga River. In common, the area has a characteristically leveled landscape having a gradient from north to south.

3.0 Aims and Objectives of the Study:

As a consequence, educational backwardness in Uttar Dinajpur persists. To analyse this, a comparison has been made between the position of primary and upper primary educational development indices based on different indicators. However, the majority of the indicators' analysis and result shows that the educational situation is stagnant. A Composite Index (CI) based on educational development indices for the primary and upper primary has also been developed. Consequently, the foremost objectives of the investigation can be stated as follows:

- i. To assess the present suggestive indicators to calculate EDI and classify indicators into various groups (based on available data).
- ii. To demonstrate steps to computer normalized values towards computing an EDI.
- iii. To discussed and interpret an EDI value based on PCA.

4.0 Materials and methods:

4.1 Data sources, sample techniques and statistical method:

There are four indicators (Fig. 3) that have been used for nine (9) Blocks of Uttar Dinajpur District for the year 2017-18. Some of the indicators are *POSITIVE* (Ratio of primary to upper primary

school, Gender Parity Index (GPI) and % of enrolled children passed, etc.) and *NEGATIVE* (Schools with <4 teachers, Average Pupil-Teacher Ratio (PTR), and Repetition Rate (RR), etc.). Rate of development of Primary education, Upper Primary education and Composite Educational Indices (CEI) are prepared based on the government granted schools data. Four indicators (i.e. Access, Infrastructure, Teacher, and Outcome index) related data have been collected from different blocks and School Inspector (SI) offices, District Inspector of Education Officer (DIEO), Karnojora, Uttar Dinajpur, West Bengal, and School Directory (SD), Govt. of West Bengal, 2017-18. For some more pertinent information about the schools, a range of primary data collected through Block-wise (different blocks of Uttar Dinajpur) selected schools (primary and upper primary) surveys have been used. For the school survey report author has selected at least 15 primary and 5 upper primary schools in each block of the district. Primary data collected through school surveys were constructed using a pre-printed questionnaire by applying interview methods. Observation method, informal discussion with the students, student's families and staffs of schools was gathered. All the amassed data and information have been tabulated and interpreted. All the amassed data were converted into normalized form (value varies 0-1). Then '*BEST*' and '*WORST*' values are identified from the indicators and it will depend upon the nature of a particular indicator. Not only that, if indicators are positive in nature, then the '*HIGHEST*' value will also be treated as the '*BEST*' value and the '*LOWEST*' value will be treated as the '*WORST*' value. On the other side, if the indicators are negative in nature, then the situation will inverse i.e. '*LOWEST*' value will be considered as the '*BEST*' value and the '*HIGHEST*' value will be considered as the '*WORST*' value (table 1). All the collected data and information from different sources was assembled in MS Excel software and analyzed in institutional SPSS version 17. Lastly, collected sample data from each block was validated by using Principal Component Analysis (PCA) with a Composite Index (CI) which has been considered as educational development scenario in the district and a suitable map has been prepared in ArcGIS (ESRI) 10.3.1 software platform. The coordinates of every survey school (will be mentioned 'sites' in the subsequent part of the paper) were recorded by the GPS handset for the function of plotting the information with GIS software platform (Fig. 2).

4.2 Pragmatic Software:

The Principal Component Analysis (PCA) values were determined by institutional SPSS version 17. All maps were prepared by the ArcGIS software (ESRI) 10.3.1 version and assembled the data by MS Excel version 2013 (Microsoft Corporation).

4.3 Analysis of Educational Development Index (EDI):

Recently, the District of Uttar Dinajpur has experience conducting large-scale programmes like the District Primary Education Programme (DPEP), but this type of programme has never performed well before (ZSS, 2015). Uttar Dinajpur District was used to assign fresh ranking based on each set of indicators as well as separately for primary, upper primary, and composite elementary levels of education. The EDI reveals a lot about the regional variations that exist in the state which is true both for primary and upper primary levels of education.

Educational Development Index (EDI) has been developed based on the entire four components' indices for primary and upper primary educational level. An effort has also been made to develop a composite index based on primary and upper primary Educational Development Indices. All the above mentioned sixteen variables were used for the construction of the Educational Development Index (EDI) for the primary and upper primary levels.

