

# **EDUCATIONAL DEVELOPMENT PARAMETERS AND THE PREPARATION OF EDUCATIONAL DEVELOPMENT INDEX**

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**PLANNING COMMISSION  
GOVERNMENT OF INDIA**



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**INSTITUTE OF APPLIED MANPOWER RESEARCH**  
Indraprastha Estate, Mahatma Gandhi Marg,  
New Delhi-110002

# EDUCATIONAL DEVELOPMENT PARAMETERS AND THE PREPARATION OF EDUCATIONAL DEVELOPMENT INDEX

## **Project Director**

Dr. Anil K. Yadav

## **Principal Investigator**

Mrs. Madhu Srivastava

## **Research Associate**

Ms. Chaitali Pal

## **Research Associate**

Shri V.K. Saxena

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I.P. Estate, Mahatma Gandhi Marg,  
New Delhi - 110 002

## PREFACE

Measuring development has been one of the important segment in social science research. Since development is multi-dimensional, a significant part of such research is also devoted to understanding the relationships between various dimensions as well as in constructing composite indices. This study analyses different facets of educational development such as physical infrastructure, access to education, quality of education and expenditure on education at different levels of schooling from lower primary level to higher secondary level. The study also segregates the rural-urban dimension as well as the gender dimension.

A number of indicators disaggregated by level of education and gender have been analysed to bring out inter-state disparities. The study uses multi variate analysis to construct composite indices based on secondary data collated from variety of sources. The study was conducted by a team consisting of Dr. Anil K. Yadav, chief, Smt. Madhu Srivastava, Sr. Research Officer and Principal Investigator, Ms. Chaitali Pal and Shri V.K. Saxena, Research Associates. The team had the benefit of advice of and discussions with Shri K.K. Bakshi, Principal Adviser, Dr. V.P. Garg, Joint Adviser and Smt. Meena Gautam, Deputy Adviser in the Education Division, Planning Commission.

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It is hoped that the indices developed and the interstate comparisons would serve as a ready reference for officials and researchers interested in the area of educational development.

**H. Ramachandran**  
**Director**

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## Chapter – I

### INTRODUCTION

Education is fundamental to all-round human, material and spiritual development, in our national perception. As a result of Education Policy 1968, there has been a considerable emphasis on expansion of educational facilities throughout the country. While these achievements are impressive by themselves; the problem of access, quality, quantity, utility and inadequacy of financial outlay accumulated over the years have now assumed serious proportions. In order to promote equity, it will be necessary to provide equal opportunity to all not only in access but also in the environment for achieving the target.

Available data indicates that there are glaring disparities at the state level in access to education and human resource development. For example, major states of Andhra Pradesh, Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh which account for 47.5 per cent of population are more backward in comparison to other States. The problems posed by disparity are much more serious at the district and block levels, particularly, in the backward states.

The important thing is to look at how effectively we manage our social sector allocations. Whether the delivery mechanism is efficient? Whether there is an appropriate institutional infrastructure to improve education, and whether social sector's programmes are successful in meeting the aspirations of the target groups? This assumes significance, as the approach paper to the Ninth Plan has highlighted huge gap between targets and achievements. To sum up, there is a mismatch between what is provided in the form of social services and the requirements of the target group.

Available evidence indicates that the poor have undoubtedly suffered from inadequate attention to the budget allocations for the social sector. Leakages from the expenditure incurred in the social sector have led to disparities further. Even where sincere efforts were made in the implementation of social sector programmes, top-down planning has come in the way of reaching the benefits to the target groups. This brings forth the need to decentralise social sector planning and implementation.

Based on this background the need is being felt to develop an Educational Development Index (EDI) as a measuring device to assess educational achievement of the country; and to draw policy attention to crucial parameters which need to be tackled effectively for achieving equity and higher rate in educational development. The educational index developed would be such as to result in the assessment of progress made over the time and to facilitate analysis of issues for policy consideration in the field of education sector.

#### **Educational Development Parameters**

To develop State-wise educational development index following five broad parameters have been considered for the study:

- I. Literacy
- II. Progress in Education
- III. Quality of Teaching
- IV. Infrastructural Facilities
- V. Expenditure

The development of education depends on large number of factors including the financial resources available for the purpose. The availability of financial resources, in turn, manifest itself into availability of teaching and non-teaching resources including the infrastructural facilities. For the development of education, it is not enough to have adequate quantity of input parameters but also to ensure the quality of these resources. As teachers are very vital input to raise quality of education, the 'Quality of Teaching' has been considered as one of the parameters to study qualitative standards of education among states. To study the level of educational development in different states, thus, the three input parameters, 'Quality of Teaching', 'Infrastructural Facilities' and 'Expenditure' which are the backbone for developing an effective education system has been considered.

The past experience has shown that provision of all requisite inputs in a state has not necessarily resulted in desired development in the field of education. Thus, in addition to input parameters, efforts have been made to study the results of the development efforts with the help of the output parameters such as 'Literacy' and 'Achievement in Education'.

### **Objectives**

The Study proposes:

- i) To develop a comprehensive Education Development Index at the state as well as all-India levels.
- ii) To develop an Education Index to facilitate inter-temporal as well as cross-sectional analysis of the levels of development among states.

### **Scope and Coverage**

The Educational Development Index will be measured for the states and All-India level. For the development of Educational Development Index, five broad parameters and 124 sub-parameters have been selected. The list of broad parameters and sub-parameters proposed for this study are enlisted in Annexure-I.

Educational Development Index (EDI) is proposed to be developed separately for rural and urban areas. Parameters required for the development of EDI are the same for both the areas (rural and urban). However, the percentage of population having schools within a prescribed distance is required for rural areas and not for the urban areas. Additionally, the break up of the expenditure data by rural/urban areas and for different stages of education is not available. The same may be available at the district or state level. Therefore, there will be common 66 sub—parameters for both rural as well as urban areas. Apart from this, 4 more sub-parameters relating to distance of the location of schools in the rural areas will be considered.

According to 1991 census there are 15 major states with population more than 10 million. The study has, therefore, been conducted for 16 states which are having population of more than 5 million (except Delhi & J&K). The educational development index has been worked out for the year 1993-94. For some variables such as literacy rate for SC & ST, the data has been collected for the year 1991-92 due to the non-availability of data for the year 1993-94. However, to work out growth index, the data has also been collected for few selected variables for the year 1997-98 subject to availability of information. Due to non-availability of data, growth index could be worked out only for selected variables.

## Methodology

The methods used for developing educational development index for states are:

- i) Principal Component Analysis
- ii) Composite Variable Rank
- iii) Growth Index.

### Principal Component Analysis

The method of Principal Component Analysis seeks to reduce large number of variables into few categories known as Principal Components, which explains maximum amount of variance among the variables. The data on educational parameters, by using Principal Component Analysis, is reduced to much smaller size without losing the properties of the data. The method of Principal Component Analysis has been applied separately for each of the five parameters selected for the study. This method has helped to reduce sub-parameters of education to selected few Principal Components summarising the data without any loss of information. These extracted Principal Components then, has been used to build up index for each parameter separately. The technical details of the method are elaborated in Annexure II. The educational development index will be worked out using following formulae;

$$\text{Index} = \frac{\sum_{i=1}^6 V_i \left[ \sum_{j=1}^6 F_{ij} E_j \right]}{\sum_{j=1}^6 F_{ij} E_j}$$

Where  $F_{ij}$  = Factor Loading (Variable  $i$ , Principal Component  $j$ )

$E_j$  = Eigen Value (Principal Component  $j$ )

$V_i$  = Variable  $i$

$i, j = 1, 2, \dots, 6$

### Composite Variable Rank

To build up composite variable rank, the state ranks have been worked out for each sub-parameter separately. These ranks for each of the sub-parameters then have been combined together to arrive at the composite variable rank.

The variable ranks thus arrived at would help to study the status of states for that respective variable. The composite variable rank on the other hand, provides consolidated position of the state in respect to all the variables.



## Growth Index

Growth Index attempts to study the growth of the variable over a period of time and is given by the equation;

$$\text{Index} = V_t / V_0$$

Where  $V_t$  = Value of the variable in  $t^{\text{th}}$  year

$V_0$  = Value of the variable in the base year

Using these three techniques, Educational Development Index has been developed for Primary, Upper Primary, High Secondary and Higher Secondary stages. Also the index has been worked out separately for rural and urban areas.

For each parameter, the cross sectional analysis has been done to:

- i) study the correlation among sub-parameters.
- ii) extract significant Principal Components for the analysis.
- iii) work out ranks based on Principal Component Analysis.
- iv) study the level of development of each state based on Principal Component Analysis.
- v) work out variable ranks for each sub-variable.
- vi) work out composite variable ranks.
- vii) compare variable rank with composite variable rank .
- viii) identify areas of concern and areas of achievement based on comparison of variable ranks and composite variable ranks.
- ix) work out Growth Index for 1993-97.
- x) compare Growth Index with status of the State in the base year.
- xi) compare the ranks worked out by using, 'Principal Component Analysis' and 'Composite variable rank'.
- xii) prepare consolidated statement of the development of all the four stages of education in the states.

## Data Sources

The information for building up educational development index has been collected from following sources:

- i) Ministry of Human Resource Development, Govt. of India.
  - a) Selected Educational Statistics.
  - b) Education in India.
- ii) The Office of the Registrar, Govt. of India.
  - a) Population Table, 1991
  - b) Socio-cultural Tables, 1991
- iii) Institute of Applied Manpower Research
  - a) Manpower Profile of India.
- iv) National Council of Educational Research and Training.

a) Sixth All India Educational Survey.

### **Structure of the Report**

The report consists of eight chapters. The first chapter deals with the research design including the objectives, selection of parameters, Scope and coverage, methodology and data sources. Chapter II presents an overview of the parameter, 'literacy'; a prime indicator of educational development among various states. Chapter III to VII are devoted exclusively to work out educational development index for five parameters Viz. i) Literacy (ii) Progress in education (iii) Quality of teaching (iv) Infrastructural facilities (v) Expenditure on Education. The last Chapter VIII presents the Summary and Conclusions emerging out of the study.

## CHAPTER – II

### LITERACY AMONG INDIAN STATES

#### Literacy as an Educational Development Indicator

Literacy is an output parameter to study the level of development of education in an area. Input parameters in the context of educational development indicates the efforts made in establishing and developing an education system whereas the output parameters are the outcome of these efforts. Number of Schools, adult literacy centres, teachers, infrastructural facilities, investments in education – are few such input parameters and literacy, enrolment are few illustrative output parameters of education. The input parameters indicate the adequacy or inadequacy of developmental efforts wherein the output parameters are the indicators of the success or efficiency of the system thus established. Input parameters are the cost accrued for educational development and the output parameters are the benefits from the system.

Literacy levels in India, varies sharply across various regions, locations and among different sections of population, like Scheduled Castes and Scheduled Tribes. The discrimination sharpens further more among the two genders. To have meaningful analysis of literacy as an educational development indicator, it is desirable that a cross sectional analysis of the pace of literacy development should be done separately for each of these components. Moreover, to study the level of literacy among different states, the cross sectional variations in literacy need to be analyzed for Scheduled Castes and Scheduled Tribes as well as for all population. Hence, in order to construct the educational development index, the sub-parameters have been selected so as to facilitate the analysis of literacy variations among different location, region, sex, castes and class.

#### Literacy Parameters

The parameters selected for studying literacy level in major states includes:

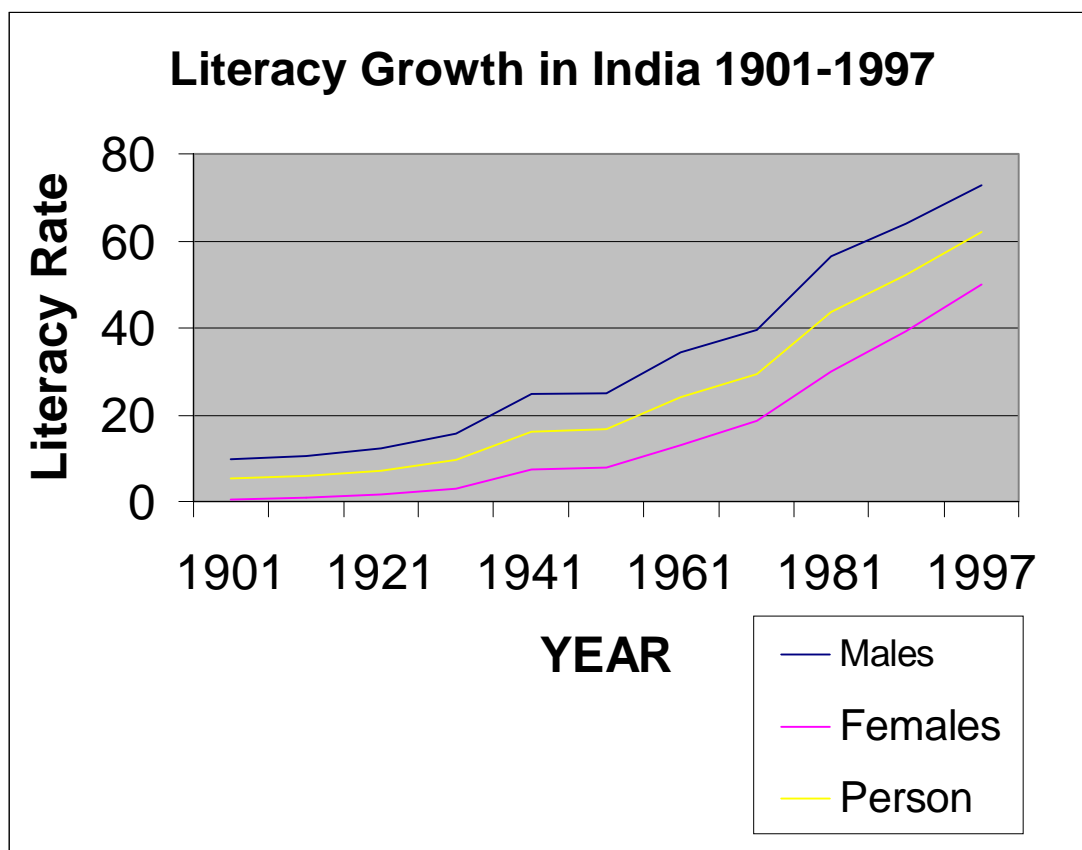
- Literacy Rate (male/female)
- Literacy Rate for Scheduled Castes (male/female)
- Literacy Rate for Scheduled Tribes (male/female)

Each of these parameters will be analyzed separately for rural and urban areas for Educational Development Index.

#### Growth of Literacy (1901 To 1997)

The literacy rate in 1901, in undivided India was 9.83 percent for males, 0.60 percent for females and 5.35 percent for total population. In 1941, the level of literacy had reached to 24.90 percent (male), 7.30 percent (female) and 16.10 percent total population. The pace of educational growth geared up in successive years and by the end of 1997, the literacy level attained was 73 percent among males, 50 percent among females and 62 percent for total population. Graph I presents growth of literacy in India from 1901 to 1997. It can be seen from the graph I that there is a sharp rise in growth of literacy after independence reflecting the efforts put in by Indian Government to raise literacy level in the country.

GRA PH - I



SOURCE : Census of India, 1981, Census of India, 1991, and 53<sup>rd</sup> Round NSSO.

**Rural / Urban Literacy**

Table 2.1 presents rural/ urban variations in literacy rates of different states. rural areas in each of the states are much less developed in terms of literacy level as compared to the literacy level in urban areas. The differences are more glaring in some of the selected states. No state has male urban literacy rate below 60 percent whereas seven states have rural male literacy rates in this range (<60%). Also as many as eleven states have urban literacy level above 80 percent whereas only one state (Kerala) has achieved rural literacy rate above 80 percent. The female literacy rate also exhibit similar pattern in rural and urban areas. No state has female literacy rate below 40 percent in urban areas whereas most of the states (11) have female literacy rate below 40 percent in rural areas. Barring Kerala, the rural female literacy rate do not exceed fifty per cent in any of the states.

**Table 2.1 : Literacy Variations among Rural/Urban Areas in States, 1991**

Literacy Level (Percent)	Locations			
	Rural		Urban	
	Male	Female	Male	Female
Upto 40	-	Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Rajasthan, Uttar Pradesh, West Bengal, Orissa	-	-
40-60	Andhra Pradesh, Assam, Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh	Himachal Pradesh, Maharashtra, Punjab and Tamil Nadu	-	Andhra Pradesh, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh
60-80	Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Punjab, Tamil Nadu, West Bengal	-	Andhra Pradesh, Bihar, Punjab, Rajasthan, Uttar Pradesh	Assam, Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Orissa, Punjab, Tamil Nadu, West Bengal
80-90	-	Kerala	Assam, Gujarat, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, West Bengal	Kerala
90+	Kerala	-	Kerala	-

Source: Derived from literacy data in Census of India, 1991.

### Male / Female Literacy

There are wide variations even among male and female literacy rates in different states. No state has male literacy rate below 40 percent whereas majority of states (eleven) have female literacy rate below 40 percent. Contrary to this nine states have achieved urban male literacy rate above 80 percent whereas no state except Kerala have achieved 80 percent female literacy rate either in urban or rural areas. Even in most educationally developed state of Kerala, the disparity among male and female literacy rates do exists. Kerala is a state which has achieved above 85 percent literacy level, but female literacy rate in urban areas has not

reached even close to the literacy level of rural (men) and it is far behind the literacy level of urban (men).

### **Minimum / Maximum Literacy**

Kerala is an exception as far as literacy level is concerned. It has achieved impressive literacy level of 95.6 percent for male (urban), 92.9 percent male (rural), 89.1 percent female (urban), 85.1 percent female (rural). This is the state which is leading in rural / urban as well as male / female literacy levels among all states. On the other hand, Rajasthan has lowest literacy level among female both in rural and urban areas.

**Table 2.2 : Minimum / Maximum Literacy Level- 1991**

Literacy Level	States			
	Rural		Urban	
	Male	Female	Male	Female
Minimum	Andhra Pradesh	Rajasthan	Uttar Pradesh	Rajasthan
Maximum	Kerala	Kerala	Kerala	Kerala

Source: Based on Literacy Rates from Census, 1991.

### **States Above / Below National Literacy Level**

The striking feature of literacy status of various states is that the states which are above or below the All India literacy level have the same status for all sections of the population like urban (male), rural (male), urban (female), rural (female) barring few exceptions. Orissa has literacy level of urban (female) and Punjab of urban (male) below All India literacy level. Similarly, the literacy rate in Madhya Pradesh was above All India literacy level only for urban (male).

**Table 2.3: States Above / Below National Literacy Level-1991**

Literacy Level	States			
	Rural		Urban	
	Male	Female	Male	Female
<b>Above National Avenge</b>	Assam, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Orissa, Punjab, Tamil Nadu, West Bengal	Assam, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Orissa, Punjab, Tamil Nadu, West Bengal	Assam, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, West Bengal	Assam, Gujarat, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, West Bengal
<b>Below National Avenge</b>	Andhra Pradesh, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh	Andhra Pradesh, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh	Andhra Pradesh, Bihar, Punjab, Rajasthan, Uttar Pradesh	Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh

Source: Derived from Data on Literacy Census, 1991.

#### **Growth in Literacy : Rural Areas**

Analysis of growth of literacy (Table 2.4) shows that the state of Andhra Pradesh is lagging far behind in literacy among rural (male). On the other hand, Assam, Rajasthan and West Bengal are the states which had medium literacy status for rural (male) in 1991 and had achieved more than 20 percent growth during 1991-97.

**Table 2.4 : Liteacy Level and Growth in Literacy Among rural male during 1991-97**

Literacy Level 1991	Growth during 1991-97 (per cent)			
	0-10	10-20	20-30	30-40
Low (0-30) Percent	Andhra Pradesh			
Medium (31-70) Percent	Gujarat, Haryana, Karnataka, Maharashtra, Orissa, Punjab, Tamilnadu	<i>Bihar, Madhya Pradesh, Uttar Pradesh</i>	Assam, Rajasthan	West Bengal
High (71-100) Percent	Kerala	Himachal Pradesh		

Source : Based on Literacy Rates from Selected Educational Statistics, 1997-98

Among rural female, the literacy level was low in five states in 1991 but all these states accelerated the pace of literacy growth during the period 1991-97 as depicted in Table 2.5. The only state which had achieved more than 20 percent growth during this period among rural female is Assam.

**Table 2.5 : Literacy Level and Growth in Literacy Among rural female During 1991-97**

Literacy Level 1991	Growth during 1991-97 (per cent)			
	0-10	10-20	20-30	30-40
Low (0-30) Percent		Andhra Pradesh, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh		
Medium (31-70) Percent	Gujarat, Karnataka, Orissa, Tamil Nadu	Haryana, Himachal Pradesh, Maharashtra, Punjab, West Bengal	Assam	
High (71-100) Percent	Kerala			

Source : Based on Literacy Rates from Selected Educational Statistics, 1997-98.

### **Growth in Literacy : Urban Areas**

The growth of literacy among urban (male) was high in 1991 in all the states except Uttar Pradesh (Table 2.6). In Uttar Pradesh the literacy level was lowest for urban male in 1991 and even the pace of growth was very slow (<10 percent). On the other hand the literacy states of urban (male) in Rajasthan is commendable. It appears from the table that Rajasthan not only had high literacy rate for urban (male) in 1991 but also achieved highest growth rate during the period 1991-97.



**Table 2.6 : Literacy Level and Growth in Literacy Among urban male during 1991-97**

Literacy Level 1991	Growth during 1991-97 (Per cent)			
	0-10	10-20	20-30	30-40
Low (0-30) Percent				
Medium (31-70) Percent	Uttar Pradesh			
High (71-100) Percent	Mahrashtra, Orissa, Punjab, Tamil Nadu, West Bengal, Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh	Rajasthan		

Source : Based on Literacy Rates from Selected Educational Statistics, 1997-98.

Rajasthan is a state which has maximum biases among male/female and rural/urban literacy levels. female literacy in this state was lowest in 1991 in both rural and urban areas whereas the urban (male) literacy was high with the maximum growth rate during 1991-97. The literacy level among urban (female) was high in four states in 1991 but the only state which could achieve the growth rate of more than 10 percent is Assam (Table 2.7).

**Table 2.7 : Literacy Level and Growth in Literacy Among urban female during 1991-97**

Literacy Level 1991	Growth during 1991-97 (per cent)			
	0-10	10-20	20-30	30-40
Low (0-30) Percent				
Medium (31-70) Percent	Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Orissa, Punjab, Tamil Nadu, West Bengal	Andhra Pradesh, Rajasthan, Uttar Pradesh		
High (71-100) Percent	Himachal Pradesh, Kerala, Maharashtra	Assam		

Source : Based on Literacy Rates from Selected Educational Statistics, 1997-98.

### **Gender Disparity in Literacy Level**

To analyse gender disparity in literacy among states, the literacy rates have been classified into three categories; High Literacy (71-100) Percent, Medium Literacy (31-70) Percent and Low Literacy (0-30) Percent. As per this classification, the rural areas in all the states except Himachal Pradesh and Kerala, were in the zone of medium/low female and medium male literacy level in 1991. Himachal Pradesh has medium female and high male literacy in rural areas and Kerala has high female as well as high male literacy level in rural areas. The scenario is different in urban areas of the states. Most of the states are located in high male and medium female literacy rate zone in urban areas. Four states viz, Assam, Himachal Pradesh, Maharashtra and Kerala are in the high male and high female literacy zone in urban areas. By 1997, there was major shift in the literacy level of male and female in rural areas and marginal shift in gender disparities in urban areas also. In 1997, there were eight states in male (high) and female (high / medium) category in rural areas in place of two states in this category in 1991. In urban areas also four out of the twelve states in male (high)

female (medium) category in 1991 shifted to male (High) female (High) category in 1997. The status of various states according to the level of gender bias is as follows:

**Table 2.8 : Gender Disparity in Literacy among States during 1991 & 1997**

States			
1991		1997	
Rural	Urban	Rural	Urban
Male (High)		Female (High)	
Kerala	Assam, Himachal Pradesh, Maharashtra, Kerala	Kerala	Assam, Gujarat, Himachal Pradesh, Kerala, Maharashtra, Punjab, Tamil Nadu, West Bengal
Male (High)		Female (Medium)	
Himachal Pradesh	Andhra Pradesh, Bihar, Rajasthan, Uttar Pradesh, Madhya Pradesh, Punjab, Gujarat, Haryana, Karnataka, Orissa, Tamil Nadu, West Bengal	Assam, Gujarat, Haryana, Himachal Pradesh, Maharashtra, Tamil Nadu, West Bengal	Andhra Pradesh, Bihar, Haryana, Karnataka, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh
Male (Medium)		Female (Medium)	
Assam, Gujarat, Haryana, Karnataka, Orissa, West Bengal, Maharashtra, Punjab, Tamil Nadu		Karnataka, Punjab	
Male (Medium)		Female (Low)	
Andhra Pradesh, Bihar, Rajasthan, Madhya Pradesh, Uttar Pradesh		Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh	

Literacy Rate : High (71-100), Medium : (31-70) , Low (0-30) Percent

Source: Derived from selected Educational Statistics, 1997-98.

### Location Biases in Literacy

The classification similar to the gender-disparity has been used to analyse location bias in literacy level. The location-wise analysis of literacy rate reveals that there is no state which has low rural or urban male literacy. Moreover, all states have high male literacy in

urban areas. The male literacy in rural areas in most of the states is medium barring the states of Himachal Pradesh and Kerala which have high male literacy rates in 1991.

