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DEVELOPMENT OF EDUCATION IN JAMMU AND KASHMIR: A PRINCIPAL COMPONENT ANALYSIS

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Abstract

Education forms an important instrument of achieving sustainable development. The present paper was an attempt to study the development of education in Jammu and Kashmir for the year 2015-16. The study was based on secondary data. Seven indicators of education development were selected for every district and the Principle Component Analysis technique was used to construct the Educational Development Index. The results point out that the composite Education Development Index of the state was 0.43853. District Leh with the Index value of 0.60871 had the highest rank and district Anantnag with the Index value of 0.26922 had the lowest rank among 22 districts of Jammu and Kashmir. It was observed from the study that only 36.37% districts were educationally developed and 63.63% districts were educationally underdeveloped.

Key words: Education, Jammu and Kashmir, Principle Component Analysis, Education Development Index

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Introduction

Education is the most crucial social infrastructure which helps a country in achieving rapid economic development. Education is no longer a sheer social service; it is in fact a long term national asset aimed at escalating human resources. Apart from providing competent people, it exposes the people to new ideas and creates right approach and atmosphere which are a pre requisite for economic development (Myrdal 1968) [1]. Most underdeveloped countries believe that it is the rapid quantitative expansion of educational opportunities is the basic key to national development (Todaro 1989) [2]. According to (Dewey 1944) [3] **"**Education is the process of facilitating learning or the acquisition of knowledge, skills, values, beliefs and habits. Educational methods include storytelling, discussion, teaching, training and directed research. Education frequently takes place under the guidance of educators, but learners may also educate themselves**".** Samra (2010) [4] by using the Education Development Index of five components of education studied the relationship between the education and economic development. The study finds very weak correlation between the education development and economic development. The study also finds the disparities in education sector between the Indian states. Tilak (1978) [5] while analyzing the relationship between poverty, inequality and education show that there is inverse relationship between poverty and inequality and education and direct relationship between education and income distribution.

As far as literacy rate in India is considered, it stands at 74.04% in 2011 [6]. India's literacy rate at the time of independence was a mere 14%, over the years literacy rate has been increasing but with varied rates in different states with some states like Kerala and Mizoram well above national average and Bihar with a dismal rate of 63.8%. There is also a concern for female literacy rate (65.46%) which is much below the male literacy rate (82.14%). Therefore there is a need to improve the overall literacy rate as improved literacy rate has an impact on increasing a country's economic growth rate and decreasing population growth rate. Also as India has a very young population, literacy will play a very important role in turning the young population into potential human capital. Like in most other states across India, Jammu and Kashmir also follows the 10+2+3 tier of whole education. The school education system in Jammu and Kashmir consists of Primary from classes I - V, Middle from classes VI - VIII, Secondary covering the classes IX & X and Higher Secondary covering the classes X and XI means that there is

5+3+2+2 system of education in Jammu and Kashmir. The total literacy in Jammu and Kashmir was 55.52 in 2001 [7] which increased to 68.74 in 2011 with a growth rate of 23.82%. The male literacy was 66.6 in 2001 which increased to 78.26 in 2011 with a growth rate of 17.5%. The female literacy was 43 in 2001 which increased to 58.01 in 2011 with a growth rate of 34.9%.

Research Methods

The study is based on secondary data. The data has been collected from District information System for Education - a data base of National University for Educational Planning and Administration, New Delhi for the year 2015-16, Census documents 2011 and Digest of statistics, Govt. of Jammu and Kashmir 2015-16. Seven indicators of education development have been selected for every district and the Principal Component Analysis technique is used to construct an Educational Development Index to study the educational development in the state of Jammu and Kashmir.