Table 1: Factor-wise Best and Worst value of primary school

Name of the C.D. Blocks	Assess Index		Infrastructure Index				Teacher Index	
	No of school /10000 population (▲)	The ratio of primary to upper primary (▲)	Average SCR (▼)	% of schools with SCR>60 (▼)	% of school with common toilet (▲)	% of schools with Girl's toilet (▲)	Schools with <4 teachers (▼)	% of female teachers (▲)
Chopra	8.36	0.21 (◀)	33.25	13.33	82.77	17.23	26.67	37.17 (◀)
Islampur	7.41	0.25	38.60	6.67	90.33	9.67	33.33	44.90
Goalpokher-I	8.03	0.22	30.50	6.67 (▶)	91.22	7.78	20.00	40.62
Goalpokher-II	6.67	0.25	39.75	6.67	93.29 (◀)	6.71 (◀)	13.33 (▶)	48.51
Karandighi	7.50	0.22	14.91 (▶)	13.33	87.73	12.27	16.67	49.50
Raiganj	6.56 (◀)	0.25	26.56	13.33	92.43	7.57	33.33	40.72
Hemtabad	11.12 (▶)	0.32 (▶)	52.14 (◀)	26.67 (◀)	88.60	11.40	40.00 (◀)	45.25
Kaliaganj	9.47	0.21	38.78	13.33	80.22 (▶)	19.78 (▶)	13.33	47.31
Itahar	10.50	0.30	40.12	6.67	91.22	8.78	40.00	54.17 (▶)

Continue...

			Outcome Index				
% of schools with PTR>60 (▼)	Average PTR (▲)	% of teachers without professional Qualifications (▼)	Gender parity index (▲)	Dropout rate (▼)	% of enrolled children passed (▲)	% of appeared kids passed with > 75 per cent & above marks (▲)	Repetition rate (▼)
16.80	68.85 (◀)	14.23	0.73 (◀)	12.14 (◀)	95.65	31.75 (◀)	4.35
11.15	51.03	10.41 (▶)	0.81	5.54	94.23	40.56	5.77
16.03	39.45	15.47	0.91 (▶)	4.23	91.54 (◀)	37.63	8.46 (◀)
23.71 (◀)	56.87	21.45	0.89	7.79	96.78	42.12 (▶)	3.22
11.18	51.63	12.87	0.88	3.42	98.42 (▶)	32.46	1.58 (▶)
1.24 (▶)	43.26	19.85	0.90	4.96	98.10	41.98	1.90
3.44	39.24 (▶)	26.63 (◀)	0.79	5.25	97.63	32.05	2.37
4.90	41.54	18.67	0.86	3.10	97.30	35.41	2.60
3.44	38.48	23.79	0.87	3.07 (▶)	96.27	37.32	3.73

Source: Compiled by the author from Office of the District Project Officer (DPO) data and school-wise survey data, Uttar Dinajpur.

Index:

(▶)	Best Value	(▼)	Negative Factor
(◀)	Worst Value	(▲)	Positive Factor

4.4 Primary, upper primary and composite indices:

These indices weights were assigned to different indicators, which were derived through Principal Component Analysis (PCA). The Principal Component Analysis (PCA) used to determine the relative individual or group indicator weights is the inter-correlation between them, high weights being assigned to those having high contribution, and vice-versa. Another important feature of this technique is that it bypasses the problem of multi-collinearity (Harman, 1967).

The selected variables are first normalised; the following formula was used to obtain normalised values:



$$NV_{ij} = 1 - \left(\frac{\{\text{Best } X_i - \text{Observed } X_{ij}\}}{\{\text{Best } X_i - \text{Worst } X_i\}} \right)$$

Source: DISE Flash Statistics, 2008

Normalised values always lies between 0 and 1 (Mehta and Siddiqui, 2008).

The relative weight for the variables is worked out as follows:

$$W_i = F_{ik} \lambda_k$$

[Where;

W_i = is the weight of i^{th} variable.

F_{ik} = is the factor loading of i^{th} variable and k^{th} factor which reflects the highest correlation between variable (X_i) and factor (F_k).

λ_k = is the variation explained by the k^{th} factor.

5.0 Results and Discussion:

5.1 Factor Analysis and Primary Educational Development Index (PEDI):

Four component indices have been constructed for nine (9) Blocks based on the indicators for the primary educational level by using the weights calculated from the 'Principal Components Analysis (PCA). Weighted Primary Educational Development Index (PEDI) has been developed based on these component indices by using the weights calculated from the 'Principal Components' (PC) for 9 Blocks of Uttar Dinajpur District and is presented in table 2.