In 1991, most of the states fall into the category of (medium / low) rural and (medium) urban female literacy rate except the states of Kerala, Assam, Himachal Pradesh, and Maharashtra. Seven of these states have medium female literacy in both rural and urban areas. Assam, Himachal Pradesh and Maharashtra have high urban but medium rural literacy rate for females. Kerala is the only state which has high urban as well as rural female literacy rate. The location specific literacy rates of various states are as follows :-

**Table 2.9: Literacy Level among states in 1991 : Rural-Urban Comparison**

Literacy Rate	
Male	Female
<b>Rural (High) Urban (High)</b>	
Himachal Pradesh, Kerala	Kerala
<b>Rural (Medium) Urban (High)</b>	
Assam, Andhra Pradesh, Bihar, Rajasthan, Uttar Pradesh, Madhya Pradesh, Punjab, Gujarat, Haryana, Karnataka, Orissa, Tamil Nadu, West Bengal, Maharashtra	Assam, Himachal Pradesh, Maharashtra
<b>Rural (Medium) Urban (Medium)</b>	
	Gujarat, Haryana, Karnataka, Orissa, Tamil Nadu, West Bengal, Punjab
<b>Rural (Low) Urban (Medium)</b>	
	Andhra Pradesh, Bihar, Rajasthan, Uttar Pradesh, Madhya Pradesh,

Low Literacy Rate : (0-30) Percent  
 Medium Literacy Rate : (31-70) Percent  
 High Literacy Rate : (71-100) Percent

Source : Derived from selected Educational Statistics, 1997-98

### Literacy Among Scheduled Caste Population – 1991

In rural areas, all the states except Assam and Kerala have female literacy rate below 40 percent whereas in urban areas all the states have male literacy rate above 40 percent. The only state which has more than 60 percent literacy among female apart from Kerala is Himachal Pradesh in urban areas. Gender biases are sharply depicted in Table 2.10. Rural male literacy level in 12 states have been above 40 percent whereas the female literacy level is below 40 percent in 14 states.

**Table 2.10 : Literacy Status of Scheduled Caste Population - 1991**

Literacy Level (Percent)	States			
	Rural		Urban	
	Male	Female	Male	Female
Upto 40	Uttar Pradesh, Andhra Pradesh, Bihar, Rajasthan	Himachal Pradesh, Gujarat, Maharashtra, Tamilnadu, West Bengal, Karnataka, Orissa, Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Bihar, Rajasthan		Bihar, Haryana, Madhya Pradesh, Orissa, Punjab, Rajasthan, Uttar Pradesh
41-60	Tamilnadu, West Bengal, Karnataka, Orissa, Punjab, Haryana, Madhya Pradesh.	Assam	Bihar, Haryana, Punjab, Uttar Pradesh	Andhra Pradesh, Assam, Gujarat, Maharashtra, Karnataka, Tamil Nadu, West Bengal
61-80	Himachal Pradesh, Assam, Gujarat, Maharashtra	Kerala	Andhra Pradesh, Assam, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Rajasthan, West Bengal	Himachal Pradesh, Kerala
81+	Kerala		Gujarat, Kerala	

Source : Based on Literacy data from Census of India, 1991

#### **Literacy Among Scheduled Tribe Population-1991**

Table 2.11 presents the literacy status of Scheduled Tribes in different states. The literacy level of Scheduled Tribes is very low in rural areas. The female literacy rate in all the

states except Kerala is less than 40 percent. In case of male literacy also, there are only seven states which have male literacy above 40 percent. Himachal Pradesh is the only exceptional state other than Kerala where literacy level exceeds 60 percent for rural male. In urban areas also the female literacy for scheduled tribes is less than 40 percent in seven states whereas no state has male literacy rate below 40 percent in urban Areas. But few states like Assam, Himachal Pradesh and Kerala has female literacy rate above 60 percent. The male literacy is as high as 80 percent in urban Areas in the states of Assam and Himachal Pradesh. There are crucial gender and location biases among the literacy level of scheduled tribes in different states. The literacy for all segments of Scheduled Tribe population in urban areas is more than 60 percent except in seven states where literacy rate is below 40 percent. The rural literacy rate in Assam is less than 60 percent where it is above 60 percent the urban.

**Table 2.11 : Literacy Status of Scheduled Tribe Population - 1991**

Literacy Level (Percent)	states			
	Rural		urban	
	Male	Female	Male	Female
<b>Upto 40</b>	Tamil Nadu, West Bengal, Orissa, Punjab, Haryana, Andhra Pradesh, Madhya Pradesh, Bihar, Rajasthan	Himachal Pradesh, Assam, Maharashtra, Tamil Nadu, West Bengal, Karnataka, Orissa, Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Bihar, Rajasthan		Andhra Pradesh, Gujarat, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, West Bengal
<b>41-60</b>	Assam, Gujarat, Maharashtra, Karnataka, Uttar Pradesh	Kerala	Andhra Pradesh, Madhya Pradesh, Orissa, Tamilnadu, West Bengal	Bihar, Karnataka, Maharashtra, Uttar Pradesh
<b>61-80</b>	Kerala, Himachal Pradesh		Bihar, Gujarat, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh	Assam, Himachal Pradesh.
<b>81+</b>			Assam, Himachal Pradesh	

Source : Based on Literacy Data from Census of India, 1991

### Literacy Level of Scheduled Caste / Total Population

In some of the states the variations among literacy rates of these two segments of population are negative i.e. the literacy rates for Schedule Castes in these states are more than the literacy rates for all population. Other striking feature of literacy variation is that the differences in literacy rates are much more in urban areas than in rural areas. But these variations are small among male and female population. The comparison of literacy rates of all

population with the literacy rates of Scheduled Castes reveals that although there are significant location biases among these two categories the gender biases are not very significant.

Pattern of states according to the variations in the male literacy rates of Scheduled Castes and All Population in rural shows that all the states except Bihar and Karnataka have literacy variations less than 15 percent. Nine out of the Sixteen states have variations less than 10 percent. In rural areas of Gujarat, literacy rate for all population is less than the literacy rate for Scheduled Castes and in Assam female literacy rate for Scheduled Castes is more than the literacy rate for all population. All other states except Karnataka and Punjab have variation in female literacy rate in rural areas below 15 percent. The variations in rural (male) literacy in the states of Assam, Gujarat and Maharashtra were below 5 percent.

**Table 2.12 : Disparity in Literacy Rates of Total Population and Scheduled Caste Population**

States	Rural		Urban	
	Male	Female	Male	Female
Andhra Pradesh	10.3	7.8	11.0	13.40
Assam	4.3	1.5	10.7	16.7
Bihar	20.0	12.4	25.0	33.0
Gujarat	-2.4	-0.3	2.3	11.2
Haryana	14.2	10.1	23.3	32.2
Himachal Pradesh	9.9	10.1	10.1	18.2
Karnataka	17.1	15.6	12.0	18.1
Kerala	8.7	12.1	6.0	9.5
Madhya Pradesh	5.3	6.4	14.1	23.6
Maharashtra	3.9	7.1	8.4	16.0
Orissa	8.8	11.5	19.1	28.9
Punjab	12.2	17.7	22.6	28.0
Rajasthan	10.0	6.9	17.1	27.4
Tamil Nadu	12.8	11.5	13.5	18.0
Uttar Pradesh	10.6	15.3	23.1	13.2
West Bengal	9.4	11.8	17.3	25.6

### Literacy Level of Scheduled Tribe/ Total Population

The variations among literacy rates of Scheduled Tribes and all population are glaring in most of the states. The variations in case of Scheduled Tribes are high in rural areas whereas the variations among Scheduled Castes were high in urban areas.

The Scheduled Tribe male literacy rate exhibits different pattern than the Scheduled Castes male literacy rates in rural areas. Most of the states except Assam, Uttar Pradesh, Bihar and Himachal Pradesh have literacy variations more than 15 percent. female ST literacy rates in rural areas also have similar pattern. Eight states have literacy variations among rural females more than 15 percent. The growth pattern of states for rural literacy have same trend for all population and for Scheduled Castes but the scenario is different for Scheduled Tribes.

**Table 2.13: Disparity in Literacy Rates of Total Population and Scheduled Tribe Population**

State	Rural		Urban	
	Male	Female	Male	Female
Andhra Pradesh	24.0	16.6	27.7	30.8
Assam	0.8	1.3	-0.1	2.7
Bihar	11.9	5.1	15.2	15.0
Gujarat	19.7	15.7	23.4	29.3
Haryana	-	--	-	-
Himachal Pradesh	12.0	19.6	1.6	6.9
Karnataka	15.7	14.7	15.7	22.7
Kerala	30.0	34.5	18.5	24.4
Madhya Pradesh	20.2	10.0	24.5	28.3
Maharashtra	24.7	21.1	11.2	18.3
Orissa	26.6	21.5	28.3	33.5
Punjab	-	-	-	-
Rajasthan	15.9	0.8	16.4	28.4
Tamil Nadu	34.8	24.0	29.8	31.7
Uttar Pradesh	3.9	1.1	-4.9	-0.7
West Bengal	22.7	24.0	29.2	36.6

## Chapter - III

### EDUCATIONAL DEVELOPMENT INDEX FOR LITERACY PARAMETERS

#### Principal Components Analysis

The principal Component Analysis extracts from a set of literacy variables (n) which have high degree of correlation among themselves, the Principal Components (<n) which represent major characteristics of the original variables. Principal Components analysis searches for a few uncorrelated linear combinations of the original variables that capture most of the information in original variables. If the variables are correlated and, especially if they are highly correlated then we can linearly transform n correlated variables into a relatively small set of K uncorrelated variables such that the K variables if considered as independent variables, will maximize the prediction of the original (n) variables.

The goal of Principal Components analysis is to explain part of the variation in a set of observed variables on the basis of a few underlying dimensions. It focuses on explaining the variation in the observed variables on the basis of the maximum variance properties of Principal Components. Principal Components maximizes the variance accounted for in the original variables. In case of literacy parameters, the Principal Component Analysis will help to identify the literacy parameters which are crucial for enhancing the level of literacy in the State.

#### Relationship Among Literacy Parameters: Rural Areas

All the literacy parameters except ST literacy parameters exhibit high degree of positive correlation among themselves. ST literacy parameters have low correlations with other parameters but have very high correlation (.97) among the two ST parameters (Male literacy and Female literacy). It shows that the States which have high literacy rate for all population, also have high literacy rates for Scheduled Castes and Vice-Versa but this is not so in case of Scheduled Tribes. The correlation for Six literacy parameters selected for the study is presented in Table 3.1.

Table 3.1: Correlation Matrix for Literacy Parameters: Rural Areas

Literacy	Literacy					
	Male	Female	SC Male	SC Female	ST Male	ST Female
Male	1.0	0.95	0.90	0.92	0.39	0.36
Female	0.95	1.00	0.86	0.96	0.40	0.40
SC Male	0.90	0.86	1.00	0.94	0.29	0.25
SC Female	0.92	0.96	0.94	1.00	0.36	0.35
ST Male	0.39	0.40	0.29	0.36	1.00	0.97
ST Female	0.36	0.40	0.25	0.35	0.97	1.00



## Extraction of Principal Components

The main statistics resulting from Principal Components analysis are the variable weight vector associated with each principal component and its associated variance explained. The Principal Component (PC) analysis has extracted Six PC's from literacy data. Kaiser's Criterion has been used to decide how many PC's to be retained in the analysis. According to Kaiser's criterion only Principal Components having Eigen values greater than one are considered as essential and should be retained in the analysis. Also 'Scree Test' has been conducted to decide about the number of significant principal components. According to Scree test, the rule is to retain the P's which have some curvature and reject the P's for which the curve becomes a straight line. Two principal components have been selected based on these criteria's. First Principal Component (PC) explains 62 per cent variation and has 3.69 as eigen value and Second PC explains 34 per cent of variation and has 2.05 as eigen value. The two PC's together explain 96 percent of variation, among the literacy variables.

**Table 3.2 : Eigen Values for Literacy Parameters : Rural Areas**

Principal Components	Eigen values	Total Variance Explained	Comulative Variance Explained
First	3.698713	61.65	61.65
Second	2.051363	34.19	95.84

In Principal Component Analysis, the factor loadings are mathematically determined to maximize among variables or to maximize the sum of squared correlations of the principal components with the original variables. The principal components are ordered with respect to their variations so that the first few account for most of the variation present in the original variables. The eigen value of a Principal Component explains the amount of variation extracted by the PC. The product of factor loadings and eigen values of PC has been used as optimal weights to arrive at Composite Index for educational development.

Table 3.3 gives the results of rotated varimax factor analysis with principal component method based on State-wise data on literacy parameters in rural areas for 1991. The first factor explains 62 percent of variance and had high factor loadings with literacy (Male and Female) and literacy Schedule Castes (Male and Female) parameters. Literacy rate for Scheduled Caste females had loading of .968027 and Scheduled Caste male literacy rate has .952552 as factor loading. This is followed by Male literacy rate which has factor loading of .948036 and female literacy rate having loading of .942726.

Based on the level of significance (Standard errors) of the Pearson Correlation Coefficient table, the significance (Standard errors) for loadings was examined. For six variables, the factor loadings are significant above .576 value at 5 per cent level and for .714 value at 1 per cent level of significance. Using this criteria, the factor loadings for literacy (Male), literacy (Female) SC literacy (Male and SC literacy (Female) are significant at 1 percent level as their values are greater than 0.714 for the first Principal Component.

Second Principal Component explains 34 percent of variation. This factor had loadings of .979043 for Scheduled Caste female literacy rate and .973403 for Scheduled Caste male literacy rate. Using Person Correlation Coefficients Criteria, both the factor loadings are significant at 1 per cent level as the loadings are more than 0.714.

**Table 3.3 : Factor loadings for Literacy variables: Rural Areas**

Literacy Rate	Factor Loadings	
	First Principal Component	Second Principal Component
All (Male)	.948036	.211630
All (Female)	.942726	.240992
SC (Male)	.952552	.096053
SC (Female)	.968027	.182300
ST (Male)	.193799	.973403
ST (Female)	.170931	.979043

The pattern of factor loadings extracted by First Principal Component shows that although all the six-literacy variables are positively contributing to literacy growth, the Comparative Share of Scheduled Tribe Literacy is insignificant in relation to other literacy parameters. This pattern also emerges in analyses of correlations among literacy variables.

All the correlations among six literacy variables are positive ranging from a low of .25 to a high of .96. The loadings are more than 0.94 for first four variables thereby implying that all these factors are equally significant for literacy growth in a State. The factor loadings for ST variables in the first Principal Component are .19 (Male SC literacy) and .17 (Female SC literacy) which are far less than the factor loadings of the other four variables. The Second Principal Component explains 34 per cent of the residual variance. The Second Principal Component has very high factor loadings for ST variables and very low loadings for other variables. The first PC will be interpreted as 'Literacy among All Population and Scheduled Castes'. The Second Principal Component will be interpreted as 'literacy for Scheduled Tribes'. The two PC together provides excellent summary of the data.

### **Educational Development Index for Literacy Parameters: Rural Areas**

Principal Component Analysis (PCA) has reduced six literacy variables to two variables. The Eigen Values of each transformed variables explains the variability in the original variables. The Composite Index for literacy development has been worked out by estimating the weighted average of each of the variable with product of factor loadings and Eigen Values as their respective weights. The formulae applied for estimating index with the help of Principal Component analysis is as follows.

$$\text{Index} = \frac{\sum_{i=1}^6 V_i \left[ \sum_{j=1}^6 F_{ij} E_j \right]}{\sum_{j=1}^6 F_{ij} E_j}$$

Where  $F_{ij}$  = Factor Loading (Variable  $i$ , Principal Component  $j$ )

$E_j$  = Eigen Value (Principal Component  $j$ )

$V_i$  = Variable  $i$

$i, j = 1, 2, \dots, 6$

Table 3.4 presents the literacy development index for sixteen states and All India for rural areas. The states and All India literacy levels have been ranked in the descending order. As expected Kerala has the highest rank for literacy and the Rajasthan is last among all States. All India literacy is ranked at number 8. There are as many as eight states above all India literacy level and equal number of states below All India rank. The 50 percent of the states have literacy level more than the All India level.

Table 3.4 presents the literacy rates for different section of the population and the state ranks derived by Principal Component Analysis. Comparative analyses of ranks of each literacy variable and the overall rank of the state for literacy identifies three categories of States;

- i. States with variable rank more than the state rank. This signifies greater growth of literacy among a particular segment of population in that state as compared to total growth of literacy in the state.
- ii. States which have same rank for variable as the state rank. This category will include the states which have same status of literacy among all segments of population.
- iii. States with variable rank less than state rank. This category will include states, a Section of whose population has not developed to the level of other segments, of population.

**Table 3.4 : Index for Literacy Parameters : Rural Areas**

State	Literacy Rate						Index	Rank
	All Male	All Female	SC Male	SC Female	ST Male	ST Female		
Kerala	92.90	85.10	84.20	73.00	62.90	50.60	0.77	1
Himachal Pradesh	73.90	49.80	64.00	39.70	61.90	30.20	0.54	2
Assam	58.70	39.20	62.20	40.70	57.90	37.90	0.50	3
Gujarat	66.80	38.60	71.20	38.90	47.10	22.90	0.49	4
Maharashtra	69.80	41.00	65.90	33.90	45.10	19.90	0.47	5
Tamil Nadu	67.20	41.80	54.40	30.30	32.40	17.80	0.42	6
West Bengal	62.10	38.10	52.70	26.30	39.40	14.10	0.40	7
Karnataka	60.30	34.80	43.20	19.20	44.60	20.10	0.38	8
India	57.90	30.60	45.90	19.40	38.50	16.00	0.36	9
Orissa	60.00	30.80	51.20	19.30	33.40	9.30	0.35	10
Punjab	60.70	43.90	48.50	29.20	-	-	0.34	11
Haryana	64.80	32.50	50.60	22.40	-	-	0.32	12
Uttar Pradesh	52.10	19.00	38.90	8.40	48.20	17.90	0.30	13
Madhya Pradesh	51.00	19.70	45.70	13.30	30.80	9.70	0.29	14
Andhra Pradesh	47.30	23.90	37.00	16.10	23.30	7.30	0.27	15
Bihar	48.30	17.90	28.30	5.50	36.40	12.80	0.25	16
Rajasthan	47.60	11.60	37.60	4.70	31.70	3.60	0.23	17

$$\text{Index} = \frac{\sum_{i=1}^6 V_i \left[ \sum_{j=1}^6 F_{ij} E_j \right]}{\sum_{j=1}^6 F_{ij} E_j}$$

Where  $F_{ij}$  = Factor Loading (Variable i, Principal Component j)

$E_j$  = Eigen Value (Principal Component j)

$V_i$  = Variable i

$i, j = 1, 2, \dots, 6$

## Variations Among Variable Ranks and Composite Variable Rank

Table 3.5 shows that a large number of States have variable ranks less than the State rank. The state having lower rank than the variable rank are clustered more for male literacy for all population and for ST literacy. There are only six states Assam, Gujarat, Karnataka, Himachal Pradesh, Uttar Pradesh and West Bengal which have variable rank above state rank for other literacy variables. In Madhya Pradesh (6), Rajasthan (6), Bihar (5), Punjab (4) and Haryana (4) variables ranks are lower than the state rank for literacy.

**Table 3.5: Distribution of States according to Variable Rank and Composite Variable Rank: Rural Areas**

Strength / Areas of Concern	All Male	All Female	SC Male	SC Female	ST Male	ST Female
<b>Strength (Variable Rank is more than State Rank)</b>	Andhra Pradesh, Assam, Karnataka, Orissa, Uttar Pradesh, West Bengal	Assam, Gujarat, Karnataka	Assam, Himachal Pradesh, Karnataka	Himachal Pradesh, Karnataka, Uttar Pradesh, West Bengal	Gujarat, Maharashtra, Tamil Nadu, West Bengal	Himachal Pradesh, Maharashtra, Orissa, Tamil Nadu, West Bengal
<b>Areas of Concern (Variable Rank is less than State Rank)</b>	Bihar, Haryana, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh	Andhra Pradesh, Bihar, Haryana, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu	Gujarat, Haryana, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan	Andhra Pradesh, Assam, Bihar, Haryana, Madhya Pradesh, Punjab, Rajasthan	Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Rajasthan, Uttar Pradesh	Andhra Pradesh, Assam, Bihar, Karnataka, Madhya Pradesh, Rajasthan, Uttar Pradesh

There are two states West Bengal and Karnataka, which have four variables ranks above state rank implying thereby that out of six variables, the development in case of four variables in these states was more than the overall development of literacy in the state. On the contrary, Rajasthan, Bihar, Madhya Pradesh, Haryana, Punjab have no variable with rank higher than the state rank. Kerala is the only state which has variable ranks equal to state rank for all the six variables. Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Bihar and Rajasthan are the states, which have maximum number of variables with rank lower than the state rank.

## Educational Development Index for Literacy Parameters: Urban Areas

### Relationship among Literacy Variables

The literacy variables in urban areas exhibit pattern of relationship similar to the rural literacy variables. All the variables except ST literacy rate are highly correlated among themselves. The correlation coefficients for all these variables are highly significant (86 to 95) percent. The ST literacy parameters on the other hand have high correlation among themselves.

**Table 3.6 : Correlation Matrix for Literacy Parameters : Urban Areas**

Variables	Male	Female	<u>SC Male</u>	SC Female	ST Male	ST Female
Male	1.0	.93	.89	.86	.40	.52
Female	.93	1.00	.87	.94	.50	.69
SC Male	.89	.87	1.00	.95	.43	.53
SC Female	.86	.94	.95	1.00	.47	.65
ST Male	.40	.50	.43	.47	1.00	.93
ST Female	.52	.69	.53	.65	.93	1.00

### Extraction of Principal Components

Analysis of Principal Components has identified two PCs for the study of literacy variables in urban areas. The first PC has eigen value as 4.57 and explains 76 per cent variation and second principal component has eigen value as 1.11 and explains 18.61 per cent variation among urban literacy variables. The two PCs together explains 94.83 per cent variation among variables. The number of PCs to be retained has been decided by using Kcuiser's criterion and Scree Test.

**Table 3.7 : Eigen Values for Literacy Parameters : Urban Areas**

Principal Component	Eigen value	% Total Variance	Cumul. Eigen value	Cumul. per cent variance
First	4.573198	76.22497	4.573498	76.22497
Second	1.116863	18.61439	5.690362	94.83936

The factor loadings has been rotated using Varimax normalized method. The first PC has very high factor loading (.90 to .93) for the first four literacy parameters and low factor loading for ST variables. The second PC has high factor loadings for ST variables (.91 to .96) and low factor loadings for other variables (.20 to .36) As per Pearson Correlation Coefficient Matrix, the factor loadings are significant at 5 per cent level above .576 value and at 1 per cent

level above .714 value. Using these criteria first four factor loadings are significant for first PC and last two factor loadings are significant for second P.C.

**Table 3.8 : Factor loadings for literacy : Urban Areas**

Literacy Variable	Factor Loadings	
	Factor 1	Factor 2
Male	.936693	.203704
Female	.905193	.361911
SC Male	.935152	.226584
SC Female	.918955	.321167
ST Male	.195371	.965577
ST Female	.375312	.914479

### Literacy Development Index: Urban Areas

Table 3.9 presents state-wise Index for Urban literacy parameters. Among 16 states, Kerala has been ranked at number one and Punjab has the last rank (sixteenth). All the literacy variables have been arranged in the order of the ranks extracted by the Principal Component Analysis.

**Table 3.9: Literacy Index: Urban Areas**

States	Literacy Rates						Literacy Index	Rank
	All		Schedule Cast		Scheduled Tribes			
	M	F	M	F	M	F		
Kerala	95.6	89.1	89.6	79.6	77.1	64.7	0.83	1
Himachal Pradesh	89.0	78.3	78.9	60.1	87.4	71.4	0.76	2
Assam	84.4	73.3	73.7	56.6	84.5	70.6	0.73	3
Maharashtra	86.6	70.9	78.2	54.9	75.4	52.6	0.69	4
Gujarat	84.6	67.7	82.3	56.5	61.2	38.4	0.65	5
Tamil Nadu	86.1	69.6	72.6	51.6	56.3	37.9	0.63	6
Karnataka	82.0	65.7	70.0	47.6	66.3	43	0.62	7
West Bengal	81.2	68.3	63.9	42.7	52.0	31.7	0.57	8
Madhya Pradesh	81.3	58.9	67.2	35.3	56.8	30.9	0.55	9
Uttar Pradesh	70.0	50.4	54.7	27.3	74.9	51.1	0.53	10
Orissa	81.2	61.2	62.1	32.3	52.9	27.7	0.53	11
Andhra Pradesh	75.9	56.4	64.9	43.0	48.2	25.6	0.53	12
Bihar	77.7	55.9	52.7	22.9	62.5	40.9	0.51	13
Rajasthan	78.5	50.2	61.4	22.8	62.1	21.8	0.49	14
Haryana	82.0	64.1	58.7	31.9	-	-	0.42	15

Punjab	77.3	66.1	54.7	38.1	-	-	0.42	16
India	81.1	64.1	66.6	42.2	66.5	45.6	-	-

Source: (I) Primary census Abstract, Scheduled Tribes population  
(II) Primary census Abstract, Scheduled Caste population  
(III) State Profile India, 1991

Table 3.9 helps to analyze variations among variable ranks and the state ranks in Urban Areas. There are four states viz. West Bengal, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh which have more than four variables with ranks higher than All India rank. In these states the growth of literacy was parallel among most of the sections of the society. The states where all the variables ranks are below All Indian ranks include Punjab (6) and Haryana (6).