Results and Discussion

For the purpose of administration, the state has been divided into three divisions, viz., Jammu, Kashmir and Ladakh divisions. Divisional Commissioner heads each division. The state has 22 districts - 10 each in Jammu and Kashmir divisions and 2 in Ladakh region. Jammu division has Jammu, Samba, Udhampur, Reasi, Doda, Kishtwar, Ramban, Kathua, Rajouri and Poonch districts where as Kashmir division has Anantnag, Kulgam, Pulwama, Shopian, Srinagar, Ganderbal, Budgam, Baramulla, Bandipora and Kupwara districts. While as Ladakh region has Kargil and Leh districts.

Following seven types of indicators have been used to construct an Education Development Index for all the 22 districts of Jammu and Kashmir:

1. No. of Primary Schools per 10,000 Population; denoted as S1
2. No. of Higher Secondary Schools per 10,000 Population; denoted as S2
3. No. of Primary Schools per 100 Km^2; denoted as S3
4. No. of Higher Secondary Schools per 100 Km^2; denoted as S4
5. Gross Enrolment Ratio at Primary Level; denoted as S5
6. Pupil Teacher Ratio at Primary Level; denoted as S6

7. Literacy Rate in Percentage; denoted as S7

Table: 1. Education Development Indicators in Jammu and Kashmir in 2015-16

DISTRICT	S1	S2	S3	S4	S5	S6	S7
ANANTNAG	7.32	2.41	21.88	7.21	52	10	62.69
BADGAM	10.19	2.69	55.16	14.54	55.7	12	56.08
BANDIPORA	10.59	2.18	118.6	24.34	72.9	13	56.28
BARAMULA	11.86	2.77	28.39	6.64	105.1	15	64.63
DODA	18.51	4.29	8.5	1.97	97.6	12	64.68
GANDERBAL	12.52	3.16	143.6	36.29	72.4	10	58.04
JAMMU	7.18	4.48	46.84	29.24	11.4	9	83.45
KARGIL	16.15	5.38	1.64	0.54	85.6	7	71.34
KATHUA	16.2	4.43	39.9	10.91	99	9	73.09
KISHTWAR	20.3	3.41	28.52	4.8	92.6	11	56.02
KULGAM	10.33	2.64	106.5	27.31	84.6	12	59.23
KUPWARA	12.54	1.94	46.19	7.14	63.3	13	64.51
LEH	9.79	4.42	0.31	0.14	105.5	3	77.2
PULWAMA	9.54	2.92	50	15.37	68.7	10	63.48
PUNCH	21.9	2.59	62.5	7.4	107.2	13	66.74
RAJAURI	17.9	3.82	42.3	9.01	104.8	12	68.17
RAMBAN	19.85	3.7	42.2	6.54	93.4	14	54.27
REASI	22.38	3.23	41	5.93	103.1	13	58.15
SAMBA	10.28	4.98	36.2	17.5	106	7	81.41
SHOPIAN	13	3.38	110.9	28.84	96.2	11	60.76
SRINAGAR	1.99	2.66	12.78	17.12	73.3	10	69.41
UDHAMPUR	17.27	3.69	36.3	7.77	98.9	11	68.49

Source: Calculated from the data from DISE of NUEPA, New Delhi. Census documents 2011. Digest of Statistics 2016-17, Govt. of J&K.

From the above indicators some are positive in nature and some are negative in nature. Apart from pupil teacher ratio which is a negative indicator, all other indicators are positive. Therefore the data needs to be normalized before applying the statistical tools to give the correct results. The following formula was used to convert the data into normalized form:

$$\text{NV}id = 1 - \left[\frac{\text{BEST } Si - \text{OBSERVED } Sid}{\text{BEST } Si - \text{WORST } Si}\right]$$

Where,

NV*id* is the normalized value of the indicator of the particular district,

Best S*i* is the best value of the indicator,

Observed S*id* is the observed value the indicator of that district,

Worst S*i* is the worst value of the indicator.

First the best and worst values in an indicator are identified. The best and the worst values will depend upon the nature of the particular indicator. In case of a positive indicator, the highest value will be considered as the best value and the lowest, will be treated as the worst value. If the indicator is negative in nature, then the lowest value will be considered as the best value and the highest value will be treated as the lowest value. The normalized values are given below.