Table 2: Primary Educational Development Index (PEDI).

Name of the C.D. Blocks	Access Index	Rank	Infrastructure Index	Rank	Teacher Index	Rank	Outcome Index	Rank
Chopra	0.557	6	0.579	3	0.184 (◀)	9	0.832	5
Islampur	0.312	8	0.044 (◀)	9	0.347	8	0.853	4
Goalpokhar-I	0.528	7	0.398	6	0.391	7	2.091 (▶)	1
Goalpokhar-II	0.568	5	0.407	5	1.805 (▶)	1	0.226	7
Karandighi	0.771	3	1.405	2	0.806	4	0.922	3
Raiganj	0.606	4	0.134	8	1.217	3	0.152	8
Hemtabad	1.987 (▶)	1	2.259 (▶)	1	1.227	2	1.049	2
Kaliaganj	0.173 (◀)	9	0.431	4	0.401	6	0.392	6
Itahar	1.476	2	0.237	7	0.795	5	0.178 (◀)	9

Source: Compiled by the author from Office of the District Project Officer (DPO) data and school-wise survey data, Uttar Dinajpur.

Table 2 shows that the index varies within a range of 0.044 to 2.259 and it is clear from the ranking that Hemtabad is at the top with the highest value of primary (in Infrastructure Index) weighted educational development index (2.259) and the block Islampur is at the bottom with the lowest value of primary (it is also in Infrastructure Index) weighted educational development index (0.044) among the 9 Blocks for which analysis has been undertaken. Other blocks in the district are as follows with Itahar (1.476), Karandighi (0.771), Goalpokhar-I (0.528), Raiganj (0.606), and EDI value highest with Hemtabad (1.987) and lowest with Kaliaganj (0.173) in Assess Index, in

Infrastructure Index Hemtabad (2.259), Karandighi (1.405), Goalpokher-II (0.407), in Teacher Index Goapokher-II (1.805), Kaliaganj (0.401) and Outcome Index Itahar (0.178), Goalpokher-I (2.091) and Karandighi (0.922) respectively. The lowest index value indicates (table 2) the low quality of education and the high index value indicates (all indexes i.e. Access, Infrastructure, Teacher and Outcome) the high quality of education spread over the community in the blocks.

5.2 Factor Analysis and Upper Primary Educational Development Index (UPEDI):

Four component indices have been constructed for nine (9) Blocks based on the indicators for the primary educational level by using the weights calculated from the 'Principal Components Analysis' (PCA). Weighted Upper Primary Educational Development Index (UPEDI) has been developed based on these component indices by using the individual weights calculated from the 'Principal Components' (PC) is presented in table 3.

Table 3: Upper Primary Education Development Index (UPEDI)

Name of the C.D. Blocks	Access Index	Rank	Infrastructure Index	Rank	Teacher Index	Rank	Outcome Index	Rank
Chopra	0.676	6	1.152	2	1.756 (►)	1	1.503 (►)	1
Islampur	0.236	8	0.956	4	0.247	8	0.484	8
Goalpokhar-I	0.826	5	0.792	6	0.239 (◄)	9	0.910	5
Goalpokhar-II	0.023 (◄)	9	1.123	3	1.550	2	0.715	6
Karandighi	1.039	4	1.327 (►)	1	0.483	6	1.219	2
Raiganj	0.575	7	0.855	5	0.395	7	0.549	7
Hemtabad	1.554 (►)	1	0.673	8	0.833	4	1.009	4
Kaliaganj	1.245	2	0.546 (◄)	9	0.631	5	1.154	3
Itahar	1.196	3	0.792	7	0.956	3	0.171 (◄)	9

Source: Compiled by the author from Office of the District Project Officer (DPO) data and school-wise survey data, Uttar Dinajpur.