**Table 3.10 : Distribution of States according to the Variable Rank and Composite Variable Rank : Urban Areas**

	All Male	All Female	SC Male	SC Female	ST Male	ST Female
<b>Strength (Variable Rank is more than Composite Variable Rank)</b>	Andhra Pradesh, Assam, Uttar Pradesh, West Bengal	A.P., Bihar, Gujarat, Karnataka, Madhya Pradesh, Rajasthan Uttar Pradesh	Assam, Bihar, Himachal Pradesh, Uttar Pradesh, West Bengal	Bihar, Madhya Pradesh, Maharashtra, Orissa, Rajasthan Uttar Pradesh, West Bengal	Andhra Pradesh, Gujarat, Kerala, Madhya Pradesh, Orissa, Tamil Nadu, West Bengal	Andhra Pradesh, Gujarat Kerala, Madhya Pradesh, Orissa, Tamil Nadu, West Bengal
<b>Areas of Concern (Variable Rank is less than Composite Variable Rank)</b>	Bihar, Haryana, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu	Haryana, Punjab, Tamil Nadu, West Bengal	Andhra Pradesh, Gujarat, Haryana, Madhya Pradesh, Punjab, Rajasthan	Andhra Pradesh, Gujarat, Haryana, Punjab	Assam, Bihar, Haryana, Himachal Pradesh, Karnataka, Punjab, Rajasthan, Uttar Pradesh	Assam, Bihar, Haryana, Himachal Pradesh, Karnataka, Punjab, Uttar Pradesh

Table 3.10 presents composite scenario of variable ranks and composite variable ranks of various states. It shows that West Bengal, Uttar Pradesh, Madhya Pradesh and Andhra Pradesh have ranks of four variables above composite variable rank. On the other hand Punjab and Haryana have ranks for six variables lower than the Composite Variable Rank. The states of aharashtra, West Bengal and Orissa have one variable with rank lower than composite variable rank.



**Table 3.11 : Variations among Variable Rank and Composite Variable Rank : Urban**

State	Number of variables with Rank Higher than Composite Variable Rank	Number of variables with Rank Lower than Composite Variable Rank
Kerala	2	0
Himachal Pradesh	1	2
Assam	2	2
Gujarat	3	2
Maharashtra	1	1
Tamil Nadu	2	2
West Bengal	5	1
Karnataka	1	2
Orissa	3	1
Punjab	0	6
Haryana	0	6
Uttar Pradesh	4	2
Madhya Pradesh	4	2
Andhra Pradesh	4	2
Bihar	3	3
Rajasthan	2	3

### Composite Educational Development Index for Literacy Parameters

Table 3.12 presents rank of the states for each of the sub-variable for literacy and composite educational development index estimated based on the ranks of the variables. The analysis of variable ranks shows that Kerala has first rank for rural as well as for urban areas. On the other hand, Rajasthan has last rank for rural areas whereas Bihar has last rank for Urban areas. Variation among ranks of the variables 'Literacy Rate for Male and Female' in rural areas were maximum in the states of Assam (M- 11, F -6 ), and Andhra Pradesh (M-16, F-12). In rural areas, maximum variation among variable ranks ( $>, 4$ ) is observed in the states of Uttar Pradesh (ST Male - 4, ST Female - 7) and Tamil Nadu (ST Male-11, ST Female -8). The gender discrimination is more in these states as compared to the other states.

**Table 3.12 : Composite Index for Literacy Parameters: Rural**

States	Rural								
	All		SC		ST		Composite Index		
	M	F	M	F	M	F	M	F	Total
Andhra Pradesh	16	12	15	12	14	13	14	11	14
Assam	11	6	5	2	3	2	6	3	5
Bihar	14	15	16	15	9	10	12	12	13
Gujarat	5	7	2	4	5	4	3	4	3
Haryana	6	10	9	9	0	0	4	7	6
Himachal	2	2	4	3	2	3	2	2	2
Karnataka	9	9	12	11	7	5	9	8	9
Kerala	1	1	1	1	1	1	1	1	1
Madhya Pradesh	13	13	11	13	13	11	11	11	12
Maharashtra	3	5	3	5	6	6	2	5	3
Orissa	10	11	8	10	10	12	9	9	10
Punjab	8	3	10	7	0	0	5	3	4
Rajasthan	15	16	14	16	12	15	13	13	15
Tamil Nadu	4	4	6	6	11	8	7	6	7
Uttar Pradesh	12	14	13	14	4	7	10	10	11
West Bengal	7	8	7	8	8	9	8	8	8

In urban areas, the variation among rank variables were maximum ( $\geq 4$ ) in the states of Madhya Pradesh (Male-8, Female – 12) and Punjab (SC M –14, SC F-10). In Rajasthan, the variation was significant among all these six literacy variables.

The comparison of rank variations among rural and urban areas reveals that location biases are maximum in the states of Andhra Pradesh (R-14, U-9), Karnataka (R-9, U-5), Madhya Pradesh (R-12 , U-6) and Rajasthan (R-15, U-9). As compared to other states, the disparity in literacy rates among rural and urban areas of these states is more glaring.

**Table 3.13 : Composite Index for Literacy Parameters : Urban**

States	Urban								
	All		SC		ST		Composite Index		
	M	F	M	F	M	F	M	F	Total
Andhra Pradesh	13	13	9	8	14	13	13	9	9
Assam	6	3	5	3	2	2	4	2	3
Bihar	11	14	15	15	7	7	12	11	10
Gujarat	5	7	2	4	9	8	5	4	4
Haryana	7	10	13	13	0	0	6	7	5
Himachal	2	2	3	2	1	1	2	1	2
Karnataka	7	8	7	7	6	6	7	6	5

Kerala	1	1	1	1	3	3	1	1	1
Madhya Pradesh	8	12	8	11	10	11	9	9	6
Maharashtra	3	4	4	5	4	4	3	3	3
Orissa	9	11	11	12	12	12	11	10	8
Punjab	12	9	14	10	0	0	9	4	5
Rajasthan	10	16	12	16	8	14	10	12	9
Tamil Nadu	4	5	6	6	11	9	8	5	5
Uttar Pradesh	14	15	14	14	5	5	12	9	8
West Bengal	9	6	10	9	13	10	11	8	7

### Levels of Development of States in Literacy

Rajasthan has highly backward status in literacy whereas Kerala has highly developed status in literacy for both rural as well as urban areas. Bihar has highly backward status for rural areas only and the Himachal Pradesh has highly developed status for urban areas only. Bihar has developed status for literacy in urban areas whereas in rural areas it has highly backward status. Punjab and Haryana have backward status for both rural as well as urban areas.

**Table 3.14: Levels of Development in Literacy Parameters**

Index Value							
Rural				Urban			
.00-.25	.26-.50	.51-.75	.76-1.00	.00-.25	.26-.50	.51-.75	.76-1.00
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Back-Ward	Developed	Highly Developed
Rajasthan Bihar	Assam Gujarat Maharashtra Tamil Nadu West Bengal Karnataka Orissa Punjab, Haryana Uttar Pradesh Madhya Pradesh, Andhra Pradesh	Himachal	Kerala		Rajasthan Haryana Punjab	Assam Maharashtra Gujarat Tamil Nadu Karnataka West Bengal Madhya Pradesh, Uttar Pradesh Andhra Pradesh Orissa Bihar	Kerala Himachal Pradesh

## Growth of Literacy during 1991-97

To study growth of literacy during 1991-97, a growth index has been developed using the formulae.

$$\text{Index} = L_{97} / L_{91}$$

$L_{97}$  = Literacy Rate for 1997

$L_{91}$  = Literacy Rate for 1991

The growth index will provide our estimate of the growth in literacy during the period 1991 to 1997. The index has been developed separately for rural / urban and male / female population.

The pace of literacy growth was faster in the states of Kerala and Karnataka during this period. Kerala has first rank for all parameters except for rural (male). Karnataka is second in ranking in urban areas and has first rank for rural (male). There are significant location / gender specific biases in different states in the growth of literacy over the period. The literacy ranks in Tamil Nadu ranged from three (rural female and urban male) to Nine for (urban female). The growth of literacy among urban (female) in this state was much less than the growth of literacy among other segments of population. The growth of urban (female) literacy was comparatively very low in West Bengal. Location specific disparities were high in the state of Punjab, Orissa., Himachal Pradesh also. Literacy in urban areas in these states progressed at much faster rate than the literacy in rural areas. In Madhya Pradesh the pace of literacy growth was comparatively very low for urban (male).

In some states, ranks for female literacy were better than the ranks for male literacy. The states viz. Assam, Gujarat, Kerala, Tamil Nadu and West Bengal have higher ranks for female literacy in rural areas and Bihar, Gujarat, Haryana, Punjab and West Bengal have better female literacy ranks for urban areas. In Haryana, while male literacy rank is higher in rural areas, the female literacy rate on the contrary is higher in urban areas.

**Table 3.15 : Growth of Literacy in Different States**

States	Growth Index							
	Rural				Urban			
	Male	Rank	Female	Rank	Male	Rank	Female	Rank
Andhra Pradesh	0.830	11	0.683	11	0.904	12	0.817	15
Assam	0.725	16	0.622	13	0.917	11	0.862	14
Bihar	0.819	12	0.597	15	0.827	17	0.873	12
Gujarat	0.903	7	0.821	4	0.930	9	0.915	5
Haryana	0.969	3	0.722	8	0.932	7	0.929	3

Himachal	0.859	9	0.722	9	0.937	4	0.921	4
Karnataka	1.005	1	0.809	5	0.988	2	0.939	2
Kerala	0.968	4	0.946	1	0.996	1	0.990	1
Madhya Pradesh	0.797	13	0.616	14	0.934	5	0.866	13
Maharashtra	0.884	8	0.759	7	0.931	8	0.897	8
Orissa	1.000	2	0.933	2	0.933	6	0.913	6
Punjab	0.934	5	0.770	6	0.899	14	0.881	11
Rajasthan	0.690	17	0.430	17	0.872	16	0.797	17
Tamil Nadu	0.921	6	0.853	3	0.946	3	0.892	9
Uttar Pradesh	0.789	15	0.543	16	0.875	15	0.813	16
West Bengal	0.796	14	0.657	12	0.902	13	0.899	7
All India	0.851	10	0.712	10	0.922	10	0.890	10

### Literacy Index

Table 3.16 presents comparative scenario of development ranks worked out on the basis of three different techniques i.e. Principal Component Analysis, Composite Variable Rank and Growth Index. All the methods show Kerala as the leading state in literacy. The last state in ranking, however, differs in the three methods. But last three states in ranking according to all the methods are the same i.e. Bihar, Rajasthan and Andhra Pradesh except for Punjab and Haryana for urban areas (PC Analysis) and Uttar Pradesh and Andhra Pradesh according to growth rank of the states.

Table 3.16 : Literacy Index

States	Composite Variable Rank		Principal Component Rank		Growth Rank	
	R	U	R	U	R	U
Andhra Pradesh	14	9	15	12	11	15
Assam	5	3	3	3	13	14
Bihar	13	10	16	13	15	12
Gujarat	3	4	4	5	4	5
Haryana	6	5	12	15	8	3
Himachal	2	2	2	2	9	4
Karnataka	9	5	8	7	5	2
Kerala	1	1	1	1	1	1
Madhya Pradesh	12	6	14	9	14	13
Maharashtra	3	3	5	4	7	8
Orissa	10	8	10	11	2	6
Punjab	4	5	11	16	6	11
Rajasthan	15	9	17	14	17	17
Tamil Nadu	7	5	6	6	3	9
Uttar Pradesh	11	8	13	10	16	16
West Bengal	8	7	7	8	12	7

R = Rural

U = Urban

## Chapter IV

### PROGRESS IN EDUCATION

Progress in education is an output parameter for measuring the education development in a state. The increase in input parameters in terms of infrastructure, teachers and monetary resources results in enhanced enrolment rate at various educational stages thereby raising the level of literacy in the region. The growth in enrolment rate and the promotion of number of students from one stage of education to another stage are the few indicators of educational development in a state. Thus, to study the level of progress in education for a state, these parameters viz. enrolment rate and promotion rate have been selected for analysis. In addition, continuance rate has also been considered as progress parameter for the study. There are wide variations in progress of education among male and female population. To capture these variations, separate parameters have been selected for the two categories of population.

#### **Sub-parameters for Progress in Education**

To study level of progress in education among different states, following sub-parameters have been selected;

- Overall Male Enrolment Rate
- Overall Female Enrolment Rate
- Male Enrolment in Class VI as a percentage of Male Enrolment in Class I
- Female Enrolment in Class VI as a Percentage of Female Enrolment in Class I
- Continuance Rate

The parameters will be analysed separately for Primary, Upper Primary and High/Higher Secondary stages of education and for rural and Urban areas. The parameters have been selected with the view to study the proportion of children in school going age group who are attending schools and the proportion of students being promoted from one stage of education to the next stage of education. The parameter continuance rate will help to identify the proportion of students who do not drop out and continue with their studies. The data on 'Continuance Rate' is not available for rural and urban areas and for high and higher secondary stages of education. The data on enrolment rate is also not available for high and higher secondary stages of education.

#### **Progress at Primary Level of Education**

##### **Relationship Among Sub-Variables**

In rural areas, the male enrolment rate has high correlation with female enrolment rate meaning thereby that female enrolment is high wherever the male enrolment is high at this stage of education and vice-versa. The female enrolment rate also have significant correlation with the parameters (iii) and (iv). This indicates that the female enrolment rate is high in the states where proportion of students promoting from one stage to other is high i.e. the level of

development of education is high. The parameters (iii) and (iv) have very high correlation among themselves and also with the variable 'Female Enrolment Rate'.

In urban areas, however, the parameter 'Male Enrolment Rate' and 'Female Enrolment Rate' have high correlation among themselves and the parameters (iii) and (iv) also have very high correlation among themselves.

**Table 4.1 : Correlation Matrix for Progress in Education : Primary Level**

Variables	Rural				Urban			
	Overall Male Enrolment Rate	Overall Female Enrolment Rate	Male Enrolment in Class VI as Percent of Male Enrolment in Class I	Female Enrolment in Class VI as Percent of Female Enrolment in Class I	Overall Male Enrolment Rate	Overall Female Enrolment Rate	Male Enrolment in Class VI as Percent of Male Enrolment in Class I	Female Enrolment in Class VI as Percent of Female Enrolment in Class I
Overall Male Enrolment Rate	1	0.83	0.44	0.47	1	0.66	-0.31	-0.25
Overall Female Enrolment Rate	0.83	1	0.65	0.71	0.66	1	0.21	0.28
Male Enrolment in Class VI as Percent of Male Enrolment in Class I	0.44	0.65	1	0.98	-0.31	0.21	1	0.99
Female Enrolment in Class VI as Percent of Female Enrolment in Class I	0.47	0.71	0.98	1	-0.25	0.28	0.99	1

### Principal Component Analysis

For rural areas, the principal component analysis has extracted only one PC for the analysis. The PC explains 76 percent variation among variables and has 3.05 as eigen value. For urban areas, however, it has extracted two PC's for analysis. The first PC explains 54 percent variation and Second PC explains 42 percent variation and has 1.66 as eigen value. The two PC's together explains 95 percent variation among variables for urban areas.

**Table 4.2 : Eigen Values for Progress in Education Parameters : Primary Level**

Principal Component	Rural				Urban			
	Eigen Value	Percent total Variance	Cummul. Eigen value	Cumul. Variance	Eigen Value	Percent total Variance	Cummul. Eigen Value	Cumul. Variance



<b>First</b>	3.047729	76.19322	3.047729	76.19322	2.142372	53.5593	2.142372	53.5593
<b>Second</b>					1.663641	41.59103	3.806013	95.15033

The PC extracted for rural areas have high factor loadings for all the parameters and thus can be titled as 'Progress Parameters'. The first PC extracted for urban areas has significant factor loadings for the variables (iii) and (iv) and thus can be named as 'Promotion from Primary to Upper Primary Stage of Education'. The Second PC extracted for urban areas have high factor loadings for parameters (i) and (ii) and thus can be named as the factor 'Enrolment Rate'.

**Table 4.3 : Factor Loadings for Progress in Education : Primary Level**

Variables	Rural		Urban
	Factor I	Factor I	Factor II
Overall Male Enrolment Rate	0.77069*	-0.352367	-0.888811 *
Overall Female Enrolment Rate	0.909509*	0.225832	-0.930437 *
Male Enrolment in Class VI as percent of Male Enrolment in Class I	0.88973*	0.99274 *	-0.016391
Female Enrolment in Class VI as percent of Female Enrolment in Class I	0.913751*	0.990796 *	-0.087599

### **Development Index for Progress in Education**

The states which are leading both in rural as well as urban areas are Kerala and Himachal Pradesh whereas the states of Punjab, Haryana, Uttar Pradesh are among the first five ranking states in urban areas and the states of Tamil Nadu, Maharashtra and Gujarat have high ranks for rural areas. States which rank last in order of both in rural and urban areas are Assam, Andhra Pradesh and Rajasthan. Whereas the states lagging behind in rural areas only are Uttar Pradesh and Bihar and the States having last ranks only for urban areas are Gujarat and Madhya Pradesh. The states which have ranks for rural areas better than the urban ranks are Assam, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan and Tamil Nadu.

**Table 4.4 : Index for Progress in Education : Principal Component Analysis - Primary Level**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.271	14	0.196	13
Assam	0.368	13	0.236	10
Bihar	0.132	17	0.052	16
Gujarat	0.614	5	0.485	4
Haryana	0.542	8	0.310	8
Himachal Pradesh	0.81	3	0.458	5
Karnataka	0.561	7	0.572	3
Kerala	0.961	1	0.854	1
Madhya Pradesh	0.439	10	0.141	15
Maharashtra	0.657	4	0.339	7
Orissa	0.495	9	0.213	12
Punjab	0.604	6	0.67	2
Rajasthan	0.232	15	0.043	17
Tamil Nadu	0.834	2	0.412	6
Uttar Pradesh	0.196	16	0.164	14
West Bengal	0.395	11	0.23	11
All-India	0.39	12	0.294	9

#### **Level of Progress in Education : Primary Level**

Table 4.5 presents level of development in different states in the parameter 'Progress in Education'. It can be seen from the table that Bihar and Rajasthan are the states classified as highly backward States for both rural and urban areas whereas the rural areas of Uttar Pradesh and Urban areas of West Bengal, Orissa, Andhra Pradesh, Gujarat, Madhya Pradesh and Assam have highly backward status. Rural areas of Tamil Nadu and Himachal Pradesh are highly developed whereas both the rural and urban areas of Kerala are highly developed.

Table 4.5 : Level of Progress in Education : Primary Level

Index Value							
Rural				Urban			
.00-.25	.26-.50	.51-.75	.76-1.00	.00-.25	.26-.50	.51-.75	.76-1.00
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
Rajasthan Uttar Pradesh Bihar	Orissa Madhya Pradesh West Bengal All-India Assam Andhra Pradesh	Maharashtra Gujarat Punjab Karnataka Haryana	Kerala Tamil Nadu Himachal Pradesh	Bihar West Bengal Orissa Andhra Pradesh Madhya Pradesh Assam Rajasthan Uttar Pradesh	Himachal Pradesh Tamil Nadu Maharashtra All-India Gujarat Haryana	Punjab Karnataka	Kerala

### Composite Variable Rank

The states which have high ranks (1-5) in both rural and urban areas are Gujarat, Himachal Pradesh, Kerala, Tamil Nadu and Maharashtra whereas Karnataka and Madhya Pradesh have higher ranks for urban areas only. The states which have last ranks (13-17) both in rural and urban areas are Bihar, Rajasthan and Uttar Pradesh whereas Andhra Pradesh and Assam are lagging behind in rural areas and Tamil Nadu is lagging behind in Urban areas. The states having rural ranks better than urban ranks are Himachal Pradesh, Kerala and Orissa.

**Table 4.6 : Composite Variable Rank for Progress in Education : Primary Level**

States	Rural					Urban				
	Enrolment Ratio		Enrolment in Class VI as percent of Class I		Composite Variable Rank	Enrolment Ratio		Enrolment in Class VI as percent of Enrolment Class I		Composite Variable Rank
	Male	Female	Male	Female		Male	Female	Male	Female	
Andhra Pradesh	15	14	15	15	16	11	7	14	14	12
Assam	12	11	16	12	13	4	5	15	15	8
Bihar	16	16	17	16	17	13	16	17	17	15
Gujarat	1	6	8	7	5	2	4	8	8	2
Haryana	14	10	4	4	8	15	12	4	5	7
Himachal Pradesh	3	2	3	3	2	12	8	6	6	5
Karnataka	5	5	9	8	7	6	3	9	7	3
Kerala	7	4	1	1	3	14	10	1	1	4
Madhya Pradesh	9	12	7	10	10	3	6	7	10	4
Maharashtra	4	3	6	6	4	5	1	5	3	1
Orissa	6	8	12	11	9	7	14	11	11	10
Punjab	8	7	5	5	6	16	11	3	4	6
Rajasthan	11	17	13	17	15	1	15	16	16	13
Tamil Nadu	2	1	2	2	1	8	2	2	2	1
Uttar Pradesh	17	15	11	13	14	17	17	12	12	14
West Bengal	10	9	14	14	12	10	9	13	13	11
All-India	13	13	10	9	11	9	13	10	9	9

Table 4.7 presents ranks of the state for each sub-variable for 'Progress in Education' in rural and urban areas. The analysis reveals that in rural areas Andhra Pradesh and Bihar have low ranks for all the variables whereas Uttar Pradesh has this status for all the variables except the variable(iii) and Rajasthan has this status for all the variable (iii) on the other hand Andhra Pradesh, Rajasthan have low ranks for variable (iii) and Rajasthan and Haryana have low ranks for variable (iv). In urban areas, Andhra Pradesh, Bihar, Uttar Pradesh and Orissa have low ranks for variables (I) and (ii). Among these, Andhra Pradesh has low rank for variable (iii) also. The states which have low ranks for variable (iii) and (iv) are Madhya Pradesh, West Bengal, Rajasthan and Karnataka. In addition Uttar Pradesh also has low rank for variable (iv), West Bengal for variable (I) and Rajasthan for variable (ii).

**Table 4.7: Classification of States According to Variable Ranks: Primary Level**

Variable Rank						
Variables	Rural			Urban		
	High (1 to 6)	Medium (7 to 12)	Low (13 to 17)	High (1 to 6)	Medium (7 to 12)	Low (13 to 17)
Overall Male Enrolment Rate	Gujarat Himachal Pradesh Karnataka Maharashtra Tamil Nadu	Assam Kerala Madhya Pradesh Punjab Orissa Rajasthan West Bengal	Andhra Pradesh Bihar Haryana Uttar Pradesh All-India	Assam Gujarat Karnataka Madhya Pradesh Maharashtra Rajasthan	Andhra Pradesh Himachal Pradesh Orissa Tamil Nadu West Bengal All-India	Bihar Haryana Punjab Uttar Pradesh
Overall Female Enrolment Rate	Gujarat Himachal Pradesh Karnataka Kerala Maharashtra Tamil Nadu	Assam Haryana Madhya Pradesh Orissa Punjab West Bengal	Andhra Pradesh Rajasthan Bihar Uttar Pradesh All-India	Assam Gujarat Karnataka Madhya Pradesh Maharashtra Tamil Nadu	Andhra Pradesh Haryana Himachal Pradesh Kerala Punjab West Bengal	Bihar Orissa Rajasthan Uttar Pradesh All-India
Male Enrolment in Class VI as percent of Male Enrolment in Class I	Haryana Himachal Pradesh Kerala Maharashtra Punjab Tamil Nadu	Gujarat Karnataka Madhya Pradesh Orissa Uttar Pradesh All-India	Andhra Pradesh Assam Bihar Rajasthan West Bengal	Haryana Himachal Pradesh Kerala Maharashtra Punjab Tamil Nadu	Gujarat Karnataka Madhya Pradesh Orissa Uttar Pradesh All-India	Andhra Pradesh Assam Bihar Rajasthan West Bengal
Female Enrolment in Class VI as percent of Female Enrolment in Class I	Haryana Himachal Pradesh Kerala Maharashtra Punjab Tamil Nadu	Assam Gujarat Karnataka Madhya Pradesh Orissa All-India	Andhra Pradesh Bihar Rajasthan Uttar Pradesh West Bengal	Haryana Himachal Pradesh Kerala Maharashtra Punjab Tamil Nadu	Gujarat Karnataka Madhya Pradesh Orissa Uttar Pradesh All-India	Andhra Pradesh Assam Bihar Rajasthan West Bengal

## Educational Development Index for Progress in Education : The Composite Variable Rank and Principal Component Rank

The states leading in rural areas according to both the methods are Tamil Nadu, Himachal Pradesh, Kerala, Karnataka and Gujarat. The states having last ranks according to both these methods are Bihar, Andhra Pradesh, Uttar Pradesh, Rajasthan and Assam. In urban areas, the leading states identified by both the methods are Gujarat, Karnataka, Kerala and Himachal Pradesh. In addition, composite variable rank method has identified Tamil Nadu and Maharashtra as leading states and Principal Component Analysis has identified Punjab as leading state. The last ranking states for urban areas identified by both the methods are Bihar, Uttar Pradesh, Rajasthan and Andhra Pradesh. In addition Madhya Pradesh has been identified by Principal Component Analysis as last ranking state.