Table: 2. Normalized Value of the Education Development Indicators of J&K

DISTRICT	NORMALIZED VALUE S1	NORMALIZED VALUE S2	NORMALIZED VALUE S3	NORMALIZED VALUE S4	NORMALIZED VALUE S5	NORMALIZED VALUE S6	NORMALIZED VALUE S7
ANANTNAG	0.2615	0.1391	0.1505	0.1895	0.4237	0.4166	0.2885
BADGAM	0.4022	0.2202	0.3825	0.3938	0.4624	0.2500	0.0620
BANDIPORA	0.4218	0.0724	0.8255	0.6669	0.6419	0.1666	0.0688
BARAMULA	0.4841	0.2434	0.1959	0.1736	0.9780	0.0000	0.3550
DODA	0.8102	0.6840	0.0571	0.0434	0.8997	0.2500	0.3567
GANDERBAL	0.5164	0.3565	1.0000	1.0000	0.6367	0.4166	0.1291
JAMMU	0.2545	0.7391	0.3247	0.8035	0.0000	0.5000	1.0000
KARGIL	0.6944	1.0000	0.0092	0.0036	0.7745	0.6666	0.5849
KATHUA	0.6969	0.7246	0.2762	0.2926	0.9144	0.5000	0.6449
KISHTWAR	0.8979	0.4289	0.1968	0.1223	0.8475	0.3333	0.0599
KULGAM	0.4091	0.2057	0.7410	0.7497	0.7640	0.2500	0.1699
KUPWARA	0.5174	0.0000	0.3201	0.1875	0.5417	0.1666	0.3509
LEH	0.3825	0.7217	0.0000	0.0000	0.9822	1.0000	0.7858
PULWAMA	0.3702	0.2869	0.3467	0.4169	0.5981	0.4166	0.3156
PUNCH	0.9764	0.1913	0.4340	0.1948	1.0000	0.1666	0.4273

RAJAURI	0.7802	0.5478	0.2930	0.2396	0.9749	0.2500	0.4763
RAMBAN	0.8759	0.5130	0.2923	0.1708	0.8559	0.0833	0.0000
REASI	1.0000	0.3768	0.2839	0.1538	0.9572	0.1666	0.1329
SAMBA	0.4065	0.8840	0.2504	0.4763	0.9874	0.6666	0.1329
SHOPIAN	0.5399	0.4202	0.7717	0.7923	0.8851	0.3333	0.1329
SRINAGAR	0.0000	0.2115	0.0870	0.4657	0.6461	0.4166	0.1329
UDHAMPUR	0.7493	0.5101	0.2511	0.2051	0.9133	0.3333	0.1329

Source: Calculated from table 1

After computation of normalized values, I calculate the Weights of every indicator by using Factor Loading and Eigen Values from Principal Component Analysis (PCA).

Table: 3. Total Variance Explained

	Initial Eigen values			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.668	38.115	38.115	2.668	38.115	38.115	2.107	30.105	30.105
2	2.106	30.088	68.203	2.106	30.088	68.203	1.859	26.559	56.664
3	1.010	14.426	82.629	1.010	14.426	82.629	1.818	25.965	82.629
4	.651	9.299	91.928						
5	.343	4.894	96.822						
6	.195	2.784	99.606						
7	.028	.394	100.000						
Extraction Method: Principal Component Analysis.									

Here it is worth to mention that only those components are extracted whose total initial Eigen value is above 1. It can be observed from table 3 and table 4 that 3 components have been extracted because only 3 components have the total initial Eigen value above 1 (2.668, 2.106 and 1.010).