The weights calculated for access, infrastructure, teachers, and outcome indices from the 'Principal Component Analysis' (PCA) of nine (9) Blocks in Uttar Dinajpur District have been used to develop the Upper Primary Educational Development Index (UPEDI) and along with the ranking of the different blocks. Table 3 shows that the index varies within the range of 0.023 to 1.756 and it is clear from the ranking of the district that Chopra is at the top with the highest value of the index with 1.756 (in Teacher Index) as teacher students ratio in this Block is good (38.45 per cent), above 20 per cent female teacher and only 17.50 per cent of teachers without professional qualifications i.e. a good sign for the educational system. On the other side, Goalpokher-II occupies the lowest rank with 0.023 in the access index followed by Hemtabad (1.554), Kaliaganj (1.245), Itahar (1.196), etc. This is because in Goalpokher-II Block, no. of school/10,000 populations is extremely low and the ratio of upper primary to primary is also low. Therefore, many guardians are not able to admit his/her children outside of the block due to the poverty of families.

Table 4: Composite Educational Development Index (CEDI)

Name of the C.D. Blocks	Primary Educational Development Index	Rank	Upper Primary Educational Development Index	Rank	Composite Index	Rank
Chopra	0.372	6	1.827 (►)	1	1.099	2
Islampur	0.125 (◄)	9	0.116 (◄)	9	0.120 (◄)	9
Goalpokhar-I	0.812	4	0.376	7	0.594	6
Goalpokhar-II	0.707	5	1.307	2	1.007	3
Karandighi	0.933	2	1.011	4	0.972	4
Raiganj	0.131	8	0.524	6	0.327	7
Hemtabad	2.204 9 (►)	1	1.030	3	1.617 (►)	1
Kaliaganj	0.302	7	0.288	8	0.295	8
Itahar	0.917	3	0.597	5	0.757	5

Source: Compiled by the author from table 2 & 3.

From the above, a Composite Educational Development Index (CEDI) based on primary and upper primary educational development indices has been constructed. Not only that, the result has also been analyzed separately for each level of the index (Fig. 3). The composite index was developed by using the weights calculated from the 'Principal Components' (PC) for 09 Blocks. Table 4 shows that the composite index varies from 0.120 to 1.617 and it is clear from the ranking of the blocks that Hemtabad is at the top with the highest value of the composite index (1.617) which indicate the overall situation is good in education and Islampur is at the lowest with composite value (0.120) i.e. indicating a poor condition in the educational system among the 9 Blocks for which analysis has been undertaken. Other blocks followed Chopra with (1.099), Goalpokher-I (0.594), Goalpokher-II (1.007), Karandighi (0.972), Raiganj (0.327), Kaliaganj (0.295), and Itahar (0.757) respectively. A block-wise better understanding of the educational development scenario in the district has been shown in table 5.

Table 5: Block-wise education development scenario and the number of blocks in each in Uttar Dinajpur District

Category of educational development	Composite Index value	No. of C.D. Blocks	Name of C.D. Blocks
Very Low	<0.281	1	Islampur
Low	0.281-0.754	3	Goalpokher-I, Raiganj and Kaliaganj
Medium	0.754-1.227	4	Chopra, Goalpokher-II, Karandighi and Itahar
High	>1.227	1	Hemtabad

Source: Compiled by the author from table 4.

Educational development status in the district is very low in Islampur Block (0.120) with a composite index value of less than 0.281. This zone is located in the Northern part of the district. The Very low educational development is because the infrastructure facilities in this block are not sufficient. Low educational development is observed in three blocks namely Goalpokher-I, Raiganj, and Kaliaganj with the development index in the range of 0.281 to 0.754. Medium educational development distribution is observed in four blocks namely Chopra, Goalpokher-II, Karandighi, and Itahar with the educational development index ranging between 0.754 and 1.227. Medium development in these blocks corresponds closely to the No. of schools /10,000 population,