**Table 4.8: Educational Development Index for Progress in Education :  
Primary Level**

States	Composite Variable Rank		Principal Component Analysis	
	Rural	Urban	Rural	Urban
Andhra Pradesh	16	12	14	13
Assam	13	8	13	10
Bihar	17	15	17	16
Gujarat	5	2	5	4
Haryana	8	7	8	8
Himachal Pradesh	2	5	3	5
Karnataka	7	3	7	3
Kerala	3	4	1	1
Madhya Pradesh	10	4	10	15
Maharashtra	4	1	4	7
Orissa	9	10	9	12
Punjab	6	6	6	2
Rajasthan	15	13	15	17
Tamil Nadu	1	1	2	6
Uttar Pradesh	14	14	16	14
West Bengal	12	11	11	11
All-India	11	9	12	9

### Progress in Education at Upper Primary Level

#### Relationship Among Sub-variables

At upper Primary level, all the parameters for rural areas have significant correlation among themselves indicating that wherever rank of one variable is high the ranks of the other variables are also high and vice-versa. In addition the variables (i) and (ii) have very high correlation among themselves and so have the variables (iii) and (iv).

For urban areas, only the variables (i) and (ii) have significant relationship among themselves and the variables (iii) and (iv) have significant relationship with each other. No other variable has significant relationship with other variables.

**Table 4.9 : Correlation Matrix for Progress in Education - Uppter Primary**

Variable	Rural				Urban			
	Overall Male Enrolment Rate	Overall Female Enrolment Rate	Male Enrolment in Class VI as percent of Male Enrolment in Class I	Female Enrolment in Class VI as percent of Female Enrolment in Class I	Overall Male Enrolment Rate	Overall Female Enrolment Rate	Male Enrolment in Class VI as percent of Male Enrolment in Class I	Female Enrolment in Class VI as percent of Female Enrolment in Class I
Overall Male Enrolment Rate	1	0.94	0.53	0.62	1	0.86	0.24	0.32
Overall Female Enrolment Rate	0.94	1	0.6	0.77	0.86	1	0.31	0.34
Male Enrolment In Class VI as percent of Male Enrolment in Class I	0.53	0.6	1	0.88	0.24	0.31	1	0.89
Female Enrolment in Class VI as percent of Female Enrolment in Class I	0.62	0.77	0.88	1	0.32	0.34	0.89	1

### Principal Component Analysis

The Principal Component analysis for rural areas has extracted one PC for the analysis. The PC explains 79 percent variation and has 3.17 as eigen value. For Urban areas, however, two PC's have been extracted for the analysis. The first PC explains 62 percent variation and has 2.48 as eigen value and Second PC explains 31 percent variation among variables and has 1.27 as eigen value. The two PC's together explains 94 percent variation among variables.

**Table 4.10 : Eigen Value for Progress in Education : Upper Primary Level**

Principal Components	Rural				Urban			
	Eigen Value	Percent Total Variance	Cumul. Eigen Value	Cumul. percent	Eigen Value	Percent Total Variance	Cumul. Eigen Value	Cumul. percent
First	3.170366	79.25914	3.170366	79.25914	2.484894	62.12235	2.484894	62.12235
Second					1.270023	31.75056	3.754917	93.87292

The PC extracted for rural areas have high factor loadings for all the variables and thus can be called the factor 'Progress Parameters'. The First PC extracted for urban areas also has high factor loadings for all the variables and can be termed as the factor 'Progress Parameters'. The Second PC has factor loadings for all the variables ranging between .52 to .59. The highest factor loadings are for the variables (I) and (iii). This factor can be titled as 'Male Enrolment'.

**Table 5.11: Factor Loading for Progress in Education : Upper Primary Level**

Variables	Factor Loading		
	Rural	Urban	
	Factor I	Factor I	Factor II
Overall Male Enrolment Rate	0.86930	0.763817*	0.590582
Overall Female Enrolment Rate	0.931979	0.790287*	0.550614
Male Enrolment in Class VI as percent of Male Enrolment in Class I	0.838161	0.781597*	-0.581837
Female Enrolment in Class VI as percent of Female Enrolment in Class I	0.918461	0.816107*	-0.528702

### Development Index for Progress in Education

The states which are included among the first five ranks for both rural and urban areas are Himachal Pradesh, Kerala, Maharashtra and Tamil Nadu whereas rural areas of Assam and urban areas of Orissa are among leading states. The states which have last ranks for both rural and urban areas are Andhra Pradesh, Bihar, Rajasthan and Uttar Pradesh whereas Madhya Pradesh is lagging behind in rural areas and West Bengal has not developed this variable in urban areas.



**Table 4.12 : Development Index for Progress in Education at Upper Primary Level  
Principal Component Analysis**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.236	13	0.296	14
Assam	0.415	4	0.472	9
Bihar	0.174	15	0.177	17
Gujarat	0.298	8	0.502	8
Haryana	0.281	10	0.524	7
Himachal Pradesh	0.572	2	0.726	3
Karnataka	0.264	12	0.451	10
Kerala	0.771	1	0.954	1
Madhya Pradesh	0.157	17	0.399	12
Maharashtra	0.441	3	0.707	4
Orissa	0.359	6	0.593	5
Punjab	0.346	7	0.571	6
Rajasthan	0.209	14	0.382	13
Tamil Nadu	0.409	5	0.762	2
Uttar Pradesh	0.173	16	0.254	16
West Bengal	0.27	11	0.291	15
All-India	0.293	9	0.44	11

### Level of Development in Progress in Education

The comparison of level of development of this parameter among states reveals that Uttar Pradesh and Bihar are highly backward both in rural as well as Urban areas. The rural areas of Andhra Pradesh, Rajasthan, Madhya Pradesh are also highly backward in progress of education. Both the rural and urban areas of Kerala are highly developed whereas the urban areas of Tamil Nadu are highly developed in education and Upper primary level.

**Table 4.13 : Level of Development in Progress in Education Parameters: Upper Primary**

Rural				Urban			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed

Andhra Pradesh	Maharashtra	Himachal Pradesh	Kerala	Uttar Pradesh	Gujarat	Himachal Pradesh	Kerala
Rajasthan	Assam			Bihar	Assam	Maharashtra	Tamil Nadu
Bihar	Tamil Nadu				Karnataka	Orissa	
Uttar Pradesh	Orissa				All-India	Punjab	
Madhya Pradesh	Punjab				Madhya Pradesh	Haryana	
Pradesh	Gujarat				Rajasthan		
	All-India				Andhra Pradesh		
	Haryana				West Bengal		
	West Bengal				West Bengal		
	Karnataka				Bengal		

Highly Backward : Index (.00-.25)  
 Backward : Index (.26-.50)  
 Developed : Index (.51-.75)  
 Highly Developed : Index (.76-1.00)

### Composite Variable Rank

The states which have high ranks (1-5) both for rural and urban areas are Kerala, Punjab, Himachal Pradesh and Tamil Nadu whereas Assam has high rank for rural areas only. The states which have low ranks (11-15) both for rural and urban areas are Bihar, Rajasthan, Madhya Pradesh and Uttar Pradesh whereas Andhra Pradesh has low rank for rural areas and West Bengal has low rank for urban areas. The states which have rural rank better than the urban rank are Andhra Pradesh, Assam, Bihar, Maharashtra and West Bengal.

**Table 4.14 : Composite Variable Rank for Progress in Education : Upper Primary Level**

States	Rural					Urban				
	Enrolment Ratio		Enrolment in Class IX as percent of Class VI		Composite Enrolment in Variable Rank	Enrolment Ratio		Enrolment in Class IX as percent of Class VI		Composite Variable Rank
	Male	Female	Male	Female		Male	Female	Male	Female	
Andhra Pradesh	16	14	7	9	11	15	13	13	10	12
Assam	9	6	4	2	4	9	9	11	5	8
Bihar	17	16	9	14	13	17	17	12	12	14
Gujarat	7	8	14	11	8	7	8	7	7	6
Haryana	6	7	15	13	9	11	5	8	9	7
Himachal Pradesh	2	2	2	3	2	4	4	5	4	2
Karnataka	8	9	13	12	10	8	7	16	14	10
Kerala	1	1	1	1	1	2	1	2	2	1
Madhya Pradesh	13	13	16	17	14	6	11	17	16	11
Maharashtra	4	4	3	5	3	3	3	4	11	4
Orissa	11	10	5	4	6	13	14	1	1	6
Punjab	5	5	12	6	5	10	6	3	3	5

Rajasthan	10	17	10	15	12	5	15	15	15	11
Tamil Nadu	3	3	12	10	5	1	2	10	6	3
Uttar Pradesh	14	15	11	16	13	16	16	6	13	12
West Bengal	15	12	6	7	8	14	12	14	17	13
All-India	12	11	8	8	7	12	10	9	8	9

Table 4.15 presents ranks of the states for all the sub-variable for 'Progress in Education' at Upper Primary level of education. The analysis shows that Madhya Pradesh has low ranks for all the variables in rural areas whereas Bihar and Uttar Pradesh have this status for all the variables except variable (iii). Andhra Pradesh, West Bengal have low ranks for variable (i) and Gujarat, Haryana, Karnataka have low ranks for variable (iii) on the other hand Andhra Pradesh, Rajasthan have low ranks for variable (ii) and Rajasthan and Haryana have low ranks for variable (iv)

In urban areas, Andhra Pradesh, Bihar, Uttar Pradesh and Orissa have low ranks for variable (i) and (ii). Among these, Andhra Pradesh has low rank for variable (iii) also. The states which have low ranks for variable (iii) and (iv) are Madhya Pradesh, West Bengal, Rajasthan and Karnataka. In addition Uttar Pradesh also have low rank for variable (iv), West Bengal for variable (i) and Rajasthan for variable (ii).

**Table 4.15 : States According to Variable Ranks : Upper Primary Level**

Variables	Variable Rank					
	Rural			Urban		
	High (1 to 6)	Medium (7 to 12)	Low (13 to 17)	High (1 to 6)	Medium (7 to 12)	Low (13 to 17)
Overall Male Enrolment Rate	Haryana Himachal Pradesh Kerala Maharashtra Punjab Tamil Nadu	Gujarat Assam Karnataka Orissa Rajasthan	Madhya Pradesh Andhra Bihar Uttar Pradesh West Bengal	Himachal Pradesh Kerala Madhya Pradesh Maharashtra Rajasthan Tamil Nadu	Assam Gujarat Haryana Karnataka Punjab All-India	Andhra Pradesh Bihar Orissa Uttar Pradesh
Overall Female Enrolment Rate	Assam Himachal Pradesh Kerala Maharashtra Punjab Tamil Nadu	Gujarat Haryana Karnataka Orissa West Bengal All-India	Andhra Pradesh Bihar Madhya Pradesh Rajasthan Uttar Pradesh	Haryana Himachal Pradesh Kerala Maharashtra Punjab Tamil Nadu	Assam Gujarat Karnataka Madhya Pradesh West Bengal All-India	Andhra Pradesh Bihar Orissa Rajasthan Uttar Pradesh West Bengal

Male Enrolment in Class IX as percent of Male Enrolment in Class VI	Assam Himachal Pradesh Kerala Maharashtra Orissa West Bengal	Andhra Pradesh Bihar Punjab Rajasthan Tamil Nadu Uttar Pradesh All-India	Gujarat Haryana Karnataka Madhya Pradesh	Himachal Pradesh Kerala Maharashtra Orissa Punjab Uttar Pradesh	Assam Bihar Gujarat Haryana Tamil Nadu All-India	Andhra Pradesh Karnataka Madhya Pradesh Rajasthan West Bengal
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### Educational Development Index for Progress in Education: The Composite Variable Rank and Principal Component Rank

The leading states identified by both the methods for rural area are Kerala, Himachal Pradesh, Maharashtra, Assam, Tamil Nadu and the backward state identified by both these methods are Madhya Pradesh, Uttar Pradesh, Rajasthan and Bihar. In addition Andhra Pradesh has also been identified as backward state for rural areas by Principal Component method.

The top ranking states for urban areas according to both the method are Kerala, Himachal Pradesh, Tamil Nadu and Maharashtra. In addition, Punjab has been identified by composite variable rank method as one of the five leading states. The last ranking states for urban areas identified by both the methods are Bihar, West Bengal, Uttar Pradesh and Andhra Pradesh. In addition, Rajasthan has been identified as last ranking state by Principal Component method.

**Table 4.16 : Educational Development Index for Progress in Education : Upper PrimaryLevel**

States	Composite Variable Rank		Principal Component Analysis	
	Rural	Urban	Rural	Urban
Andhra Pradesh	11	12	13	14
Assam	4	8	4	9
Bihar	13	14	15	17
Gujarat	8	6	8	8
Haryana	9	7	10	7
Himachal Pradesh	2	2	2	3
Karnataka	10	10	12	10
Kerala	1	1	1	1
Madhya Pradesh	14	11	17	12
Maharashtra	3	4	3	4
Orissa	6	6	6	5
Punjab	5	5	7	6
Rajasthan	12	11	14	13
Tamil Nadu	5	3	5	2
Uttar Pradesh	13	12	16	16

West Bengal	8	13	11	15
All India	7	9	9	11

### Progress in Education at High / Higher Secondary Level

#### Relationship Among Sub-Variables

The sub-variables for 'Progress in Education' at High / higher level do not have significant relationship among themselves except the variables enrolment rate for male and female indicating that the states where more male children are going to school, the female children are also going to the schools.

**Table 4.17 : Coorelation Matrix for Progress in Education : High/Higher Secondary Level**

Variable	Overall Male Enrolment Rate	Overall Female Enrolment Rate	Male Enrolment in Class VI as percent of Male Enrolment in Class I	Female Enrolment in class VI as percent of Female Enrolment in Class I	Continuance Rate (Male)	Continuance Rate (Female)
Overall Male Enrolment Rate	1.00	.71	-.19	.01	-.47	-.18
Overall Female Enrolment Rate	.71	1.00	.02	-.3	-.48	-.13
Male Enrolment in Class VI as percent of Male Enrolment in Class I	-.19	.02	1.00	.12	.25	.37
Female Enrolment in class VI as percent of Female Enrolment in Class I	.01	-.30	.12	1.00	.32	.24
Continuance Rate (Male)	-.47	-.48	.25	.32	1.00	.42

Continuance Rate (Female)	-.18	-.13	.37	.24	.42	1.00
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### Principal Component Analysis

The Principal Component method had extracted two PC's for the analysis. The first PC extracts 41 per cent variation and has 2.46 as eigen value and the second PC extracts 21 per cent variation among variables and has 1.28 as eigen value.

The factor loadings extracted by the first PC are significant for the parameters, Male/Female Enrolment Rate and Male Continuance Rate. The factor loadings for Female Continuance Rate is also quite high. This PC can be name as 'Enrolment and Continuous Rate'. The second PC has high factor loadings for 'Male Enrolment in Class VI as a Percentage of Male Enrolment in Class I'.

**Table 4.18: Factor Loadings for Progress in Education : High/Higher Secondary Level**

Variables	Factor Loading	
	Factor 1	Factor 2
Overall Male Enrolment Rate	.741699*	-.453420
Overall Female Enrolment Rate	.759630*	-.529514
Male Enrolment inClass VI as Percentage of Male Enrolment in Class I	-.402357	-.631116*
Female Enrolment in Class VI as Percentage of Female Enrolment inClass I	-.452996	-.256652
Continuance Rate (Male)	-.811662*	-.052760
Continuance Rate (Female)	-.562396	-.578803
Eigen Value	2.469337	1.287949

\* Significant

### Development Index for Progress in Education

According to Principal Component Analysis, the first five leadings states in 'Progress in Education' are Himachal Pradesh, Tamil Nadu, West Bengal, Madhya Pradesh, and Kerala and the states which are last in the ranking in this area are Rajasthan, Bihar, Punjab, Andhra Pradesh and Orissa.

**Table 4.19:Development Index for Progress in Education at High/Higher Secondary level**

States	Index	Rank
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Andhra Pradesh	0.361	14
Assam	0.421	12
Bihar	0.323	16
Gujarat	0.447	11
Haryana	0.518	7
Himachal Pradesh	0.922	1
Karnataka	0.453	10
Kerala	0.593	5
Madhya Pradesh	0.651	4
Maharashtra	0.487	9
Orissa	0.365	13
Punjab	0.350	15
Rajasthan	0.126	17
Tamil Nadu	0.742	2
Uttar Pradesh	0.545	6
West Bengal	0.690	3
India	0.506	8

### Variable/Composite Variable Rank

According to composite variable rank Kerala is number one state followed by Maharashtra, Himachal Pradesh, Tamil Nadu and Gujarat and the state having last ranks are Orissa, Bihar, West Bengal and Rajasthan. Among leading states Kerala have first rank for four variables, Maharashtra have second rank for 'Male Enrolment in Class, IX as Percentage of Enrolment in Class VI and third and fourth ranks for Enrolment Ratio for male and female respectively Himachal Pradesh, Tamil Nadu have four parameters with ranks (1 to 3).

**Table 4.20: Variable/Composite Variable Rank for Progress in Education: High/Higher Secondary Level**

States/UT	Ranks						Composite Variable Rank
	Gross Enrolment Ratio in School High & Higher Secondary		Enrolment in Class IX as percentage of Enrolment in Class VI		Continuance Rate		
	Male	Female	Male	Female	Male	Female	
Andhra Pradesh	13	11	8	6	15	11	11
Assam	14	6	14	4	13	10	11
Bihar	17	14	11	14	12	14	15
Gujarat	4	5	5	3	88	12	5
Haryana	6	7	10	7	9	6	6
Himachal Pradesh	1	2	13	11	3	2	3
Karnataka	7	8	7	9	10	9	8
Kerla	5	1	1	1	1	3	1
Madhya Pradeh	12	12	17	16	5	4	12

Maharashtra	3	4	2	5	7	7	2
Orissa	15	14	12	15	11	16	16
Punjab	8	6	3	2	16	13	7
Rajasthan	10	16	4	8	17	15	13
Tamil Nadu	2	3	15	12	2	1	4
Uttar Pradesh	9	15	6	13	4	5	9
West Bengal	16	13	16	17	14	5	14
India	11	10	9	10	6	8	10

### Areas of Concern/Strengths

Bihar and Orissa have low ranks for all the progress parameters relating to female education. They have low female enrolment rate, low female enrolment in class IX as percent of female enrolment in class VI and low female continuance rate. In addition, they have low rank for male enrolment rate as well. West Bengal have low rank for most of the progress parameters followed by Rajasthan which is also lagging behind in female education. All these states have low composite variable ranks. There are two states; Himachal Pradesh and Tamil Nadu which have high composite variable rank but rank for the variable Enrolment in Class IX as percent of Male Enrolment in Class VI' is low. On the category, Rajasthan has low composite variable rank but the rank for this variable is high. The states of Himachal Pradesh, Maharashtra and Tamil Nadu have high male as well as female enrolment ratio and continuance rate. Kerala also has high ranks foremost of progress parameters.

**Table 4.21 :Areas of Concern/Strengths of States for Progress in Education**

Areas of Concern/Strengths	Male Enrolment Rate	Female Enrolment Rate	Male Enrolment in Class IX as Percent of Male Enrolment in Class VI	Female Enrolment in Class IX as Percent of Male Enrolment in Class VI	Continuance Rate	
					Male	Female
<b>Areas of Concerns</b>						
State Rank Low and Variable Rank Low	Bihar Orissa West Bengal	Bihar Orissa Rajasthan West Bengal	West Bengal	Bihar Orissa West Bengal	Rajasthan West Bengal	Bihar Orissa Rajasthan
State Rank High but variable rank low			Himachal Pradesh Tamil Nadu			
<b>Strengths</b>						
State Rank low but variable			Rajasthan			



Rank high						
State Rank high and Variable Rank high	Himachal Pradesh Maharashtra Tamil Nadu	Himachal Pradesh Kerala Maharashtra Tamil Nadu	Kerala Maharashtra	Kerala	Himachal Pradesh Kerala Tamil Nadu	Himachal Pradesh Tamil Nadu

### Educational Development Index for Progress in Education : The Composite Variable Rank and Principal Component Rank

The states identified as top ranking states (Rank 1-5) by both these methods are Kerala, Gujarat, Himachal Pradesh and Tamil Nadu. In addition, Composite Variable rank has identified Punjab as leading state. The last ranking states according to both the methods are Orissa, Bihar, West Bengal and Rajasthan. Similarly, Madhya Pradesh according to composite variable rank and Assam, Andhra Pradesh according to Principal Component analysis have been identified as last ranking states.

**Table 4.22 : Educational Development Index for Progress in Education :High/Higher Secondary Level**

States	Composite Variable Rank	Principal Component Analysis
Andhra Pradesh	11	14
Assam	11	12
Bihar	15	16
Gujarat	5	4
Haryana	6	7
Himachal Pradesh	3	1
Karnataka	8	10
Kerala	1	5
Madhya Pradesh	12	11
Maharashtra	2	9
Orissa	16	13
Punjab	4	3
Rajasthan	13	17
Tamil Nadu	4	2
Uttar Pradesh	9	6
West Bengal	14	15
India	10	8

### Comparative Scenario of Progress in Education at Various Levels of Education

In rural areas, Rajasthan is a highly backward state for all levels of education. Moreover, Bihar and Uttar Pradesh have highly backward status for primary and upper primary level of education. At upper primary level Andhra Pradesh and Madhya Pradesh also have this status. The highly developed states in rural areas are Kerala, Tamil Nadu and Himachal Pradesh. At upper primary level only Kerala has this status and at high/higher secondary level Himachal Pradesh has highly developed status.

**Table 4.23 : Index for Progress in Education for All Stages : Rural Areas**

Primary	Upper Primary	High/ Higher Secondary*
<b>Highly Backward (Index.00-.25)</b>		
Rajasthan, Uttar Pradesh Andhra Pradesh, Rajasthan	Bihar Rajasthan, Bihar	Uttar Pradesh, Madhya Pradesh
<b>Backward (Index .26-.50)</b>		
Maharashtra, Assam Andhra Pradesh, Orissa, Madhya Pradesh, Tamil Nadu, Orissa	Assam, Bihar, West Bengal, All-India Punjab, Gujarat, Karnataka, Maharashtra	Assam, Andhra Pradesh All-India, Haryana, Orissa, Madhya Pradesh West Bengal, Karnataka
<b>Developed (Index .51-.75)</b>		
Maharashtra, Gujarat, Himachal Pradesh Haryana, Uttar Pradesh,	Punjab, Karnataka Gujarat, Kerala, Punjab,	Haryana Tamil Nadu, All India
<b>Highly Developed (Index .76-.10)</b>		
Kerala, Tamil Nadu, Kerala Kerala	Himachal Pradesh	Himachal Pradesh

\* Rural and Urban

In urban areas, Bihar has highly backward status for both primary and upper primary level. However, Uttar Pradesh has highly backward status for upper primary level. The states having highly backward status at primary level are West Bengal, Orissa, Andhra Pradesh, Gujarat, Madhya Pradesh, Assam and Rajasthan. Kerala has highly developed status for both primary and upper primary level whereas Tamil Nadu has this status for upper primary level only.

**Table 4.24 : Index for Progress in Education for All Stages : Urban Areas**

<b>Primary</b>	<b>Upper Primary</b>
<b>Highly Backward</b>	
Bihar, West Bengal, Orissa, Andhra Pradesh, Gujarat, Madhya Pradesh, Assam, Rajasthan	Uttar Pradesh, Bihar
<b>Backward</b>	
Uttar Pradesh, Himachal Pradesh, Tamil Nadu, Maharashtra, Karnataka, All-India	Gujarat, Assam, Karnataka, All-India, Madhya Pradesh, Rajasthan, Andhra Pradesh West Bengal
<b>Developed</b>	
Punjab, Haryana Himachal Pradesh,	Maharashtra, Orissa, Punjab, Haryana
<b>Highly Developed</b>	
Kerala	Kerala, Tamil Nadu

## Chapter V

### QUALITY OF TEACHING

#### Quality of Teaching as an Educational Development Parameter

Educational System in India, particularly at school level, is characterised by poor quality of education. One of the dominant factor contributing to low learning apart from social, economic and numerous others, is the quality of teaching at the school stage. The schools at primary and middle level have very high teacher pupil ratios. There are evidences of one teacher schools also at the primary level. The scenario is much more disturbing in rural and remote areas. Lack of motivation and accountability are the predominant features among school teachers. The 'Quality of Teaching' being a significant factor associated with qualitative and quantitative development of education in an area, has thus been selected as one of the to study the comparative scenario of educational development in various states. The sub-identified for analysing quality of teaching at school level are :

- i) Pupil Per Teacher
- ii) Percentage of Trained Teachers
- iii) Percentage of Female Teachers
- iv) Percentage of Schools with two or more Teachers.

The parameter on 'Percentage of Schools with two or more teachers' will be considered for primary level only. These sub- will help to visualize the adequacy of teaching faculty in schools, the status of teacher's training, the representation of female teachers among teaching faculty and the proportion of schools with at least two teachers in rural and urban areas of the states. These variables will assess the quantitative as well as qualitative aspects of the teaching input at school level. The disparities in quality of teaching will be analyzed separately for rural and urban areas.