Table: 4. Component Matrix

	Component		
	1	2	3
No. of Primary Schools per 10000 Population	.306	-.781	.280
No. of Secondary Schools per 10000 Population	.752	.245	.496
No. of Primary Schools per 100 Sq. Km	-.830	.005	.502
No. of Secondary Schools per 100 Sq. Km	-.753	.458	.439
Gross Enrolment Ratio at Primary Level	.384	-.693	.394
Pupil Teacher Ratio at Primary Level	.548	.651	.290
Literacy Rate in Percentage	.553	.568	-.039
Extraction Method: Principal Component Analysis. a. 3 components extracted.			

Table: 5. Rotated Component Matrix

	Component		
	1	2	3
No. of Primary Schools per 10000 Population	-.133	.859	-.160
No. of Secondary Schools per 10000 Population	.870	.320	-.114
No. of Primary Schools per 100 Sq. Km	-.305	-.012	.921
No. of Secondary Schools per 100 Sq. Km	-.015	-.374	.911
Gross Enrolment Ratio at Primary Level	.024	.877	-.117
Pupil Teacher Ratio at Primary Level	.880	-.174	-.042
Literacy Rate in Percentage	.681	-.282	-.294
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.			

Weights for indicators were calculated by the following formula:

$W_i = \sum_{n=1}^{3}(|Cin| \times EVn)$

Where.

W*i* is the weight of the ith indicator

C*in* is the n[th] component of ith indicator

EV*n* is fixed

Table: 6. Weights of the Education Indicators in J&K

Rotated Component Matrix				**Eigen Values**			
	Component			1	2	3	
	1	2	3	2.668	2.106	1.01	**Weights**
No. of Primary Schools per 10000 Population	-.133	.859	-.160	0.35386	1.80966	0.16190	2.32543
No. of Secondary Schools per 10000 Population	.870	.320	-.114	2.32039	0.67315	0.11479	3.10833
No. of Primary Schools per 100 Sq. Km	-.305	-.012	.921	0.81489	0.02458	0.93016	1.76963
No. of Secondary Schools per 100 Sq. Km	-.015	-.374	.911	0.04108	0.78689	0.91968	1.74766
Gross Enrolment Ratio at Primary Level	.024	.877	-.117	0.06353	1.84739	0.11775	2.02867
Pupil Teacher Ratio at Primary Level	.880	-.174	-.042	2.34911	0.36546	0.04235	2.75692
Literacy Rate in Percentage	.681	-.282	-.294	1.81745	0.59288	0.29666	2.70699
TOTAL WEIGHTS							16.44362

Source: Calculated from tables 3 and 5

By using the above formula the weights are calculated for each indicator as can be seen in the table 6. The third column of the table shows the weights of every indicator and also total weight of indicators is calculated and depicted at the bottom of the column. The Education Development Index of each district of Jammu and Kashmir is determined with the help of Normalized values and Weights of each indicator by using the following formula:

$$EDI_d = \frac{\sum_{i=1}^{7}[NV\,i \times W\,i]}{\sum_{i=1}^{7} Wi}$$

Where,

EDI_d is the Education Development Index of each district

NV*i* is the Normalized value of the i^{th} indicator

W*i* is the Weight of i^{th} indicator.

By using the above formula the Education Development Index for each district was computed in table 7. The table points that district Leh with the Index value 0.60871 has the highest rank and district Anantnag with the Index value 0.26922 has the lowest rank among 22 districts of the Jammu and Kashmir state.

The composite Education Development Index of the state is 0.43853 which is not even touching 0.5. The table 5.7 depicts that the highest index value of the district indicates the top position for the education development. Leh district is on the top position with 0.60871 values. The reason behind this is that, in Leh, availability of primary schools as well as secondary schools per 10000 populations has been good among the districts of the state. Its gross enrolment ratio was highest in the study year. Its pupil teacher ratio was also the highest among the districts in the state. Its literacy was third highest with 77.20 % which increased the Index value of Leh district, followed by Kathua (0.59915) and Kargil with the value 0.59220. On the lower side, Anantnag district (0.26922) has the lowest Index value and stayed last position followed by Srinagar (0.27027) and Kupwara (0.28007).