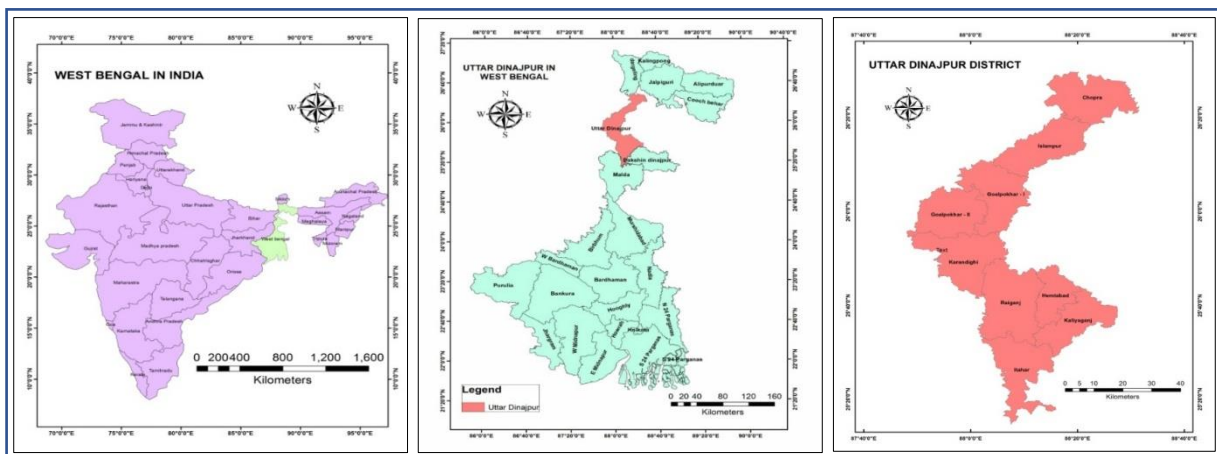
schools with <5 teachers and % of enrolled children passed (both primary and upper primary school) are low. On the other hand, the Dropout rate and Repetition rate are high. Last, of all, only one block namely Hemtabad (1.617) falls under the high educational development. The high zone is located in the northern part of the district (Fig. 4). The educational development is high in this block because, Assess Index (AI), Infrastructure Index (II), Teacher Index (TI), and Outcome Index (OI) conditions are overall excellent.

6.0 Conclusion:

Different blocks of the district have different levels of the primary and upper primary education system. Some blocks in the district have a very low education development index value, while others have a very high education development index value. The reason for this disparity is that some government schools lack primary and upper primary education facilities. In primary school average, SCR worst value is found in Karandighi (14.91) but the best value is found in Hemtabad block (52.14), the school with <4 teacher worst value lowest in Goalpokher-II (13.33) and best is Hemtabad (40.00). Furthermore, all development index values, such as access, infrastructure, teacher and outcome index values, indicate that the district's educational system is in poor to moderate condition. However, the picture in upper primary school is more or less grim, particularly in terms of teacher development index, which is relatively low, indicating a neglected early education situation due to insufficient teachers. Not only that, the student-classroom ratio is low, the dropout rate is high but the enrolment ratio decreases day-to-day, the repetition rate is high and many more. Some schools' performance is better, and then more students are attracted even to the government schools and in the process, the schools also become well. Government schools do not provide an adequate number of teachers or other infrastructure facilities resulting, in the collapse of primary and upper primary education in the district's rural areas.

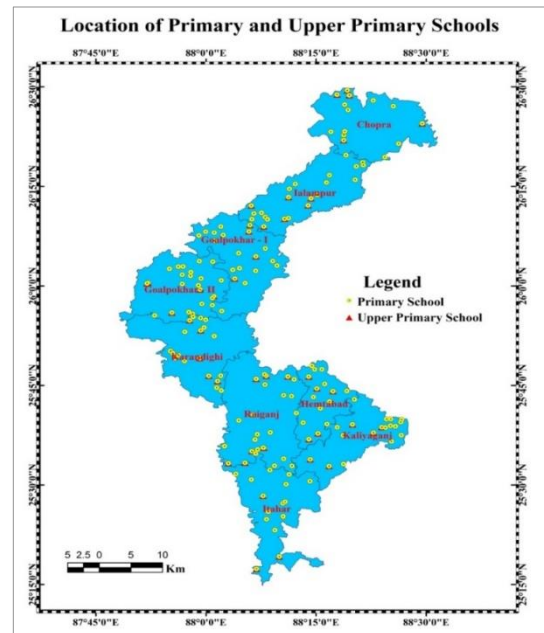
Finally, the observational and manipulative findings may be useful for future recommendations to achieve the district's educational improvement goal. It is a serious matter for which the district must find a solution; otherwise, the district will lose ground in the educational system.

Fig. 1: Location map of Uttar Dinajpur District.