#### Quality of Teaching at Primary Stage of Education

##### **Relationship among Sub-**

The parameter 'Pupil Per Teacher' has inverse relationship with all other sub-. In rural areas, all the except 'Pupil Per Teacher' have positive correlation among themselves but the correlation coefficients are not significant. Most of the for 'Quality of Teaching' in urban areas on the other hand have low correlation's among themselves. All the variables are inversely correlated with the variable 'Percentage of Schools with two or more teachers'. There is significant positive correlation between Trained Teachers and Female Teachers.

**Table 5.1 : Correlation Matrix for Quality of Teaching : Primary Level**

Variables	Rural				Urban			
	Pupil Per Teacher	Percent of Trained Teacher	Percentage of Female Teacher	Percentage of Schools with 2 or more Teachers	Pupil Per Teacher	Percent of Trained Teacher	Percentage of Female Teacher	Percentage of Schools with 2 or more Teachers
Pupil Per Teacher	1	-0.01	-0.38	-0.02	1	0.49	0.03	0.58
Percentage of Trained Teacher	-0.01	1	0.54	0.4	0.49	1	0.58	0.26
Percentage of Female Teachers	-0.38	0.54	1	0.41	0.03	0.58	1	0.03
Percentage of schools with two or more teachers	-0.02	0.4	0.41	1	0.58	0.26	0.03	1

### Extraction of Principal Components

Principal Components analysis on variables for 'Quality of Teaching' in rural areas has extracted two principal components (Table 5.2). The first principal component (PC) explains 49 percent variation and Second PC explains 27 percent variation among the . The cumulative variation explained by the two variables is 76 percent. The eigen value for the first parameter is 1.96 and for the second parameter is 1.08. For Urban areas also two PC's have been extracted for analysis. First PC has 2.03 as eigen value and explains 51% of variation and the second PC has 1.24 as eigen value and explains 31% variation. The two PC's together extracts 82% variation among variables.

The factor loadings indicate the amount of correlation of the variable with the principal component. Table 5.2 gives the factor loadings for each of the extracted principal components. The first factor has high but negative factor loadings for the variables, 'Female Teachers', 'Trained Teachers' and 'Schools with two or more Teachers'. Loadings for these three variables are more than .69 and are thus significant. The first principal component can be titled as 'Profile and Adequacy of Teachers'. The first PC has very low factor loading for the variable Pupil Per Teacher. The second factor also has negative factor loadings for all the variables except female teachers. The Second PC has very high factor loading for 'Pupil Per Teacher' (-0.89) and comparatively low factor loading for the other variables. The second principal component can thus be designated as 'Pupil Per Teacher'. Based on the level of significance of the person correlation coefficient the significance for factor loading is examined. Based on this criteria, the second and third factor loadings for first PC and first factor loading for the second PC are significant.

The Principal Component method has extracted two PC's for urban areas. The first PC has high positive factor loadings for the variables 'Pupil Per Teacher' (0.79) and Trained Teachers (0.83). But it has negative high factor loading for the variable 'Schools with two or more teachers' (-0.67). The First Principal Component can be interpreted as contrast between fourth and other three variables. The Second PC has high factor loading for female teachers (0.78). This factor is representative of 'Female teachers among schools'.

**Table: 5.2 Factor Loading for 'Quality of Teaching' : Primary Level**

Variables	Rural		Urban	
	Factor 1	Factor 2	Factor 1	Factor 2
Pupil Per Teacher	0.36062	-0.894467	0.786141	-0.446396
Percentage of Trained Teachers	-0.773795	-0.324479	0.8339	0.378833
Percentage of Female Teachers	-0.870683	0.206601	0.514404	0.778319
Percentage of Schools with two or more teachers	-0.694859	-0.361752	-0.673159	0.542738
Eigen Value	1.969724	1.078907	2.031162	1.243129
Variation Explained	49.24310	26.97267	50.7795	31.07822

### Principal Component Index

The development index for quality of teaching based on 'Principal Component Analysis' reveals that Kerala has first rank for rural areas but has tenth rank for urban areas. The first four leading states in rural areas apart from Kerala are Gujarat, Tamil Nadu, Punjab and Himachal Pradesh whereas the leading states in urban areas are Punjab, Haryana, Maharashtra, Karnataka and Andhra Pradesh. States which are among last five in ranking for both rural and urban areas are West Bengal, Uttar Pradesh, Madhya Pradesh and Assam. In addition, Bihar is lagging behind in rural areas and Rajasthan is lagging behind in urban areas.

**Table 5.3 : Index for Development of Quality in Teaching at Primary Level : Principal Component Analysis**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.437	11	0.89	5
Assam	0.336	15	0.217	13
Bihar	0.339	14	0.711	8
Gujarat	0.695	2	0.845	7
Haryana	0.56	7	0.901	2
Himachal Pradesh	0.64	5	0.707	9

Karnataka	0.541	8	0.896	4
Kerala	0.516	1	0.684	10
Madhya Pradesh	0.162	17	0.058	17
Maharashtra	0.597	6	0.901	3
Orissa	0.464	9	0.604	11
Punjab	0.673	4	0.956	1
Rajasthan	0.457	10	0.142	15
Tamil Nadu	0.685	3	0.852	6
Uttar Pradesh	0.343	13	0.116	16
West Bengal	0.224	16	0.204	14
All-India	0.43	12	0.516	12

### Level of Development of Quality of Teaching

Analysis of level of development in 'Quality of Teaching' reveals that there are three categories of states:

- i) States which have same status for rural and urban areas like West Bengal and Madhya Pradesh (Highly Backward), Himachal Pradesh (Developed)
- ii) States which have rural status better than urban status like; Rajasthan, Uttar Pradesh, Assam, Kerala.
- iii) States which have urban status better than rural status like; Orissa, Bihar, Andhra Pradesh, Punjab, Haryana, Maharashtra, Karnataka, Tamil Nadu and Gujarat.

In Andhra Pradesh there are wide variations in rural-urban status. It has backward status for rural areas but has highly developed status for urban areas.

**Table 5.4: Level of Development of Quality of Teaching : Primary Level**

Index Value							
Rural				Urban			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
.01-.25	.26-.50	.51-.75	.76-1.00	.01-.25	.26-.50	.51-.75	.76-1.00
West Bengal Madhya Pradesh	Orissa Rajasthan Andhra Pradesh All India Uttar Pradesh Bihar Assam	Gujarat Tamil Nadu Punjab Himachal Pradesh Maharashtra Haryana Karnataka	Kerala	Assam West Bengal Rajasthan Uttar Pradesh Madhya Pradesh		Bihar Himachal Pradesh Kerala Orissa All India	Punjab Haryana Maharashtra Karnataka Andhra Pradesh Tamil Nadu Gujarat

## Composite Variable Rank

Table 5.5 presents the variable ranks and Composite Variable ranks for quality for teaching at primary stage of education. In rural areas, although Kerala has first rank for all and composite variable rank is also first but it has Seventh rank for the variable 'Percentage of Trained Teachers'. In urban areas also Kerala has first Composite Variable rank but has first rank only for one variable i.e. 'Percentage of Schools with two or more Teachers'. Andhra Pradesh has high rank only for the variable 'Trained Teachers' both in rural as well as in urban areas. Assam has high rank for the variable 'Pupil Per Teacher' for both rural and urban areas. Gujarat has all variable ranks below six in rural areas except the variable 'Percentage of Schools with two or more Teachers' whereas in urban areas all the variable ranks are above six. Haryana has low rank only for parameter 'Pupil Per Teacher' both in rural and urban areas. Madhya Pradesh has low rank for most of the variables both in rural as well as in urban areas. Punjab has high ranks for all variables except for the variable 'Pupil Per Teacher'. Rajasthan has high rank only for the variable 'Pupil Per Teacher' in urban areas. Tamil Nadu has maximum number of trained teachers both in rural and urban areas. Uttar Pradesh and West Bengal have high ranks for the variable 'Schools with two or more Teachers'. The prominent feature of the variable rank analysis among states is that in most of the cases either a variable is developed in both rural as well as urban areas or has not developed in either of the areas.

**Table : 5.5 Variable/Composite Variable Ranks for Quality of Teaching for Rural Areas : Primary Level**

States	Variable Rank				Composite Variable Rank
	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers	Percentage of Schools with two or more Teacher	
Andhra Pradesh	13	3	10	15	10
Assam	3	16	11	16	12
Bihar	13	11	14	10	13
Gujarat	2	5	5	12	4
Haryana	12	2	4	7	5
Himachal Pradesh	4	6	6	9	5
Karnataka	6	8	7	11	7
Kerala	1	7	1	1	1
Madhya Pradesh	9	17	17	14	14
Maharashtra	2	10	8	8	6
Orissa	5	12	13	6	8
Punjab	10	4	2	4	3
Rajasthan	7	9	12	13	10
Tamil Nadu	6	1	3	5	2
Uttar Pradesh	10	13	15	3	10
West Bengal	11	15	16	2	11
India	8	14	9	9	9



The states having high Composite Variable rank in both rural and urban areas are Haryana, Himachal Pradesh, Kerala, Punjab and Tamil Nadu. In addition Gujarat is leading in rural areas and Maharashtra in urban areas. The state lacking both in rural and urban areas are Bihar. Also Madhya Pradesh, West Bengal and Assam are lacking in rural areas and Rajasthan, Gujarat are lacking these facilities in urban areas.

**Table : 5.6 Variable/Composite Variable Ranks for Quality of Teaching for Urban Areas : Primary Level**

States	Variable Rank				Composite Variable Rank
	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers	Percentage of Schools with two or more Teacher	
Andhra Pradesh	13	2	10	16	8
Assam	3	15	9	13	7
Bihar	11	7	13	14	12
Gujarat	12	11	6	15	11
Haryana	10	8	3	6	5
Himachal Pradesh	1	9	1	5	2
Karnataka	12	6	5	17	7
Kerala	3	4	7	1	1
Madhya Pradesh	4	17	12	8	8
Maharashtra	3	5	8	7	4
Orissa	9	10	14	9	9
Punjab	7	3	2	4	2
Rajasthan	2	13	16	12	10
Tamil Nadu	6	1	4	11	3
Uttar Pradesh	5	16	15	3	6
West Bengal	8	14	17	2	8
India	8	12	11	10	8

### Growth in Quality of Teaching

The growth in 'Percentage of Trained Teachers' during the period was maximum in Uttar Pradesh and minimum in West Bengal. The 'Percentage of Female Teachers' increased maximum in Punjab whereas the growth in 'Percentage of Schools with two or more Teachers' was maximum in Bihar. The 'Pupil Teacher Ratio' was lowest in Karnataka followed by Kerala and was maximum in Bihar and Gujarat. Assam, Bihar and Gujarat had high growth rank only for the variable 'Percentage of Schools with two or more Teachers'. The states which have high growth only for the variable 'Trained Teachers' are Uttar Pradesh, Orissa and Madhya Pradesh. The states which are leading in growth in 'Percentage of Female Teachers' are Gujarat, Kerala, Maharashtra and Punjab.

**Table 5.7 : Growth in Quality of Teaching during the Period 1993-1997 : Primary level**

States/UT	Growth Index				Rank				Composite Growth Rank
	Pupil Per Teacher	% of Trained Teachers	% of Female Teachers	% of Schools With two more teachers	Pupil Per Teachers	% of Trained Teachers	% of Female Teachers	% of Schools with two more teachers	
Andhra Pradesh	0.48	0.67	0.49	0.53	5	10	10	6	4
Assam	0.53	0.7	0.4	0.72	9	6	16	2	8
Bihar	0.69	0.67	0.37	0.79	16	10	17	1	9
Gujarat	0.61	0.7	0.59	0.6	15	5	4	3	12
Haryana	0.52	0.68	0.53	0.19	7	8	7	15	3
Himachal Pradesh	0.47	0.63	0.42	0.58	4	11	14	4	1
Karnataka	0.4	0.71	0.56	0.6	1	4	6	3	9
Kerala	0.41	0.71	0.66	0.2	2	6	3	14	4
Madhya Pradesh	0.59	0.7	0.5	0.44	12	2	8	11	10
Maharashtra	0.45	0.73	0.67	0.36	3	8	2	13	5
Orissa	0.5	0.68	0.41	0.57	6	2	15	5	7
Punjab	0.53	0.73	0.75	0.49	8	7	1	9	10
Rajasthan	0.64	0.68	0.56	0.49	14	8	5	9	11
Tamil Nadu	0.54	0.67	0.46	0.43	10	9	13	12	2
Uttar Pradesh	0.54	0.86	0.46	0.45	11	1	12	10	9
West Bengal	0.63	0.6	0.48	0.52	13	12	11	7	6
All-India	0.54	0.71	0.5	0.48	11	3	9	8	10

States which had high rank in quality of teaching in 1993 and had maintained the high rank till 1997 are Tamil Nadu, Haryana, Himachal Pradesh, Kerala and Maharashtra. Moreover, the ranks for these states were high for both rural as well as Urban areas. The states which had low growth profile for this variable during the period in rural areas are Bihar and Madhya Pradesh. No other State has low rank either for rural or urban areas.

Table 5.8 presents comparative scenario of status of states in quality of teaching in 1993 and 1997. In rural areas, Tamil Nadu, Haryana, Himachal Pradesh, Kerala and Maharashtra had high rank for quality of teaching in 1993 and maintained their status till 1997. On the other hand, Andhra Pradesh and West Bengal which had high rank in 1993 had medium growth rank during 1993-97. Other states for which ranks had gone down during this period in rural areas are Bihar and Madhya Pradesh. Gujarat and Punjab on the other hand improved their ranks during this period.

In urban areas, the states which maintained high rank from 1993 to 1997 are Haryana, Himachal Pradesh, Kerala, Maharashtra and Tamil Nadu. Punjab and Uttar Pradesh have also improved their rank from medium to high. On the other hand, ranks of Andhra Pradesh and West Bengal have gone down from high to medium during this period.

**Table 5.8 : Status of States in Quality of Teaching in 1993 vis-à-vis its Growth during 1993-97**

Growth Rank (1993-97)	Variable Rank (1993)					
	Rural			Urban		
	High (1 to 6)	Medium (1 to 12)	Low (13 to 17)	High (1 to 6)	Medium 7 to 12)	Low (13 to 17)
High (1 to 6)	Tamil Nadu Haryana Himachal Pradesh Kerala Maharashtra	Gujarat Punjab		Haryana Himachal Pradesh Kerala Maharashtra Tamil Nadu	Punjab Uttar Pradesh	
Medium (7 to 12)	Andhra Pradesh West Bengal	Assam Karnataka Orissa Rajasthan Uttar Pradesh All-India		Andhra Pradesh West Bengal	Rajasthan Assam Bihar Gujarat Karnataka Madhya Pradesh Orissa All-India	
Low (13 to 17)		Bihar Madhya Pradesh				

### **Educational Development Index for Quality of Teaching**

Table 5.9 presents educational development index based on three different methods. The ranks based on Principal Component Analysis and Composite Variable Analysis relates to the year 1993 whereas the Growth Rank is based on progress in quality of teaching during the period 1993-97. It shows that the states of Tamil Nadu, Haryana, Himachal Pradesh, Kerala, Maharashtra had good ranks in 1993 and has maintained the progress during 1993-97. In Punjab the ranks in the year 1993 were good but the progress made during the period is not satisfactory.

**Table 5.9 : Educational Development Index for Quality of Teaching : 025  
Primary Level**

States	Educational Development Index				
	Composite Variable Rank		Principal Component Rank		Variable Growth Rank
	Rural	Urban	Rural	Urban	
Andhra Pradesh	10	8	11	5	4
Assam	12	7	15	13	8
Bihar	13	12	14	8	9
Gujarat	4	11	2	7	12
Haryana	5	5	7	2	3
Himachal Pradesh	5	2	5	9	1
Karnataka	7	7	8	4	9
Kerala	1	1	1	10	4
Madhya Pradesh	14	8	11	17	10
Maharashtra	6	4	6	3	5
Orissa	8	9	9	11	7
Punjab	3	2	4	1	10
Rajasthan	10	10	10	15	11
Tamil Nadu	2	3	3	6	2
Uttar Pradesh	10	6	13	16	9
West Bengal	11	8	16	14	6
All-India	9	8	12	12	10

**Quality of Teaching at Upper Primary level of Education**  
**Relationship among Sub-variables**

In rural areas, the variables have low but positive correlation coefficients. The correlation among, the variables Pupil Per Teacher and 'Percentage of Female Teachers' is insignificant. The sub- do not exhibit significant relationship in rural areas but the correlation coefficients among these are significant for urban areas except for the variables Pupil Per Teacher and 'Percentage of Female Teachers'.

**Table 5.10 : Correlation Matrix for 'Quality of Teaching' : Upper Primary**

Variable	Rural			Urban		
	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers
Pupil Per Teacher	1	0.43	0.03			
Percentage of Trained Teachers	0.43	1	0.3			
Percentage of Female Teachers	0.03	0.3	1			

## Extraction of Principal Components

The Principal Component analysis has extracted one PC for analysis for rural areas. The Eigen value for the extracted PC is 1.60 and it explains 53 per cent variation among variables. The PC has high factor loadings for first two variables. The factor extracted for rural area represents the relationship among 'Pupil and Trained Teachers'. For urban areas also the Principal Component Analysis has extracted one PC for the purpose. The Eigen value for the PC is 1.75 and it explains 58 percent variation. The factor loading for the PC is very high for the variable 'Percentage of Trained Teachers'. The extracted PC has highest correlation with this variable. The factor loading for the variable 'Pupil Per Teacher' is also significant. This factor can also be named as 'Pupil and Trained Teachers' on similar lines as for rural areas.

**Table 5.11: Factor Loadings / Eigen Value for Quality of Teaching  
: Upper Primary**

Variables	Factor Loading	
	Rural	Urban
Pupil Per Teacher	0.766802	.694386
Percentage of Trained Teachers	-0.884785	-.928994
Percentage of Female Teachers	-0.478646	-.639544
Eigen Value	1.599933	1.754220
Exp. Variance	.533311	.584740

## Development Index for Quality of Teaching : Principal Component Analysis

Tamil Nadu has first rank for quality of teaching at upper primary level of education both for rural and urban areas followed by Karnataka which has second rank for both areas. Haryana has third rank for rural areas whereas Gujarat is third in Urban areas. The states lagging behind in both rural and urban areas are Assam and Madhya Pradesh. Himachal Pradesh and Orissa have last ranks for rural areas and Rajasthan, Uttar Pradesh are among last five ranking states in urban areas.

The states for which rural ranks are better than the urban ranks are Bihar, Haryana, Kerala and Rajasthan. The states which have same rank for rural and urban areas are Andhra Pradesh, Assam, Karnataka, Madhya Pradesh and Tamil Nadu.

**Table 5.12: Index for Development of Quality of Teaching at Upper Primary Level**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.908	5	0.789	5
Assam	0.050	17	0.004	17
Bihar	0.824	8	0.709	10
Gujarat	0.904	6	0.848	3
Haryana	0.926	3	0.786	6

Himachal pradesh	0.585	15	0.572	13
Karnataka	0.957	2	0.876	2
Kerala	0.922	4	0.750	8
Madhya Pradesh	0.553	16	0.381	16
Maharashtra	0.834	7	0.837	4
Orissa	0.658	14	0.687	11
Punjab	0.763	9	0.775	7
Rajasthan	0.728	11	0.497	15
Tamil Nadu	0.995	1	0.912	1
Uttar pradesh	0.663	13	0.527	14
West Bengal	0.720	12	0.670	12
All India	0.759	10	0.714	9

### Level of Development in Quality of Teaching

Analysis of level of development in quality of teaching at Upper primary level of education reveals that Assam is highly backward state in both rural and urban areas. Rajasthan and Madhya Pradesh developed these facilities better in rural areas than in urban areas. Kerala and Bihar also have better development in rural areas than urban areas. The states which have highly developed facilities in both rural as well as urban areas are Tamil Nadu, Karnataka, Gujarat, Maharashtra, Andhra Pradesh, Haryana and Punjab.

**Table 5.13: Level of Development in Quality of Teaching : Upper Primary Level**

Rural				Urban			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
Assam		All India Rajasthan West Bengal Uttar Pradesh Orissa Himachal Pradesh Madhya Pradesh	Tamil Nadu Karnataka Haryana Kerala Andhra Pradesh Gujarat Maharashtra Bihar Punjab	Assam	Rajasthan Madhya Pradesh	Kerala India Bihar Orissa West Bengal Himachal Pradesh Uttar Pradesh	Tamil Nadu Karnataka Gujarat Maharashtra Andhra Pradesh Haryana Punjab

Highly Developed : Index Value (.76-1.00)  
 Developed : Index Value (.51-.75)  
 Highly Backward : Index Value (.26-.50)  
 Backward : Index Value (.01-.25)

## Composite Variable Rank

Table (5.14) presents ranks of the States for quality of teaching at upper primary level. It can be seen from the table that Punjab which is leading at number one among composite variable ranks is at number six for the variable 'Trained Teachers'. Tamil Nadu also has high composite variable rank but has low rank for the variable 'Pupil Per Teacher'. The comparison of variable and composite variable rank shows that other states also have similar pattern. The States which have high rank for one variable do have low rank for other variables. A cross sectional analysis of variable ranks and composite variable rank has thus been done to identify weak/ strong areas of the States.

**Table 5.14 : Variable/Composite Variable Ranks for Quality of Teaching : Upper Primary Level**

States	Rural				Urban			
	Variable Rank				Variable Rank			
	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers	Composite Variable Rank	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers	Composite Variable Rank
Andhra Pradesh	12	5	11	8	11	2	8	4
Assam	1	17	12	10	2	17	14	11
Bihar	11	10	14	12	12	5	12	8
Gujarat	8	2	5	3	14	7	6	6
Haryana	9	4	4	5	7	11	3	4
Himachal Pradesh	1	3	10	2	1	10	2	2
Karnataka	13	9	6	8	15	4	5	6
Kerala	4	11	1	4	6	11	4	4
Madhya Pradesh	5	16	17	13	4	16	13	10
Maharashtra	7	7	8	6	13	3	7	5
Orissa	4	13	16	11	9	8	11	7
Punjab	1	6	2	1	3	6	1	1
Rajasthan	3	8	13	7	5	15	16	13
Tamil Nadu	10	1	3	2	12	1	3	3
Uttar Pradesh	2	12	15	9	6	14	15	12
West Bengal	6	15	9	10	8	12	10	9
All India	7	14	7	8	10	13	9	10

Cross sectional analysis of composite variable rank and variable ranks presented in table (5.15) shows that 'Pupil Per Teacher' has low rank in the urban areas of Gujarat, Karnataka and Maharashtra. These three states have high ranks for other quality of teaching except for this parameter. The rank of Madhya Pradesh (Rural) and Rajasthan (Urban) are low for 'Trained Teachers' as well as for 'Female Teachers'. The overall rating for quality of teaching for these states are also not good.

**Table 5.15 : Areas of Concern/Strengths of States in Quality of Teaching: Upper Primary Level**

Areas of Concern/ Strengths	Pupil Per Teacher		Percentage of Trained Teachers		Percentage of Female Teachers	
	Rural	Urban	Rural	Urban	Rural	Urban
<b>Areas of Concern</b>						
i) States with low Composite Variable and low variable ranks	-	-	Madhya Pradesh	Rajasthan	Madhya Pradesh	Rajasthan
ii) Composite Variable rank high but variable rank low	-	Gujarat Karnataka Maharashtra	-	-	-	-
<b>Strengths</b>						
i) Composite Variable rank low but variable rank high	Madhya Pradesh	Rajasthan	-	-	-	-
ii) Composite Variable rank and variable rank high	Himachal Pradesh Kerala Punjab	Himachal Pradesh Kerala Punjab	Gujarat Haryana Himachal Pradesh Punjab Tamil Nadu	Andhra Pradesh Karnataka Maharashtra Punjab Tamil Nadu	Tamil Nadu Gujarat Haryana Kerala Punjab	Tamil Nadu Himachal Pradesh Gujarat Haryana Karnataka Kerala Punjab

### **Growth in Quality of Teaching at Upper Primary Level**

To assess the growth in quality of teaching, the ranks of the state in 1993 are compared with the growth rank of the State for 1993-97. The analysis has helped to identify States which had low rank for quality of teaching in 1993 as well as in 1997. In the states thus identified, the quality of teaching will be the area which needs attention. At the same time, the States with higher rank in quality of in 1993 and 1997 have been identified.



**Table 5.16 : Growth Index for Quality of Teaching for the Period 1993-1997: Upper Primary Level**

States	Growth Index			Rank			
	Pupil Per Teacher	% of Trained Teachers	% of Female Teachers	Pupil Per Teacher	% of Trained Teachers	% Female Teachers	Composite Growth Rank
Andhra Pradesh	-0.45	0.45	0.55	15	16	1	11
Assam	0.54	0.78	0.28	4	1	15	4
Bihar	0.58	0.49	0.39	2	14	12	8
Gujarat	0.5	0.49	0.52	10	11	3	6
Haryana	0.33	0.48	0.33	17	13	14	14
Himachal Pradesh	0.5	0.53	0.26	9	4	16	9
Karnataka	0.46	0.52	0.52	14	6	4	6
Kerala	0.49	0.53	0.51	12	5	5	5
Madhya Pradesh	0.57	0.5	0.53	3	10	2	1
Maharashtra	0.5	0.49	0.48	11	12	6	9
Orissa	0.51	0.56	0.24	8	2	17	7
Punjab	0.36	0.52	0.42	16	7	11	13
Rajasthan	0.63	0.51	0.46	1	8	7	2
Tamil Nadu	0.48	0.5	0.43	13	9	9	10
Uttar Pradesh	0.52	0.54	0.41	6	3	10	3
West Bengal	0.53	0.46	0.36	5	15	13	12
All India	0.51	0.46	0.46	7	-	8	1

### **Comparative Scenario of Quality of Teaching in 1993 and 1997**

In Punjab and Haryana the rank for quality of teaching drastically changed from high to low during the period 1993-97 in both rural as well as urban areas. The deterioration in standard of teaching in these states during this period is the matter of concern. On the other hand, the teaching standard has gone down marginally from high to medium in rural areas of Tamil Nadu, Himachal Pradesh, Maharashtra and urban areas of Tamil Nadu, Himachal Pradesh, Maharashtra and Andhra Pradesh.