Table: 7. Education Development Index of Jammu and Kashmir in 2015-16

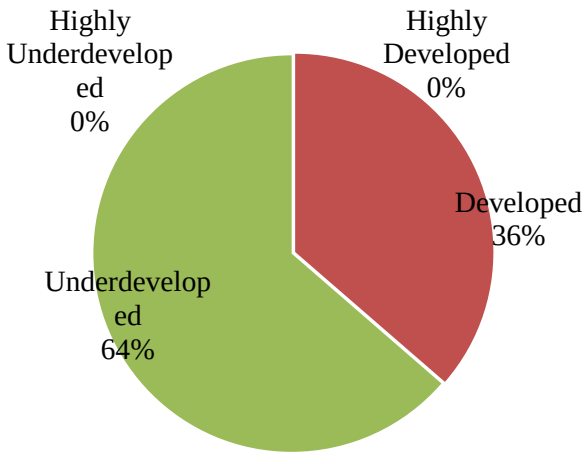
DISTRICT	**EDUCATION DEVELOPMENT INDEX**	**RANK**
ANANTNAG	0.26922	**22**
BADGAM	0.29069	**19**
BANDIPORA	0.35150	**17**
BARAMULA	0.33310	**18**
DODA	0.46626	**9**
GANDERBAL	0.52397	**6**
JAMMU	0.54450	**5**
KARGIL	0.59220	**3**
KATHUA	0.59915	**2**

KISHTWAR	0.41253	**14**
KULGAM	0.42030	**13**
KUPWARA	0.28007	**20**
LEH	0.60871	**1**
PULWAMA	0.38380	**16**
PUNCH	0.46330	**10**
RAJAURI	0.51148	**7**
RAMBAN	0.39001	**15**
REASI	0.42744	**12**
SAMBA	0.55761	**4**
SHOPIAN	0.50999	**8**
SRINAGAR	0.27027	**21**
UDHAMPUR	0.44164	**11**
COMPOSITE EDUCATION DEVELOPMENT INDEX	**0.43853**	

On the basis of the values of the indices, the districts have been classified into following four categories on one point scale:

S. No.	**Category**	**Range**	**No. of Districts**	**%age**
1	Highly Developed	0.750 – 1.000	0	0
2	Developed	0.500 – 0.749	8	36.37
3	Underdeveloped	0.250 – 0.499	14	63.63
4	Highly Underdeveloped	0.000 – 0.249	0	0

Figure: 1. Percentage of Districts under Different Categories in J&K



I have classified all the districts of Jammu and Kashmir into four categories; highly developed, developed, underdeveloped and highly underdeveloped. Districts with index values in the range 0.750 to 1.00 are classified as 'highly developed', the districts with index values in the range 0.500 to 0.749 are classified as 'developed', districts with index values in the range 0.250 to 0.499 are classified as 'underdeveloped' and districts with index values between 0.000 to 0.249 as 'highly underdeveloped'. It is a cause of concern that none of the districts are coming under 'highly developed' category. Only 8 districts are coming under 'developed' category and 14 districts are coming under 'underdeveloped' category. While none of the districts have come under 'highly underdeveloped' category. It can be noticed from the percentage of districts under different categories, only 36.37% districts are developed and 63.63% districts are underdeveloped.

Conclusion

The study is in line with the Education Development Index of NUEPA, New Delhi. There is a vast and uneven development of social infrastructure like education in the state of Jammu and Kashmir. There has been high degree of disparity across districts as reflected in the values of education development index and its indicators. With huge inequalities within the state imply that there is a need to redesign the public policies that directly affect the development of education. It may be stated that whatever be the policies adopted for improving education sector in the state, emphasis should be given to enhance skills based on education because it is conducive to accelerate the rate of economic growth.

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