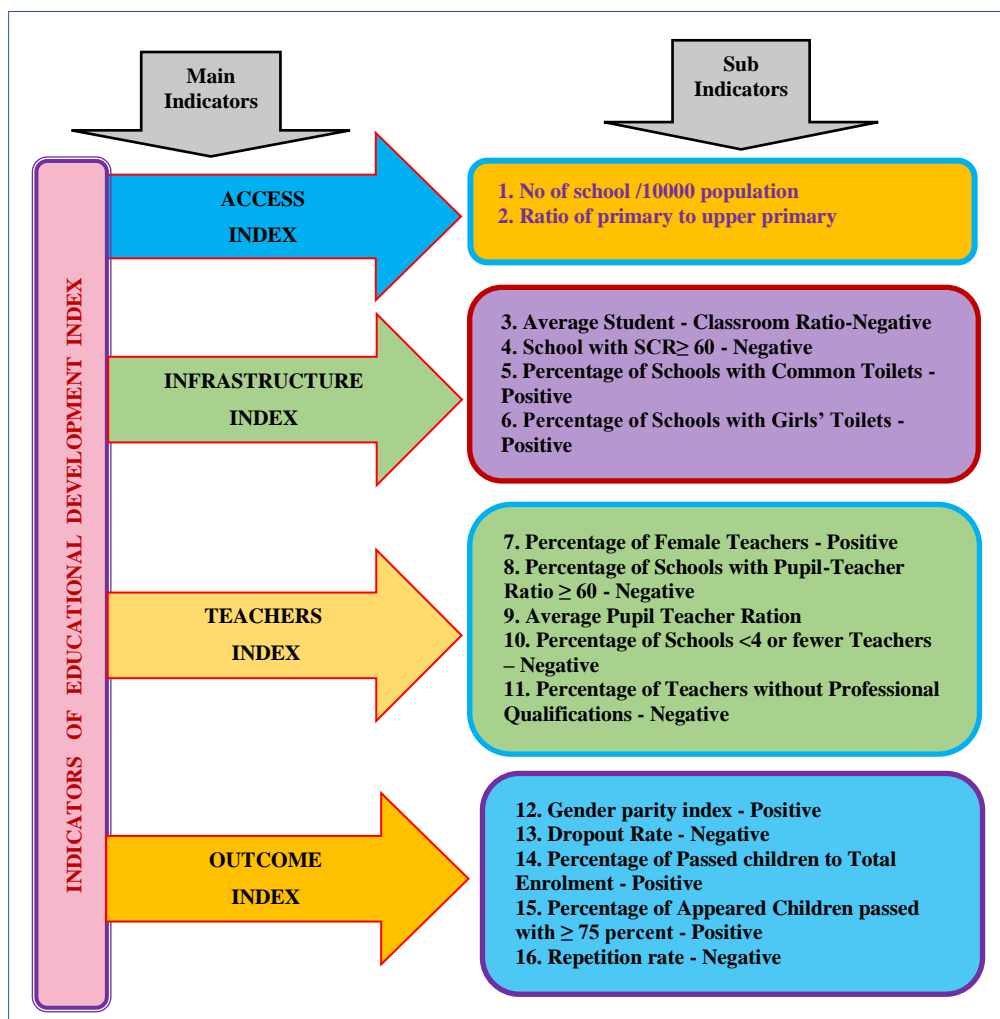
Source: Prepared by the author based on Human Development Report, 2010, Uttar Dinajpur

Fig. 2: Location of modelling sites (sample schools) for fuzzy application.



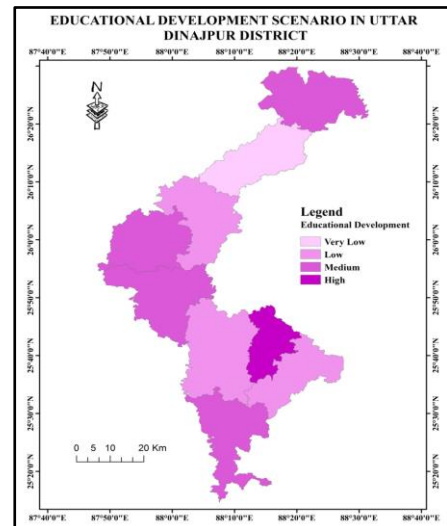
Source: Prepared by the author

Fig. 3: Different indicators of the Educational Development Index (EDI).



Source: NUEPA, 2015

Fig. 4: Educational development scenarios in Uttar Dinajpur District.



Source: Prepared by the author

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