**Table 5.17 : Variable Rank/Variable Growth Rank in Quality of Teaching :  
Upper Primary Level**

Variable Rank 1993	Growth Rank (1993-97)					
	Rural			Urban		
	High 1 to 6	Medium 7 to 12	Low 13 to 17	High 1 to 6	Medium 7 to 12	Low 13 to 17
<b>High 1 to 6</b>	Gujarat Kerala	Himachal Pradesh Maharashtra Tamil Nadu	Haryana Punjab	Gujarat Karnataka Kerala	Andhra Pradesh Himachal Pradesh Maharashtra Tamil Nadu	Haryana Punjab
<b>Medium 7 to 12</b>	Assam Karnataka Rajasthan Uttar Pradesh All-India	Andhra Pradesh Bihar Orissa West Bengal		Assam Madhya Pradesh Uttar Pradesh All-India	Bihar Orissa West Bengal	
<b>Low 13 to 17</b>	Madhya Pradesh			Rajasthan		

### Educational Development Index

Table 5.18 Presents educational development index for sixteen states based on:

- i) Composite Variable Rank : Each variable has been given state-wise rank separately and then composite index is arrived at by contributing all Variable ranks.
- ii) Principal Component Analysis : Each variable has been assigned weight using the Principal Component Analysis to arrive at the educational development index for states.
- iii) Variable Growth Index is based on growth of each variable during the period 1993-97.

**Table 5.18 : Educational Development Index for Quality of Teaching : Upper Primary Level**

States	Composite Variable Rank		Principal Component Rank		Growth Rank
	Rural	Urban	Rural	Urban	
Andhra Pradesh	8	4	5	5	11
Assam	10	11	17	17	4
Bihar	12	8	8	10	8
Gujarat	3	6	6	3	6
Haryana	5	4	3	6	14
Himachal Pradesh	2	2	15	13	9
Karnataka	8	6	2	2	6

Kerala	4	4	4	8	5
Madhya Pradesh	13	10	16	16	1
Maharashtra	6	5	7	4	9
Orissa	11	7	14	11	7
Punjab	1	1	9	7	13
Rajasthan	7	13	11	15	2
Tamil Nadu	2	3	1	1	10
Uttar Pradesh	9	12	13	14	3
West Bengal	10	9	12	12	12
All India	8	10	10	9	1

### Quality of Teaching at High Secondary Level of Education

#### Relationship among Sub-variables

At high secondary level, the correlation coefficients are positive but less than .5 for all variables in rural areas. But in urban areas, the correlation coefficient among the variables 'Trained Teacher' and 'Pupil Per Teacher' is high.

**Table 5.19 : Correlation Matrix for 'Quality of Teaching'  
: High Secondary Level**

Variable	Rural			Urban		
	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers	Pupil Per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers
Pupil Per Teacher	1.00	0.45	0.16	1.00	0.66	-.10
Percentage of Trained Teachers	0.45	1.00	0.16	0.66	1.00	0.21
Percentage of Female Teachers	0.16	0.16	1.00	-0.10	0.21	1.00

#### **Extraction of Principal Component**

In rural areas one PC has been extracted for the purpose of analysis which has 1.58 as Eigen value and explains 53 percent of variation among variables. The extracted PC has very high factor loadings for the variables 'Pupil Per Teacher' and 'Percentage of Trained Teachers'. The factor loading for the variable 'Percentage of Female Teachers' is not significant. The analysis for urban variables has extracted two PC's. The first PC has Eigen value as 1.73 and explains 58 percent variation among variables.. The second PC has 1.02 as Eigen value and explains 34 percent variation among variables. The two PC's together explains 92 percent of variation among variables and hence provide an excellent summary for all variables. The first PC has high factor loadings for first two variables. This variable can be titled as 'Pupil and Trained Teachers'. The Second PC has very high factor loadings for third variable and thus can be designated as factor 'Female Teachers'.

Table 5.20 : Factor Loadings/Eigen Value for 'Quality of Teaching' : High Secondary

Variable	Factor Loading		
	Rural	Urban	
	Factor 1	Factor 1	Factor 2
Pupil Per Teacher	.824301	-.896363	.285759
Percentage of Trained Teachers	-.822166	.934867	.040239
Percentage of Female Teachers	-.471938	.225897	.967364
Eigen Value	1.578155	1.728473	1.019070
Variance Exp.	.526051	.576157	.339690

### Development Index for Quality of Teaching : Principal Component Analysis

The first five leading states in quality of teaching in rural and urban areas are Tamil Nadu, Kerala, Haryana and West Bengal. The first five ranking states also includes Punjab (Urban areas) and Himachal Pradesh (rural areas). The states having last five ranks in rural as well as urban areas are Rajasthan, Orissa, Madhya Pradesh and Assam. In addition, Karnataka (rural) and Gujarat (urban) are among last five ranking states. The states for which rural ranks are better than urban are Uttar Pradesh, Tamil Nadu, Madhya Pradesh, Himachal Pradesh, Gujarat and Bihar.

Table 5.21 : Educational Development Index for Quality of Teaching : The Principal Component Analysis

State	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	.723	7	.844	6
Assam	.028	17	.118	17
Bihar	.692	9	.750	12
Gujarat	.640	12	.732	13
Haryana	.875	3	.964	3
Himachal Pradesh	.803	4	.824	8
Karnataka	.579	13	.772	11
Kerala	.938	2	.986	1
Madhya Pradesh	.382	15	.403	16
Maharashtra	.666	10	.833	7

Orissa	.257	16	.580	15
Punjab	.763	6	.975	2
Rajasthan	.500	14	.612	14
Tamil Nadu	.949	1	.950	4
Uttar Pradesh	.763	8	.787	9
West Bengal	.771	5	.848	5
All India	.651	11	.773	10

### Level of Development in Quality of Teaching at High Secondary Stage

Assam has highly backward status in quality of teaching at high secondary level for both rural and urban areas whereas Orissa has this status for rural areas only. Urban areas of Orissa are covered under developed category. Rural areas of Rajasthan are covered under backward category but urban areas are included under developed states. The states which have highly developed status for both rural and urban areas include Kerala, Tamil Nadu, Haryana, Himachal Pradesh, West Bengal and Punjab.

Table 5.22 : Level of Development for Quality of Teaching : High Secondary

Rural				Urban			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
Orissa Assam	Rajasthan Madhya Pradesh	Andhra Pradesh Uttar Pradesh Bihar Maharashtra All India Gujarat Karnataka	Tamil Nadu Kerala Haryana Himachal Pradesh Punjab West Bengal	Assam	Madhya Pradesh	Bihar Gujarat Rajasthan Orissa	Kerala Punjab Haryana Tamil Nadu West Bengal Andhra Pradesh Maharashtra Himachal Pradesh Uttar Pradesh All India Karnataka

High Developed : Index Value (.76-1.00)  
 Developed : Index Value (.56-.75)  
 Backward : Index Value (.26 - .50)  
 Highly Backward : Index Value (.01 - .25)

## Composite Variable Index for Quality of Teaching

The States which have first five ranks for both rural and urban areas include Punjab, Kerala, Tamil Nadu, Haryana and Andhra Pradesh. Among these the rural ranks of the states Punjab and Haryana are higher than their urban ranks. Other states among first five ranks in rural areas are Assam and Gujarat and in urban areas are Himachal Pradesh and Maharashtra. The states ranked among last five in both rural and urban areas are Bihar, West Bengal and Uttar Pradesh. However, Maharashtra and Madhya Pradesh are lagging behind in rural areas and Assam is lagging behind in urban areas. State to be noted in this analysis is Assam which is among first five states for rural areas and among last five states in urban areas. Maharashtra on the other hand is among first five in urban areas and among last five in rural areas.

**Table 5.23 : Variable/Composite Variable Ranks for High Secondary Level**

States/UT	Rural				Urban			
	Pupil Per Teachers	Percentage of Trained Teachers	Percentage of Female Teachers	Composite Variable Rank	Pupil per Teacher	Percentage of Trained Teachers	Percentage of Female Teachers	Composite Variable Rank
Andhra Pradesh	9	6	9	5	7	4	7	4
Assam	2	17	7	7	1	17	13	10
Bihar	10	12	15	13	11	10	17	13
Gujarat	5	7	10	4	8	3	15	6
Haryana	11	2	4	3	9	9	4	5
Himachal Pradesh	10	5	5	6	4	11	2	3
Karnataka	4	9	12	6	7	8	12	7
Kerala	8	4	1	2	5	2	1	1
Madhya Pradesh	6	16	14	12	2	16	10	8
Maharashtra	7	11	11	9	6	5	6	3
Orissa	1	15	10	7	2	15	11	8
Punjab	5	3	2	1	9	6	3	4
Rajasthan	3	10	13	7	3	13	14	9
Tamil Nadu	13	1	3	3	7	1	5	2
Uttar Pradesh	10	8	16	11	12	7	16	12
West Bengal	12	13	8	10	10	14	8	11
All India	7	14	6	8	6	12	9	7

## Areas of Concern/Strength in Quality of Teaching

There are large number of states which have high composite variable rank as well as high variable ranks for quality of teaching at High Secondary Level (Table 5.24). But some states have low variable and low state ranks for a particular variable which is the areas of concern. Tamil Nadu, which otherwise have overall high rank, has low rank in the field of 'Pupil Per Teacher' in rural areas. Similarly, Gujarat also has low variable rank for 'Female Teachers' in urban areas. Only state which has low Composite Variable and low variable rank for 'Female Teachers' both in rural as well as urban areas is Bihar.

**Table 5.24 : Areas of Concern/Strength in Quality of Teaching : High Secondary**

Areas of Concern/ Strengths	Pupil Per Teacher		Percentage of Trained Teachers		Percentage of Female Teachers	
	Rural	Urban	Rural	Urban	Rural	Urban
<b>Areas of Concerns</b>						
i) Low composite variable and low variable ranks	-	-	-	-	Bihar	Bihar
ii) composite variable rank high but variable rank low	Tamil Nadu	-	-	-	-	Gujarat
<b>Strengths</b>						
i) Composite variable rank low but variable rank High	-	-	-	-	--	
ii) Composite variable rank high and Variable rank high	Gujarat Karnataka Punjab	Himachal Pradesh Kerala Maharashtra	Andhra Pradesh Himachal Pradesh Haryana Kerala, Tamil Nadu Punjab	Andhra Pradesh Kerala Gujarat Maharashtra Punjab Tamil Nadu	Tamil Nadu Haryana Himachal Kerala Punjab	Himachal Pradesh Haryana Kerala Maharashtra Punjab Tamil Nadu

## Growth in Quality of Teaching : High Secondary Level

To analyse growth in quality of teaching during the period 1993-97 among states, the state's growth ranks have been compared with the ranks of the states for the year 1993. In the states which had strong base in 1993, there was not much scope for improvement, whereas the states where ranks for 1993 were not good had comparatively better scope for raising the quality of teaching during this period. Thus, to have a realistic view of the growth of quality of teaching among states, it is desirable to have the comparative analysis of the states ranks for the year 1993 and growth rank for the period 1993-97.

The comparison of ranks of the states presented in table 5.25 shows that ranks of the states of Assam has gone down from Medium to Low whereas Bihar has improved its rank (low to high) during this period. Some of the states whose ranks have declined from High to Medium are Gujarat, Kerala, Haryana and Himachal Pradesh. The ranks of Kerala has gone down for rural areas perhaps because there was not much scope for improvement in this state during this period as they have already achieved high ranks in 1993 itself.

**Table 5.25 Growth in Quality of Teaching during the period 1993-97**

State Rank 1993	Growth rank (1993-97)					
	Rural			Urban		
	High (1-6)	Medium (7-12)	Low (13-17)	High (1-6)	Medium (7-12)	Low (13-17)
	High (1-6)	Tamil Nadu Andhra Pradesh Karnataka Punjab	Kerala Gujarat Haryana Himachal Pradesh		Andhra Pradesh Maharashtra Punjab Tamil Nadu	Gujarat Haryana Himachal Pradesh Kerala
Medium (7-12)	Madhya Pradesh  Maharashtra Rajasthan Uttar Pradesh All -India	Orissa West Bengal	Assam	Karnataka Madhya Pradesh Rajasthan Uttar Pradesh All-India	Orissa West Bengal	Assam
Low (13-17)		Bihar			Bihar	

### Quality of Teaching at Higher Secondary Stage of Education Relationship among Sub-variables

In rural areas, the sub-variable 'Pupil Teacher Ratio' has positive correlation with trained teachers but negative with female teachers. But in urban areas, the sub-variables do not have significant relationships among themselves. Also the variables 'Pupil Per Teacher' and 'Female Teachers' have inverse relationship among themselves.



**Table 5.26 : Correlation Matrix for 'Quality of Teaching' : Higher Secondary**

Variable	Rural			Urban		
	Pupil Per Teacher	Trained Teachers	Female Teachers	Pupil Per Teacher	Trained Teachers	Female Teachers
Pupil Per Teacher	1.00	.51	-.19	1.00	.46	-.34
Trained Teachers	.51	.100	.04	0.46	1.00	.28
Female Teachers	.19	.04	1.00	-.34	.28	1.00

### Extraction of Principal Components

For rural areas only two PC's have been extracted. First PC has 1.53 as Eigen value and explains 51 percent variation among variables and Second PC has Eigen value equal to 1.03 and explains 34 percent variation among variables. The two PC's together explains 85 percent variation among variables. The Principal Component analysis for urban areas also, has extracted two PC's. The first PC has 1.46 as Eigen value and explains 49 percent of variation and second PC has 1.26 as Eigen Value and explains 42 percent of variation among variables. The two PC's together explains 91 percent variation among variables for urban areas.

The PCs extracted for rural areas have very high factor loadings for the first (-.88) and Second (-.82) variables. This PC can be named as variable 'Pupil and Trained Teachers'. The Second PC has high factor loading for third variable (.95) and can be called factor representing 'Female Teachers'. For urban areas first PC has negative significant factor loading for first two variables and Second PC has positive high factor loading for third variable. These two PC together will explain significant variation among all the three variables.

**Table 5.27 : Factor Loadings for 'Quality of Teaching' : Higher Secondary**

Variable	Factor Loading			
	Rural		Urban	
	Factor 1	Factor 2	Factor 1	Factor 2
Pupil Per Teacher	-.883781*	-.058928	-.907555*	-.263407
Trained Teachers	-.824619	.360083	-.774849	.549268
Female Teachers	.258816	.946045*	.198235	.941022
Eigen Value	1.5228050	1.0281333	1.463344	1.256601

### Educational Development Index for Quality of Teaching at Higher Secondary Level : The Principal Component Analysis

The States leading both in rural and urban areas in quality of teaching at higher secondary level are Kerala, Tamil Nadu and Haryana. Other states among first five ranks in rural areas are Maharashtra, West Bengal and in urban areas are Punjab and Uttar Pradesh. The states which are lagging behind both in rural and urban areas are Orissa, Bihar, Andhra

Pradesh and Assam. However, rural areas of Rajasthan and urban areas of Karnataka are among the last five ranks. The states which have rural ranks better than urban ranks are Himachal Pradesh, Gujarat, Maharashtra, Karnataka, West Bengal and Assam. The variations among rural and urban ranks are significant in Punjab, Himachal Pradesh and West Bengal.

**Table 5.28 : Educational Development Index for Quality of Teaching at Higher Secondary Level : The Principle Component Analysis**

States	Rural		Urban	
	Index	Rank	Index	Rank
Kerala	.806	2	.857	2
Punjab	.538	11	.812	4
Tamil Nadu	.910	1	.897	1
Haryana	.775	4	.851	3
Himachal Pradesh	.612	8	.553	12
Gujarat	.630	7	.672	9
Maharashtra	.686	5	.765	6
Uttar Pradesh	.681	6	.765	5
Orissa	.215	15	.339	15
Karnataka	.477	12	.527	13
Bihar	.011	17	.330	16
Andhra Pradesh	.442	14	.445	14
All India	.604	9	.696	8
Rajasthan	.460	13	.640	11
West Bengal	.784	3	.755	7
Madhya Pradesh	.582	10	.645	10
Assam	.060	16	.076	17

### Level of Development in Quality of Teaching at Higher Secondary Level

Assam is highly backward state in quality of teaching both in rural and urban areas at higher secondary level of education. Also Orissa and Bihar have highly backward status for rural areas. The highly developed states in both rural and urban areas are Tamil Nadu, Kerala and Haryana. In addition, West Bengal has highly developed status for rural areas and Punjab, Uttar Pradesh and Maharashtra have highly developed status in urban areas. The urban areas of Rajasthan and Karnataka are covered under developed category whereas the rural areas of these states are backward in quality of teaching. On the other hand, rural areas of West Bengal are highly developed whereas the urban areas are covered under developed category.

**Table 5.29 : Level of Development of Quality of Teaching : Higher Secondary**

Highly Backward	Rural			Urban			
	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
Orissa Assam Bihar	Karnataka Rajasthan Andhra Pradesh	Maharashtra Uttar Pradesh Gujarat Himachal Pradesh	Tamil Nadu Kerala West Bengal Haryana	Assam	Andhra Pradesh Orissa Bihar	West Bengal All India Gujarat Madhya	Tamil Nadu Kerala Haryana Punjab Uttar Pradesh Maharashtra

		All-India Madhya Pradesh Punjab				Pradesh Rajasthan Himachal Pradesh Karnataka	
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High Developed : Index Value (.76-1.00)  
 Developed : Index Value (.56-.75)  
 Backward : Index Value (.26 - .50)  
 Highly Backward : Index Value (.01 - .25)

### Composite Variable Index

The states which are leading both in rural and urban areas in quality of teaching according to composite variable rank are Kerala, Punjab, Haryana, Tamil Nadu. The rural areas of Assam, Gujarat and Urban areas of Orissa are also among the top five ranking states. The states which are included among last five ranks for both rural and urban areas are Andhra Pradesh, Karnataka and Uttar Pradesh. The rural areas of Maharashtra and urban areas of Bihar are also lagging behind in quality of teaching.

**Table 5.30 : Variable/Composite Variable Rank for Higher Secondary Level**

States	Rural				Urban			
	Pupil Per Teacher	Percent- age of Trained Teachers	Percent- age of Female Teachers	Compo- site Variable Rank	Pupil Per Teacher	Percent- age of Trained Teachers	Percent- age of Female Teachers	Composite Variable Rank
Andhra Pradesh	5	14	12	13	5	15	10	12
Assam	1	16	3	5	1	17	5	8
Bihar	1	17	11	11	4	16	17	14
Gujarat	4	6	8	4	4	9	11	9
Haryana	8	5	5	4	8	4	2	3
Himachal Pradesh	6	11	6	7	3	12	6	7
Karnataka	6	13	14	14	10	14	16	15
Kerala	4	7	1	2	2	7	1	1
Madhya Pradesh	9	12	9	12	6	11	8	10
Maharashtra	8	8	15	13	8	5	12	10
Orissa	3	15	7	8	1	13	4	5
Punjab	1	2	2	1	7	2	7	4
Rajasthan	2	3	16	6	2	3	14	6
Tamil Nadu	12	1	4	3	9	1	3	2
Uttar Pradesh	10	9	17	15	11	8	15	13
West Bengal	11	4	13	10	8	6	13	11
India	7	10	10	9	6	10	9	10

## Areas of Concern/Strength of States

There are some states which have low composite variable as well as low rank for the variable 'Trained Teachers'. Karnataka has this status for both rural and urban areas whereas Andhra Pradesh is lacking in rural areas and Bihar has this status for urban areas. The states which have low proportion of 'Female Teachers' both in rural and urban areas are Karnataka and Uttar Pradesh. The rural areas of Maharashtra and urban areas of Bihar also have low ranks for 'Female Teachers'. The states of Assam, Orissa and Rajasthan although have high composite variable rank but the ranks for rural areas of Assam and urban areas of Orissa are low for the variable 'Trained Teachers'. Also both rural and urban areas of Rajasthan have low ranks for the variable 'Female Teachers'.

**Table 5.31 : Areas of Concern/Strength of States in Quality of Teaching : Higher Secondary**

Areas of Concern/Strengths	Pupil Per Teacher		Percentage of Trained Teachers		Percentage of Female Teachers	
	Rural	Urban	Rural	Urban	Rural	Urban
<b>Areas of Concern</b>						
i) Composite Variable rank low and variable rank low			Andhra Pradesh Karnataka	Bihar Karnataka	Karnataka Uttar Pradesh Maharashtra	Bihar Karnataka Uttar Pradesh
ii) Composite Variable rank high but variable rank low			Assam	Orissa	Rajasthan	Rajasthan
<b>Strengths</b>						
i) Composite Variable rank low but variable rank high	Andhra Pradesh Karnataka	Bihar				
ii) Composite Variable rank high and variable rank high	Assam Gujarat Kerala Punjab Rajasthan	Kerala Orissa Rajasthan	Haryana Gujarat Rajasthan Tamil Nadu Punjab	Haryana Punjab Rjasthan Tamil Nadu	Assam Haryana Kerala Punjab Tamil Nadu	Assam Himachal Pradesh

## Growth Index for Quality of Teaching

Madhya Pradesh has first rank in growth index for quality of teaching followed by Maharashtra, Rajasthan, Tamil Nadu and Andhra Pradesh. Among these leading states, Madhya Pradesh has sixth rank for Female Teachers' and Maharashtra has tenth rank for 'Trained Teachers'. The last four ranking states in growth index are Assam, Kerala, Haryana and Gujarat.

**Table 5.32 : Growth Index for Quality of Teaching for the Period 1993-97**

State	Index			Rank		
	Pupil Per Teacher	Percentage of Training Teachers	Percentage of Female Teachers	Pupil Per Teacher	Percentage of Training Teachers	Percentage of Female Teachers
Andhra Pradesh	0.53	0.53	0.74	2	4	5
Assam	0.34	0.57	0.42	6	3	16
Bihar	0.48	0.75	0.93	3	1	2
Gujarat	0.35	0.32	0.62	7	16	12
Haryana	0.25	0.35	0.7	17	11	8
Himachal Pradesh	0.31	0.43	0.58	13	7	14
Karnataka	0.32	0.52	0.83	12	5	4
Kerala	0.47	0.36	0.63	4	9	11
Madhya Pradesh	0.28	0.46	0.59	16	6	13
Maharashtra	0.3	0.27	0.7	14	17	7
Orissa	0.76	0.61	0.39	1	2	17
Punjab	0.33	0.35	0.85	9	12	3
Rajasthan	0.33	0.34	0.95	8	14	1
Tamil Nadu	0.32	0.33	0.64	11	15	9
Uttar Pradesh	0.35	0.37	0.64	5	8	10
West Bengal	0.3	0.34	0.56	15	13	15
India	0.33	0.36	0.71	10	10	6

Table 5.33 presents comparative scenario of ranks of the states for quality of teaching in 1993 and the growth rank for the year 1993-97. The table shows that Karnataka and Uttar Pradesh had low rank in 1993 for both rural as well as urban areas but had achieved high growth rank for the period 1993-97. Whereas rural areas of Andhra Pradesh and urban areas

of Bihar have this status. There is no state which had low rank in 1993 and also had low growth rate during this period. At higher secondary level, the states of Kerala, Punjab and Rajasthan have high rank in 1993 and 1997 for both rural and urban areas.

**Table 5.33 : Growth in Quality of Teaching During the period 1993-97 : Higher Secondary Level**

Variable Rank	Rural			Urban		
	High (1-6)	Medium (7-12)	Low (13-17)	High (1-6)	Medium (7-12)	Low (13-17)
High (1-6)	Kerala Punjab Rajasthan	Assam Gujarat Haryana Tamil Nadu		Kerala Orissa Punjab Rajasthan	Haryana Tamil Nadu	
Medium (7-12)	Bihar Orissa	Himachal Pradesh Madhya Pradesh All India	West Bengal	Andhra Pradesh	Assam Gujarat Himachal Pradesh Madhya Pradesh Maharashtra All India	West Bengal
Low (13-17)	Andhra Pradesh Karnataka Uttar Pradesh	Maharashtra		Bihar Karnataka Uttar Pradesh		

Table 5.34 gives the educational development index based on three different methods. The composite variable rank is based on ranks of each sub-variable for quality of teaching. The ranks determined by Principal Component Analysis are based on weighted average with Eigen Values and Factor Loadings as weights derived by this method. Growth Index is based on the growth of the variable during 1993-97.

**Table 5.34 : Educational Development Index for Quality of Teaching : Higher Secondary Level**

States	Composite Variable Rank		Principal Component Rank		Variable Growth Rank
	Rural	Urban	Rural	Urban	
Andhra Pradesh	13	12	14	14	2
Assam	5	8	16	17	7
Bihar	11	14	17	16	1
Gujarat	4	9	7	9	10
Haryana	4	3	4	3	11
Himachal Pradesh	7	7	8	12	9
Karnataka	14	15	12	13	4
Kerala	2	1	2	2	6
Madhya Pradesh	12	10	10	10	10
Maharashtra	13	10	5	6	12
Orissa	8	5	15	15	3

Punjab	1	4	11	4	6
Rajasthan	6	6	13	11	5
Tamil Nadu	3	2	1	1	10
Uttar Pradesh	15	13	6	5	5
West Bengal	10	11	3	7	13
India	9	10	9	8	8

## Chapter - VI

### INFRASTRUCTURAL FACILITIES

#### Infrastructural Facilities and Educational Development

Availability of adequate infrastructural facilities is a prerequisite for educational development. Despite of enormous efforts in last five decades by the Government, the Indian Schools gravely lack even in the basic infrastructural facilities. Education being a State subject, different priorities are being assigned by different states for development of infrastructural facilities for education. There are glaring disparities in infrastructural facilities among states and more so in the rural and urban areas. The facilities are worse at primary level of education. An attempt, has thus been made in this chapter to study the status of infrastructural facilities at different levels of education in various states. The analyses of infrastructural facilities will help us to identify areas requiring urgent attention for upgrading the basic amenities in schools.

#### Parameters for Infrastructural Facilities

The selected to study the infrastructural facilities available for different level of education among various states are:

1. Percentage of Rural Population having Primary Schools within 1 km.
2. Percentage of Rural Population having Upper Primary schools within 3 kms.
3. Percentage of Rural Population having Secondary schools within 8 kms.
4. Percentage of Schools with Urinal Facilities at different stages.
5. Percentage of Schools with Urinal Facilities separately for Girls at different stages
6. Percentage of schools with Lavatory Facilities at different stages.
7. Percentage of schools with Drinking Water Facilities at different stages
8. Percentage of schools with more than equal to one room at different stages.

The will be examined separately for rural and urban areas. Educational Development Index will be developed for Primary, Upper Primary, High Secondary and Higher Secondary levels of education. have been selected to study the availability of schools, rooms, drinking water and lavatory facilities in the schools.

#### Infrastructural Facilities at Primary Level

#### Relationship among sub-parameters

The analysis of correlation coefficients among sub- for infrastructural facilities (Table 6.1) reveals that there is significant relationship among 'Drinking Water' and Lavatory/Urinal facilities both in rural and urban areas. It shows that the schools, which have one of these facilities, have other facilities also i.e. either the schools do not have any of these facilities or



have all these facilities. The parameter 'Population having school within 1 km' is not at all related with other i.e. the schools are available within 1 Km but no facilities are available or the schools may not be available within 1 km but the facilities are available. The educational policies have not focussed on simultaneous development of both these facilities. The schools have been built within 1 km without ensuring the adequate facilities. The parameter 'Facilities for one or more room' also has very low correlation coefficient with other implying that rooms have been provided in the schools without availability of other facilities.

**Table 6.1: Correlation Matrix for Infrastructural Facilities - Primary Level**

Variables	Rural						Urban					
	% of population having schools within 1 km	% of schools with urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms	% of population having schools within 1 km	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms
% of population having schools within 1 km	1	-0.01	-0.06	-0.12	0.03	-0.08	1	0.05	0.09	0.05	0.05	0.01
% of schools with Urinal facilities for All	-0.01	1	0.97	0.91	0.77	0.41	0.05	1	0.9	0.85	0.92	0.57
% of schools with Urinal facilities for Girls	-0.06	0.97	1	0.92	0.69	0.42	0.09	0.9	1	0.89	0.87	0.5
% of schools with Lavatory facilities	-0.12	0.91	0.92	1	0.71	0.35	0.05	0.85	0.89	1	0.82	0.47
% of schools with drinking water facilities	-0.03	0.77	0.69	0.71	1	0.35	0.05	0.92	0.87	0.82	1	0.53
% of schools with one or more rooms	-0.08	0.41	0.42	0.35	0.35	1	0.01	0.57	0.5	0.47	0.53	1

### Principal Component Analysis

For rural areas, the principal component analysis has extracted two principal components (Table 6.2). The first PC explains 62 percent variation and Second PC explains 17 percent variation among . Both the PC's together explains 79 percent variation and thus provide good summary of the sub-. The Eigen value for the first PC is 3.72 and for the second PC is 1.02. The Eigen values being greater than one show that the PC's extracted are significant for the analysis. The principal component analysis has extracted one PC for urban areas. The extracted PC explains 66 percent variation among variables and has Eigen value as 3.75. The Eigen value being more than one shows that the PC is significant for analysis of the variables.

The first PC has high factor loadings for the variables 'Drinking water' and 'Lavatory/Urinal' facilities. This principal component can be named as 'Facilities for Drinking water/Lavatory'. The second PC has very high factor loading for the parameter 'Population having schools within 1 km'. Second PC represents this variable. The two PC's together thus provide excellent summary of variables for infrastructural facilities. The PC extracted for urban area has high factor loadings for 'Drinking water' and 'Lavatory/Urinal' facilities and thus can be termed as 'Facilities for Drinking water/Lavatory'.

**Table 6.2: Factor Loadings for Infrastructural facilities (Primary Level)**

Variables	Factor Loading		
	Rural		Urban
	Factor 1	Factor 2	Factor 1
% of Population having Schools within 1 km	0.071033	0.978252*	-0.391349
% of schools with Urinal facilities for all	-0.971915*	0.076676	-0.942172*
% of Schools with Urinal facilities for Girls	-0.960176*	0.006499	-0.941013*
% of schools with Lavatory facilities	-0.939407*	-0.033953	-0.922386*
% of schools with facilities for drinking water	-0.832309*	0.147890	-0.859831*
% of schools with facilities for one or more rooms	-0.523720	-0.195657	-0.481195
Eigen Value	3.721108	1.024205	3.748003
Variabnce Explained	62.01846	17.07008	66.47631

\* Significant

### Infrastructural Facilities Development Index

The Educational development index for infrastructural facilities at primary level is presented at Table (6.3). The index shows that Kerala (rank 1), Punjab (rank 2) and Haryana (rank 3) are the leading States for development of infrastructural facilities and Bihar, Andhra Pradesh and Karnataka are the last ranking among all selected states in rural areas.

But in urban areas, Maharashtra is leading followed by Gujarat and Kerala. The states having last ranks in urban areas are Bihar, Orissa and Assam. In nine states, the rural ranks are better than the urban ranks implying that development in rural areas in these nine states is better in infrastructural facilities as compared to urban areas.

**Table 6.3: Infrastructural Facilities Development Index for primary level :The Principal Component Analysis**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.24	16	0.552	12
Assam	0.259	13	0.376	15
Bihar	0.189	17	0.176	17
Gujarat	0.338	10	0.797	2
Haryana	0.619	3	0.672	8
Himachal Pradesh	0.427	5	0.549	13
Karnataka	0.25	15	0.413	14
Kerala	0.962	1	0.781	3
Madhya Pradesh	0.256	14	0.688	7

Maharashtra	0.373	8	0.82	1
Orissa	0.273	12	0.37	16
Punjab	0.642	2	0.699	6
Rajasthan	0.469	4	0.709	5
Tamil Nadu	0.423	6	0.65	9
Uttar Pradesh	0.398	7	0.737	4
West Bengal	0.351	9	0.576	11
All India	0.331	11	0.637	10

### Level of Development in Infrastructural Facilities

The analysis of educational development index of the states reveals that Bihar is the only highly backward state in level of development in infrastructural facilities both in rural and urban areas and needs more attention. In Madhya Pradesh, Assam, Karnataka and Andhra Pradesh however, the rural areas are severely lacking in the infrastructural facilities. The infrastructural facilities are highly developed in rural areas of Kerala and urban areas of Maharashtra, Gujarat and Kerala.

In urban areas, nine states are covered under developed category whereas in rural area only Punjab and Haryana have this status. Similarly, eight states are covered under backward category for rural areas whereas only the urban areas of Karnataka, Assam and Orissa have this status. The states which have same status for both rural and urban areas are Orissa (Backward), Punjab, Haryana (Developed) and Kerala (Highly Developed). In all other states, the development in infrastructural facilities in rural areas is less than the development in urban areas. The location-wise disparity is more glaring in the states of Maharashtra and Gujarat where urban areas have highly developed status and rural areas have backward status. Similarly, in states of Madhya Pradesh and Andhra Pradesh, urban areas are developed whereas rural areas are highly backward.

**Table 6.4: Levels of Development in Infrastructural Facilities: Primary Level**

Rural				Urban			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
Index Values				Index Value			
0-.25	.26-.50	.51-.75	.76-1.0	0-.25	.26-.50	.51-.75	.76-1.0
Assam	Rajasthan	Punjab	Kerala	Bihar	Karnataka	Uttar Pradesh	Maharashtra
Madhya Pradesh	Himachal Pradesh	Haryana			Assam	Rajasthan	Gujarat
Karnataka	Tamil Nadu				Orissa	Punjab	Kerala
Andhra Pradesh	Uttar Pradesh					Madhya Pradesh	
Bihar	Maharashtra					Haryana	
	West Bengal					All India	
	Gujarat					Tamil Nadu	
	All India					West Bengal	
	Orissa					Andhra Pradesh	
						Himachal Pradesh	

## Composite Variable Rank

To work out composite variable rank, all the sixteen states are ranked separately for each selected variable. The composite rank is then calculated by ranking the states according to the total of all variable ranks. The variable ranks and state rank (composite variable ranks) are given in Table (6.5). According to the composite variable rank the states leading both in rural and urban areas are Punjab, Kerala, Tamil Nadu and Gujarat where as the states leading only in urban areas are Maharashtra and Uttar Pradesh. Haryana is leading in the rural areas.

The States which are lagging behind both in rural as well as in urban areas are Assam and Orissa. Andhra Pradesh, Karnataka and Madhya Pradesh are lagging behind in rural areas and Karnataka, Himachal Pradesh and Bihar have less development in urban areas. The States where rural ranks are better than urban ranks are Bihar, Haryana, Himachal Pradesh, Kerala, Orissa, Punjab and Rajasthan.

**Table 6.5 : Infrastructural Facilities in Rural Areas: Primary Level**

States	Variable Rank						Composite Variable ranks
	Percentage of Population having school within 1 km	Percentage of Schools with facilities for					
		URINAL		Lavatory	Drinking Water	One or more room	
All	Girls						
Andhra Pradesh	5	15	14	14	14	15	15
Assam	8	12	15	17	17	13	16
Bihar	6	16	17	9	11	17	13
Gujarat	2	5	4	13	12	7	5
Haryana	4	2	2	4	2	9	3
Himachal Pradesh	16	13	10	11	4	4	11
Karnataka	10	17	16	16	16	3	14
Kerala	12	1	1	1	3	1	2
Madhya Pradesh	13	11	11	12	13	16	13
Maharashtra	9	7	6	10	9	8	7
Orissa	11	14	13	15	15	6	12
Punjab	3	3	3	2	1	5	1
Rajasthan	15	4	5	3	8	10	6
Tamil Nadu	1	8	7	6	5	2	4
Uttar Pradesh	14	6	8	5	7	11	9
West Bengal	7	9	12	8	6	12	10
All India		10	9	7	10	14	8

**Table 6.6: Infrastructural Facilities in Urban Areas: Primary Level**

States	Variable Rank						Composite Variable ranks
	Percentage of Population having school within 1 km	Percentage of Schools with facilities for					
		URINAL	Lavatory	Drinking Water	One or more room		
Andhra Pradesh	5	13	11	11	13	5	11
Assam	8	14	16	17	15	10	14
Bihar	6	17	17	16	17	16	16
Gujarat	2	3	1	3	3	6	1
Haryana	4	4	6	12	4	12	6
Himachal Pradesh	16	12	12	13	8	14	13
Karnataka	10	15	14	14	14	7	12
Kerala	12	1	2	6	6	1	3
Madhya Pradesh	13	5	9	5	10	13	9
Maharashtra	9	2	3	1	2	3	2
Orissa	11	16	15	15	16	8	15
Punjab	3	7	7	9	1	11	5
Rajasthan	15	8	4	4	5	15	8
Tamil Nadu	1	11	8	8	7	2	4
Uttar Pradesh	14	6	5	2	9	1	4
West Bengal	7	10	13	10	12	4	10
All India	-	9	10	7	11	9	7

**Areas of Concern / Strength of the States in Infrastructural Facilities**

The states of Rajasthan, Uttar Pradesh and Gujarat have high ranks for overall infrastructural facilities but lack in a particular area. Rajasthan has low rank for the variable 'Percentage of Population having schools within one km' in rural areas and Uttar Pradesh has low rank for this facility in urban areas. Gujarat has low rank for the variable 'Lavatory Facilities' in rural areas. On the other hand, Bihar has high rank for the variable 'Percentage of Population having schools within one km' for both rural and urban areas. Andhra Pradesh also has high rank for this facility in rural areas. Karnataka has high rank for 'Percentage of Schools with facilities of one or more rooms' for rural areas.

**Table 6.7: Areas of Concern / Strength of States in Infrastructural Facilities:  
Primary Level**

Areas of Concern	Rural						Urban					
	% of population having schools within 1 km	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms	% of population having schools within 1 km	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more schools
i) State rank variable rank low	Madhya Pradesh	Andhra Pradesh Bihar Karnataka	Andhra Pradesh Assam Bihar Karnataka	Andhra Pradesh Assam Karnataka	Andhra Pradesh Assam Karnataka Madhya Pradesh	Andhra Pradesh Assam Madhya Pradesh	Himachal Pradesh	Assam Bihar Orissa	Assam Bihar Orissa	Assam Bihar Himachal Pradesh Orissa	Assam Bihar Orissa	Bihar Himachal Pradesh
ii) State rank high/variable rank low	Rajasthan			Gujarat			Uttar Pradesh					
<b>Strengths</b>												
i) State rank/variable rank high	Andhra Pradesh Bihar					Karnataka	Bihar					
ii) State rank low and variable rank high	Tamil Nadu Gujarat Haryana Punjab	Gujarat Haryana Kerala Punjab Rajasthan	Gujarat Haryana Kerala Punjab Rajasthan	Tamil Nadu Haryana Kerala Punjab Rajasthan	Haryana Kerala Punjab Tamil Nadu	Kerala Punjab Tamil Nadu	Gujarat Haryana Punjab Tamil Nadu	Maharashtra Gujarat Haryana Kerala Uttar Pradesh	Maharashtra Gujarat Haryana Kerala Uttar Pradesh	Maharashtra Gujarat Kerala Uttar Pradesh	Maharashtra Gujarat Haryana Kerala Punjab	Maharashtra Gujarat Tamil Nadu Kerala Uttar Pradesh

### Infrastructural Facilities at Upper Primary Level

#### **Relationship among sub-parameters**

The correlation matrix for infrastructural facilities (Table 6.8) shows that the at upper primary level have same pattern as for the primary level. The parameter 'Population having Schools within 3 kms' have no relationship with other i.e. there can be schools within 3 kms but without any facilities and there can be schools outside 3 kms but with all the facilities. The 'Drinking water and Lavatory/ Urinal facilities' have very high correlation with each other i.e. either the schools have both these facilities or does not have any of these facilities. The parameter 'schools with one or more rooms' has no relationship with other in rural areas but have low correlation with 'urinal facilities'. This shows that in Urban areas, the schools which have one or more rooms also have this facility.

**Table 6.8 : Correlation Matrix for Infrastructural Facilities : Upper Primary Level**

Variables	Rural						Urban					
	% of population having schools within 3 kms	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms	% of population having schools within 3 kms	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms
% of population having schools within 3 kms	1.00	-0.01	-0.06	-0.12	0.03	-0.08	1.00	0.04	0.04	0.12	-0.00	-0.04
% of schools with Urinal facilities for All	-0.01	1.00	0.97	0.91	0.77	0.41	0.04	1.00	0.91	0.82	0.93	0.51
% of schools with Urinal facilities for Girls	-0.06	0.97	1.00	0.92	0.69	0.42	0.04	0.91	1.00	0.91	0.90	0.50
% of schools with Lavatory facilities	-0.12	0.91	0.92	1.00	0.71	0.35	0.12	0.82	0.91	1.00	0.85	0.20
% of schools with drinking water facilities	-0.03	0.77	0.69	0.71	1.00	0.35	-0.00	0.93	0.90	0.85	1.00	0.43
% of schools with one or more rooms	-0.08	0.41	0.42	0.35	0.35	1.00	-0.04	0.51	0.50	0.20	0.43	1.00

## Principal Component Analysis

The principal component analysis for rural areas has extracted one principal component (PC) for the analysis. The extracted PC explains 62 percent of variation among and has 3.75 as Eigen Value. For urban areas, two PC's have been extracted for the analysis. First PC explains 65 percent variation and second PC explains 17 percent variation among variables. The two PC's together explains 82 percent variation among variables for urban areas.

For rural areas, the factor loadings of the PC are significant for the 'Facilities for drinking water and lavatory'. The factor loadings are not significant for the variable, Availability of class rooms. This PC can thus be termed as 'Facilities other than class rooms'. In urban areas on the other hand, two PC's have been extracted for analysis. For first PC, the factor loadings are not significant for the variables, Availability of schools within 3 kms or class rooms. This PC can be titles as 'Facilities other than class rooms' as in rural areas. The second PC on the other hand, have high factor loading for the variable 'Population having schools within 3 kms' and thus, can be named as 'Availability of Schools'. The two PCs extracted for urban areas gives excellent summary of all the variables.

**Table 6.9: Factor Loadings for Infrastructural Facilities - Upper Primary Level**

Variables	Factor Loading		
	Rural	Urban	
	Factor 1	Factor 1	Factor 2
Percentage of Population having schools within 3 km.	-0.391349	-0.054102	0.930173*
% of schools with Urinal facilities for All	-0.942172*	-0.963319*	
% of Schools with facilities for girls	-0.941013*	-0.977263*	0.006008
% of schools with lavatory facilities	-0.922386*	-0.896665*	0.203954
% of schools with drinking facilities	-0.859831*	-0.957417*	-0.023227
% of schools with one or more rooms	-0.481195	-0.539133	-0.366456
Eigen Value	3.748003	3.897273	1.042085
Variance Explained	62.46672	64.95455	17.36808

\* Significant

## Infrastructural Facilities Development Index

The states of Kerala, West Bengal, Haryana and Tamil Nadu are leading in the level of development in infrastructural facilities at Upper primary level both in rural as well as urban areas. On the other hand, Punjab is leading in rural areas whereas Rajasthan is leading in urban areas. The states which are lacking in these facilities both in rural and urban areas are Assam, Bihar and Karnataka. However, Andhra Pradesh and Himachal Pradesh are lacking these facilities in rural areas only and Maharashtra and Orissa is lacking the facilities in urban areas.



**Table 6.10: Infrastructural Facilities Development Index for Upper Primary Level: The Principal Component Analysis**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.266	16	0.531	8
Assam	0.165	17	0.165	15
Bihar	0.354	13	0.009	17
Gujarat	0.463	9	0.628	7
Haryana	0.705	4	0.757	2
Himachal Pradesh	0.317	14	0.516	10
Karnataka	0.311	15	0.16	16
Kerala	0.857	1	0.853	1
Madhya Pradesh	0.401	11	0.52	9
Maharashtra	0.548	7	0.467	13
Orissa	0.431	10	0.24	14
Punjab	0.855	2	0.629	6
Rajasthan	0.57	6	0.732	3
Tamil Nadu	0.642	5	0.683	4
Uttar Pradesh	0.383	12	0.503	11
West Bengal	0.766	3	0.632	5
All India	0.465	8	0.475	12

### Level of Development in Infrastructural Facilities

Level of development of infrastructural facilities presented in Table (6.11) reveals that both rural and urban areas of Assam are highly backward while the urban areas of Orissa, Karnataka and Bihar are highly backward in terms of these facilities. The facilities are highly developed in rural as well as urban areas of Kerala while in Punjab and West Bengal, the rural areas have developed these facilities. The analysis shows that Maharashtra is the only state where rural areas have developed these facilities but the urban areas are backward in terms of infrastructural facilities.

Table 6.11: Level of Development in Infrastructural Facilities: Upper Primary Level

RURAL				URBAN			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
INDEX VALUE				INDEX VALUE			
0-.25	.26-.50	.51-.75	.76-1.0	0-.25	.26-.50	.51-.75	.76-1.0
Assam	All India	Haryana	Kerala	Orissa	Uttar Pradesh	Haryana	Kerala
	Gujarat	Tamil Nadu	Punjab	Assam	All India	Rajasthan	
	Orissa	Rajasthan	West Bengal	Karnataka	Maharashtra	Tamil Nadu	
	Madhya Pradesh	Maharashtra		Bihar		West Bengal	
	Uttar Pradesh					Punjab	
	Bihar					Gujarat	
	Himachal Pradesh					Andhra Pradesh	
	Karnataka					Madhya Pradesh	
	Andhra Pradesh					Himachal Pradesh	

### Composite Variable Rank

Kerala has first rank for almost all the variables in rural and urban areas. Punjab which has second Composite rank for rural areas has Seventh rank for the variables 'Population having school within 3 kms' and 'schools with one or more rooms' in these areas. Haryana, which has third composite rank for rural areas, has eighth rank for the variable 'Lavatory Facility' in these areas.

On the other hand, Assam which is last in composite rank has fourth rank for the variable 'Population having school within 3 kms'. Himachal Pradesh and Andhra Pradesh which are among last three states in composite rank in rural areas have higher ranks for availability of schools and rooms in these areas.

**Table 6.12 : Variable / Composite Variable Rank for Infrastructural Facilities for Rural Areas :  
Upper Primary Level**

States	Variable Rank						Composi te Ranks
	Percentage of Population having school within 3 Kms	Percentage of Schools with facilities for				One or more room	
		URINAL		Lavatory	Drinking Water		
All	Girls						
Andhra Pradesh	13	17	16	14	11	1	14
Assam	4	13	15	17	16	16	16
Bihar	9	16	17	11	8	11	14
Gujarat	2	9	11	13	9	8	9
Haryana	3	4	4	8	2	2	3
Himachal Pradesh	14	14	14	16	6	14	15
Karnataka	5	15	13	15	14	6	12
Kerala	1	1	3	1	1	1	1
Madhya Pradesh	16	8	7	12	12	12	11
Maharashtra	11	7	8	7	5	13	8
Orissa	12	11	10	6	15	4	10
Punjab	7	3	1	3	1	7	2
Rajasthan	15	5	6	5	7	5	6
Tamil Nadu	8	6	5	4	4	3	5
Uttar Pradesh	10	12	12	9	13	15	13
West Bengal	6	2	2	2	3	9	4
All India		10	9	10	10	10	7

In urban areas, all the states which are leading in composite rank are also leading in all the variable ranks. On the other hand, the urban areas of Assam and Karnataka which are among last five ranking states for development of infrastructural facilities have high ranks for the variable, 'Availability of one or more room'.

The states which are leading in composite variable rank both in rural and urban areas are Kerala, Haryana and Tamil Nadu. While Punjab and West Bengal are leading in rural areas only

and Andhra Pradesh, Gujarat and Rajasthan are on the top for Urban areas. The states which are trailing behind in both rural and urban areas are Assam and Bihar. However, Andhra Pradesh, Himachal Pradesh and Uttar Pradesh, lack these facilities in rural areas and Karnataka, Orissa have not developed the facilities in urban areas.

**Table 6.13 : Variable / Composite Variable Rank for Infrastructural Facilities for Urban Areas : Upper Primary Level**

States	Variable Rank					Composite Variable Ranks
	Percentage of Schools with facilities for					
	URINAL		Lavatory	Drinking Water	One or more room	
	All	Girls				
Andhra Pradesh	13	12	7	9	1	8
Assam	14	16	16	16	5	14
Bihar	17	17	12	15	12	16
Gujarat	6	7	5	4	6	5
Haryana	2	3	4	2	1	2
Himachal Pradesh	9	13	13	5	1	7
Karnataka	16	15	14	17	8	15
Kerala	1	1	1	1	1	1
Madhya Pradesh	8	8	10	11	11	10
Maharashtra	12	11	11	10	6	12
Orissa	15	14	15	14	2	13
Punjab	7	2	2	8	10	6
Rajasthan	4	5	2	3	4	3
Tamil Nadu	5	4	3	6	3	4
Uttar Pradesh	11	10	8	13	1	9
West Bengal	3	6	6	7	7	6
All India	10	9	9	12	9	11

#### Areas of Concern/Strength of the States

In Rajasthan, all infrastructural facilities have been developed in rural areas except for the availability of schools within the radius of 3 kms whereas in Andhra Pradesh schools in urban areas lack urinal facilities. On the other hand, the state which has not developed all the facilities but has made progress in one of the area is Assam which has high rank for availability

of schools within 3 kms. Himachal Pradesh has better drinking water facilities in rural areas while Andhra Pradesh, Assam and Orissa have better ranks for the variable 'Percentage of Schools with one or more rooms'.

**Table 6.14 : Area of Concern / Strength of States in Infrastructural Facilities : Upper Primary Level**

Areas of Concern	Rural						Urban					
	% of population having schools within 3 kms	% of schools having Urinal facilities for All	% of schools having Urinal facilities for Girls	% of schools having Lavatory facilities	% of schools having drinking water facilities	% of schools with one or more rooms	% of population having schools within 3 km	% of schools having Urinal facilities for All	% of schools having Urinal facilities for Girls	% of schools having Lavatory facilities	% of schools having drinking water facilities	% of schools with one or more rooms
<b>i) State rank/ variable rank low</b>	Andhra Pradesh Himachal Pradesh	Andhra Pradesh Assam Bihar Himachal Pradesh	Andhra Pradesh Assam Bihar Himachal Pradesh	Andhra Pradesh Assam Himachal Pradesh	Assam Uttar Pradesh	Assam Himachal Pradesh		Assam Bihar Karnataka Orissa	Assam Bihar Orissa Karnataka	Assam Orissa Karnataka	Assam Bihar Karnataka Orissa	
<b>ii) State rank high and variable rank low</b>	Rajasthan											
<b>Strengths</b>												
<b>i) State rank low but variable rank high</b>	Assam				Himachal Pradesh	Andhra Pradesh						Assam Orissa
<b>ii) State rank high and variable rank high</b>	Haryana Kerala West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Kerala Punjab Rajasthan Tamil Nadu West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Haryana Kerala Rajasthan Tamil Nadu West Bengal		Gujarat Haryana Kerala Rajasthan Tamil Nadu West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Gujarat Haryana Kerala Rajasthan Tamil Nadu West Bengal	Gujarat Haryana Kerala Rajasthan Tamil Nadu West Bengal	Gujarat Haryana Kerala Rajasthan Tamil Nadu

## Educational Development Index for Infrastructural Facilities: Upper Primary Level

The Composite Variable rank provides simple average of the variable ranks but the index based on Principal Component Analysis provided weighted average of the variables, the weights for which have been worked out by using Principal Component Analysis. The comparison of the ranks derived by two different methods shows that there is only marginal difference in the two ranks of the states in rural and in urban areas barring few exceptions. The two techniques gives similar pattern of ranks for the states.

**Table 6.15 : Educational Development Index for Infrastructural Facilities: Upper Primary Level**

States	Composite Variable Rank		Principal Component Rank	
	Rural	Urban	Rural	Urban
Andhra Pradesh	14	8	16	8
Assam	16	14	17	15
Bihar	14	16	13	17
Gujarat	9	5	9	7
Haryana	3	2	4	2
Himachal Pradesh	15	7	14	10
Karnataka	12	15	15	16
Kerala	1	1	1	1
Madhya Pradesh	11	10	11	9
Maharashtra	8	12	7	13
Orissa	10	13	10	14
Punjab	2	6	2	6
Rajasthan	6	3	6	3
Tamil Nadu	5	4	5	4
Uttar Pradesh	13	9	12	11
West Bengal	4	6	3	5
All India	7	11	8	12

### Infrastructural Facilities at High Secondary Level

#### Relationship among sub-parameters

Correlation matrix for these variables presented at Table 6.16 shows that in rural areas there is significant relationship among all the variables except variable (i) indicating that the schools which have any of the facility except variable (i) have all other facilities too. But in urban areas the variable (i) has significant relation with variable (ii) only meaning thereby that the schools which have facilities (I) also have facility (ii) but not necessarily the other facilities.

The variable (ii) has significant relationship with all other variables i.e. wherever the facility (ii) is available all other facilities will also be available. Variable (iii) has significant relationship only with variable (iv) and variable four have significant relationship with variable (ii) and (iii).

**Table 6.16: Correlation Matrix for Infrastructural Facilities : High Secondary Level**

Variables	Rural					Urban			
	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities
% of schools with Urinal facilities for All	1.00	0.37	0.43	0.34	0.29	1.00	0.76	0.34	0.54
% of schools with Urinal facilities for Girls	0.37	1.00	0.96	0.58	0.82	0.76	1.00	0.51	0.72
% of schools with Lavatory facilities	0.43	0.96	1.00	0.61	0.89	0.34	0.51	1.00	0.72
% of schools with drinking water facilities	0.34	0.58	0.61	1.00	0.64	0.54	0.72	0.72	1.00
% of schools with one or more rooms	0.29	0.82	0.89	0.64	1.00	-	-	-	-

### Principal Component Analysis

The Principal Component Analysis has extracted one Principal Component (PC) for rural areas. The extracted PC explains 70 percent of variation among variables and has 3.48 as Eigen Value. For urban areas also it has extracted one PC for the analysis. This PC also explains 70 percent of variation among variables and has 2.80 as Eigen value.

**Table 6.17: Eigen Value for Infrastructural Facilities : High Secondary Level**

Principal Component	RURAL				URBAN			
	Eigen Value	% total variance	Cumul. Eigen Val.	Cumul. %	Eigen Value	% total variance	Cumul. Eigen Val.	Cumul. %
I	3.484870	69.69740	3.484870	69.69740	2.808378	70.20945	2.808378	70.20945

The PC for rural areas has significant factor loadings for all variables except variable (I). The PC for urban areas has significant factor loadings for all the variables. In rural areas, the factor loading is comparatively small for the variable 'Drinking water' indicating comparatively low weightage to this variable. In urban areas, the factor loadings are comparatively small for the variables (I) and (iii).

Both these principal components selected for rural and urban areas can be designated as 'Infrastructural Facilities' as they represent almost all these variables except variable (i) which is also partially reflected in other sub-variables.

**Table 6.18: Factor Loading for Infrastructural Facilities : High Secondary Level**

Variables	Factor Loading	
	Rural	Urban
	Factor 1	Factor 1
% of schools with Urinal facilities for All	0.519714	0.787254*
% of Schools with facilities for girls	0.930210*	0.901710*
% of schools with lavatory facilities	0.966043*	0.757214*
% of schools with drinking water facilities	0.761701*	0.895632*
% of schools with one or more rooms	0.914357*	-

- significant

### Infrastructural Facilities Development Index

Punjab, Kerala, Gujarat, and Haryana are leading in infrastructural facilities both in rural as well as in urban areas. Whereas West Bengal has better facilities in rural areas and Rajasthan have better facilities in urban areas. States lacking in these facilities both in rural and urban areas are Bihar, Assam, Uttar Pradesh, and Madhya Pradesh. Karnataka lacks facilities in rural areas and Orissa in urban areas. States having rural ranks higher than the ranks for urban areas are West Bengal, Himachal Pradesh, Andhra Pradesh, Tamil Nadu, Orissa and Assam.



**Table 6.19: Infrastructural Facilities Development Index for Higher Secondary Level: The Principal Component Analysis**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.533	9	0.440	10
Assam	0.261	14	0.171	17
Bihar	0.313	13	0.324	13
Gujarat	0.702	4	0.807	1
Haryana	0.695	5	0.803	3
Himachal Pradesh	0.603	6	0.517	8
Karnataka	0.227	16	0.362	12
Kerala	0.818	2	0.805	2
Madhya Pradesh	0.186	17	0.248	16
Maharashtra	0.549	8	0.606	6
Orissa	0.335	12	0.270	15
Punjab	0.828	1	0.711	4
Rajasthan	0.602	7	0.672	5
Tamil Nadu	0.466	10	0.408	11
Uttar Pradesh	0.229	15	0.291	14
West Bengal	0.708	3	0.599	7
All India	0.446	11	0.466	9

### Levels of Development in Infrastructural Facilities

Based on infrastructural facilities development index, all the states have been classified into four categories;

- Highly Backward
- Backward
- Developed
- Highly Developed

Levels of development in infrastructural facilities presented in table 6.20 reveals that Madhya Pradesh lacks the infrastructural facilities both in rural and urban areas whereas the rural areas of Uttar Pradesh and Karnataka and urban areas of Assam are highly backward and needs attention. On the other hand, both rural and urban areas of Kerala are highly developed whereas only rural areas of Punjab and Urban areas of Gujarat and Haryana are highly developed in terms of infrastructural facilities in the schools. The states where rural ranks are better than the urban ranks are Assam, Andhra Pradesh and Punjab.

**Table 6.20: Levels of Development in Infrastructural Facilities: High Secondary Level**

Rural				Urban			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
Index Value				Index Value			
0-.25	.26-.50	.51-.75	.76-1.0	0-.25	.26-.50	.51-.75	.76-1.0
Uttar Pradesh, Karnataka, Madhya Pradesh	Tamil Nadu, All India Orissa, Bihar, Assam	West Bengal, Gujarat, Haryana, Himachal Pradesh, Rajasthan, Maharashtra, Andhra Pradesh	Punjab, Kerala	Madhya Pradesh, Assam	All-India, Andhra Pradesh, Tamil Nadu, Karnataka, Bihar, Uttar Pradesh, Orissa	Punjab, Rajasthan, Maharashtra, West Bengal, Himachal Pradesh	Gujarat, Kerala, Haryana

### Composite Variable Rank

States leading in ranks (1 to 5) for the infrastructural facilities both in rural and urban areas are Gujarat, Haryana, Kerala, Punjab and Rajasthan. In these states development has taken place simultaneously both in rural and in urban areas. The states which are lagging behind (Rank 13 to 17) both in rural and urban areas are Assam, Bihar and Madhya Pradesh. Whereas the states of Karnataka and Uttar Pradesh are lagging behind in rural areas and Orissa and Tamil Nadu are last in ranking among urban areas. The states for which the rural ranks are higher than the urban ranks include Andhra Pradesh, Assam, Bihar, Orissa and Punjab. In these states as compared to other states the development in rural areas took place comparatively at a faster pace.

**Table 6.21: Variable/ Composite Variable Rank for Infrastructural Facilities: High Secondary Level Rural**

States	Variable Rank					Composite Variable Rank
	Percentage of Schools with facilities for					
	URINAL		Lavatory	Drinking Water	One or more room	
	All	Girls				
Andhra Pradesh	10	9	7	8	1	8
Assam	12	13	17	14	1	13
Bihar	16	17	6	12	10	15
Gujarat	5	3	5	4	6	3
Haryana	4	4	9	6	1	4
Himachal Pradesh	8	6	13	1	6	7

Karnataka	17	15	15	16	9	17
Kerala	2	2	1	3	1	2
Madhya Pradesh	13	14	16	13	11	16
Maharashtra	7	8	14	7	5	9
Orissa	14	12	11	17	2	12
Punjab	1	1	2	2	1	1
Rajasthan	6	7	4	5	3	5
Tamil Nadu	11	11	8	10	4	10
Uttar Pradesh	15	16	12	15	1	14
West Bengal	3	5	3	9	8	6
All India	9	10	10	11	7	11

In urban areas, Haryana which has second composite variable rank has seventh rank for the variable 'Lavatory Facilities'. Whereas Punjab which has third composite variable rank has seventh rank for the variable 'Urinal Facilities'. On the other hand, Orissa and Assam, Uttar Pradesh, Karnataka which have last composite variable ranks have high ranks for the variable 'Schools with one or more rooms'.

**Table 6.22: Variable/ Composite Variable Rank for Infrastructural Facilities: High Secondary Level Urban**

States	Variable Rsnk					Composite Variable Rank
	Percentage of Schools with facilities for					
	URINAL		Lavatory	Drinking Water	One or more room	
	All	Girls				
Andhra Pradesh	11	8	10	10	11	11
Assam	10	14	17	14	2	14
Bihar	17	17	9	9	10	16
Gujarat	3	2	1	4	7	4
Haryana	1	1	7	2	1	2
Himachal Pradesh	13	7	14	1	1	7
Karnataka	15	15	8	10	4	12
Kerala	2	3	2	3	1	1
Madhya Pradesh	8	11	16	15	9	15
Maharashtra	6	6	12	5	8	8
Orissa	14	16	15	13	1	15
Punjab	7	4	3	1	1	3
Rajasthan	5	5	5	7	1	5
Tamil Nadu	12	10	6	12	3	10
Uttar Pradesh	16	13	13	11	1	13
West Bengal	4	12	4	6	6	6
All India	9	9	11	8	5	9

### Areas of Concern / Strength of States in Infrastructural Facilities

Assam is the state which has low composite variable as well as low rank for almost all the variables both in rural and urban areas. Bihar, Karnataka and Orissa lack lavatory / Water facilities in urban areas. In rural areas, these facilities are lacking in Andhra Pradesh, Bihar and Himachal Pradesh. Himachal Pradesh has developed drinking water facilities in rural areas. Andhra Pradesh has developed schools with one or more rooms in rural areas whereas Assam and Orissa has developed this facility for urban areas.

**Table 6.23: Areas of Concern / Strength of States in Infrastructural Facilities : High Secondary Level**

Areas of Concern	Rural					Urban				
	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms
<b>i) State rank / variable rank low</b>	Andhra Pradesh Assam Bihar Himachal Pradesh	Andhra Pradesh Assam Bihar Himachal Pradesh	Andhra Pradesh Assam Himachal Pradesh	Assam Uttar Pradesh	Assam Himachal Pradesh Uttar Pradesh	Assam Bihar Karnataka Orissa	Assam Bihar Orissa Karnataka	Assam Orissa Karnataka	Assam Bihar Karnataka Orissa	
<b>ii) State rank high but variable rank low</b>										
<b>Strengths</b>										
<b>i) State rank low but variable rank high</b>				Himachal Pradesh	Andhra Pradesh					Assam Orissa
<b>ii) State rank high and variable rank high</b>	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Kerala Punjab Rajasthan Tamil Nadu West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Gujarat Haryana Kerala Rajasthan Tamil Nadu West Bengal	Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Gujarat Haryana Kerala Punjab Rajasthan Tamil Nadu West Bengal	Gujarat Haryana Kerala Rajasthan Tamil Nadu West Bengal	Gujarat Haryana Kerala Rajasthan Tamil Nadu

## Educational Development Index for Infrastructural Facilities

The leading states in development of infrastructural facilities according to both the methods are Punjab, Kerala, Gujarat, Haryana and Rajasthan for both rural and for urban areas. The states which are last in ranking for both rural and urban areas are Assam, Bihar, Madhya Pradesh, Uttar Pradesh, Orissa and Karnataka. All India rank for infrastructural facilities in rural areas is 11 whereas this rank for urban areas is 9.

**Table 6.24: Educational Development Index for Infrastructural Facilities: High Secondary Level**

States	Composite Variable Rank		Principal Component Rank	
	Rural	Urban	Rural	Urban
Andhra Pradesh	8	11	9	10
Assam	13	14	14	17
Bihar	15	16	13	13
Gujarat	3	4	4	1
Haryana	4	2	5	3
Himachal Pradesh	7	7	6	8
Karnataka	17	12	16	12
Kerala	2	1	2	2
Madhya Pradesh	16	15	17	16
Maharashtra	9	8	8	6
Orissa	12	15	12	15
Punjab	1	3	1	4
Rajasthan	5	5	7	5
Tamil Nadu	10	10	10	11
Uttar Pradesh	14	13	15	14
West Bengal	6	6	3	7
All India	11	9	11	9

### Infrastructural Facilities at Higher Secondary Level

#### Relationship among sub-variables

The parameter (i) has very low correlation coefficients for all the indicating that there is no relationship in the availability of facility (i) and other facilities. The schools may have only facility (i) and not necessary have other facilities and vice-versa. The parameter (ii) has significant relationship with parameter (iii) and parameter (iv) indicating that wherever either of these facility is available, other facility would also be available.

In urban areas, all the four variables have significant relationship with each other indicating that either all the facilities are available or no facility will be available in the urban schools.

**Table 6.25: Correlation Matrix for Infrastructural Facilities : Higher Secondary Level**

Variables	Rural					Urban			
	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more room	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities
% of schools with Urinal facilities for All	1.00	-0.14	-0.11	0.01	-0.09	1.00	0.78	0.63	0.71
% of schools with Urinal facilities for Girls	-0.14	1.00	0.80	0.31	0.49	0.78	1.00	0.66	0.69
% of schools with Lavatory facilities	-0.11	0.80	1.00	0.42	0.52	0.63	0.66	1.00	0.90
% of schools with drinking water facilities	0.01	0.31	0.42	1.00	0.79	0.71	0.69	0.90	1.00
% of schools with one or more rooms	0.09	0.49	0.52	0.79	1.00	-	-	-	-

### Principal Component Analysis

The Principal Component Analysis has extracted two PC's for rural areas. First PC explains 54 percent variation among variables and Second PC explains 21 percent variation among variables. The first PC has 2.68 as Eigen value and second PC has 1.06 as Eigen value. Both these PC's are significant for the analysis as their Eigen value is more than 1. The two PC's together explains 75 percent of variation among variables.

For urban areas, PC analysis has extracted only one PC. This PC explains 80 percent variation among variables and has 3.19 as Eigen value.

**Table 6.26: Eigen Value for Infrastructural Facilities : Higher Secondary Level**

Principal Component	RURAL				URBAN			
	Eigen Value	% total variance	Cumul. Eigen Val.	Cumul. %	Eigen Value	% total variance	Cumul. Eigen Val.	Cumul. %
I	2.686291	53.72582	2.686291	53.72582	3.191272	79.78181	3.191272	79.78181
II	1.059785	21.19570	3.746076	74.92152	--	--	--	--

The first PC selected for rural areas has very high factor loadings for all the variables except variable (I) whereas the second PC has very high factor loading for variable (I). The second PC can be called as 'Urinal Facilities' and the first PC can be designated as 'Other Facilities'. The two PC's together provide excellent summary of the data.

The PC extracted for urban areas has very high significant factor loadings for all the variables. This factor thus can be called as 'Infrastructural Facilities'

**Table 6.27: Factor Loadings for Infrastructural Facilities : Higher Secondary Level**

Variables	Factor Loading		
	Rural		Urban
	Factor 1	Factor 2	Factor 1
% of schools with Urinal facilities for All	-0.162498	-0.807283*	0.871782*
% of Schools with facilities for girls	0.800667*	0.308078	0.874519*
% of schools with lavatory facilities	0.840298*	0.217962	0.894819*
% of schools with drinking facilities	0.760476*	-0.445392	0.930475*
% of schools with one or more rooms	0.856967*	-0.259394	--

\*Significant

### Infrastructural Facilities Development Index

The infrastructural facilities development index for higher secondary level of education is presented in Table (6.28). It can be seen from the table that the only state which is leading both in rural and urban areas is Kerala. The states leading in rural areas are Orissa, Karnataka, Assam, Madhya Pradesh and in urban areas are Himachal Pradesh, Gujarat, Rajasthan and Punjab. The development process is not simultaneous in rural and urban areas.

The only state which is last in ranking in both rural and urban areas is Bihar. In rural areas the states of Maharashtra, Punjab, Himachal Pradesh and Rajasthan are lacking in availability of infrastructural facilities whereas in urban areas the states lagging behind are Madhya Pradesh, Assam, Karnataka and Orissa. The important feature of the analysis is that the state of Punjab is among first five states in urban areas whereas for rural areas the Punjab is among last five states.

**Table 6.28: Infrastructural facilities Development Index for Higher Secondary Level: The Principal Component Analysis**

States	Rural		Urban	
	Index	Rank	Index	Rank
Andhra Pradesh	0.6229	8	0.780	12
Assam	0.4266	14	0.608	14
Bihar	0.7971	3	0.461	15
Gujarat	0.7085	6	0.951	3
Haryana	0.6734	7	0.882	6
Himachal Pradesh	0.8450	2	0.975	1
Karnataka	0.3466	15	0.334	16
Kerala	0.2744	16	0.975	2
Madhya Pradesh	0.5670	13	0.724	13
Maharashtra	0.7134	5	0.789	11
Orissa	0.1677	17	0.207	17
Punjab	0.7287	4	0.891	5
Rajasthan	0.8813	1	0.902	4
Tamil Nadu	0.5782	12	0.806	9
Uttar Pradesh	0.5986	10	0.850	7
West Bengal	0.6205	9	0.827	8
All India	0.5929	11	0.789	10

### Levels of Development in Infrastructural Facilities

Orissa is highly backward state in infrastructural facilities for both rural and urban areas. The highly developed states for both rural and urban areas are Himachal Pradesh and Rajasthan. Rural areas of Bihar has also developed these facilities. There are many states like Andhra Pradesh, Gujarat, Haryana, Kerala, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal which have developed these facilities in urban areas. The rural areas of Kerala and Assam and urban areas of Bihar are included among backward states for these facilities. Karnataka is a backward state for both rural and urban areas.



**Table 6.29: Levels of Development in Infrastructural Facilities: Higher Secondary Level**

Rural				Urban			
Highly Backward	Backward	Developed	Highly Developed	Highly Backward	Backward	Developed	Highly Developed
Index Value				Index Value			
0-.25	.26-.50	.51-.75	.76-1.0	0-.25	.26-.50	.51-.75	.76-1.0
Orissa	Assam Karnataka Kerala	Andhra Pradesh Gujarat Haryana Madhya Pradesh Punjab Tamil Nadu Uttar Pradesh West Bengal All-India Maharashtra	Bihar Himachal Pradesh Rajasthan	Orissa	Bihar Karnataka	Assam Madhya Pradesh	Andhra Pradesh Gujarat Haryana Kerala Maharashtra Punjab Rajasthan Tamil Nadu Uttar Pradesh West Bengal All-India Himachal Pradesh

**Composite Variable Rank**

The states leading in Composite Variable rank in both rural and urban areas are Haryana and Gujarat. Whereas Bihar has high rank for infrastructural facilities in rural areas and Himachal Pradesh, Kerala, Rajasthan and Punjab have high ranks for urban areas. The states lacking in infrastructural facilities both in rural and urban areas are Karnataka, Orissa and Madhya Pradesh whereas the facilities are lacking in rural areas of Kerala and urban areas of Bihar.

**Table 6.30 : Variable/ Composite Variable Rank in Infrastructural Facilities for Rural Areas: Higher Secondary**

States	Variable Rank					Composite Variable Rank
	Percentage of Schools with facilities for					
	URINAL		Lavatory	Drinking Water	One or more room	
	All	Girls				
Andhra Pradesh	8	11	7	7	1	10
Assam	1	5	15	14	1	11
Bihar	1	1	3	8	9	4
Gujarat	6	3	4	6	5	5
Haryana	2	4	10	2	1	3
Himachal Pradesh	-	-	-	-	1	NA
Karnataka	12	11	11	12	1	15
Kerala	11	13	10	10	1	14
Madhya Pradesh	3	6	13	11	7	13
Maharashtra	1	9	12	1	6	9

Orissa	13	12	14	13	3	16
Punjab	5	2	1	1	2	1
Rajasthan	1	1	8	1	1	2
Tamil Nadu	10	5	5	5	1	7
Uttar Pradesh	7	7	6		1	6
West Bengal	4	10	2	3	8	8
All India	9	8	9	9	4	12

Punjab which has first composite variable rank for rural areas has fifth rank for first variable. The next leading states, Rajasthan and Haryana have lower ranks for third variable. Bihar the next ranking state has lower rank for drinking water facilities. On the other hand, last ranking state Orissa for rural areas have third rank for facility for one or more room Karnataka and Kerala which are also last ranking states have high ranks for this variable. In urban areas, most of the states have similar status according to variable and composite variable rank barring few exceptions. Karnataka has thirteenth composite variable rank but second rank for the facility of one or more rooms in the school.

**Table 6.31 : Variable/ Composite Variable Rank in Infrastructural Facilities for Urban Areas: Higher Secondary**

States	Variable Rank					Composite Variable Room
	Percentage of Schools with facilities for					
	URINAL		Lavatory	Drinking Water	One or more	
	All	Girls				
Andhra Pradesh	7	11	10	6	1	9
Assam	1	10	14	11	1	10
Bihar	13	15	12	10	8	14
Gujarat	2	2	2	1	5	2
Haryana	5	6	3	1	1	4
Himachal Pradesh	1	1	1	1	1	1
Karnataka	12	16	15	11	2	13
Kerala	1	1	1	1	1	1
Madhya Pradesh	8	9	13	9	6	11
Maharashtra	1	13	11	1	4	7
Orissa	12	14	16	12	1	12
Punjab	6	3	8	4	1	5
Rajasthan	3	4	5	2	1	3
Tamil Nadu	11	7	7	7	1	8
Uttar Pradesh	10	5	6	5	1	6
West Bengal	4	12	4	3	7	7
All India	9	8	9	8	3	10

## Areas of Concern/Strength of the states

In rural areas, Orissa has low rank for most of the variables whereas Kerala has low rank for development of facility (ii). In urban areas, Bihar lack most of the facilities whereas Karnataka lacks in facilities (ii) and (iii). Karnataka, Kerala and Orissa have developed the facility (5) in rural areas whereas Karnataka acquired this status for urban areas. There are large number of states which have developed these facilities in both rural and urban areas.

Gujarat has high composite variable as well as high rank for all the variable in rural and urban areas. Haryana and Rajasthan also have this status but for the variable 'Availability of one or more rooms' in urban areas. Punjab also has this status except for the variables (iii) and (v) for urban areas. Other states having this status for rural areas are Bihar for parameter (I) and (ii) and Himachal Pradesh for parameter (v). The states leading in urban areas for most of variables include Himachal Pradesh, Karnataka, Uttar Pradesh. The states of Assam, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu having this status for variable (v) in urban areas.

**Table 6.32: Area of Concern / Strength of States in Infrastructural Facilities: Higher Secondary Level**

Areas of Concern	Rural					Urban				
	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms	% of schools with Urinal facilities for All	% of schools with Urinal facilities for Girls	% of schools with Lavatory facilities	% of schools with drinking water facilities	% of schools with one or more rooms
I) State rank / variable rank low	Orissa	Kerala	Orissa	Orissa		Bihar	Bihar Karnataka	Karnataka	Bihar	
ii) State rank high but variable rank low										
<b>Strengths</b>										
I) State rank low but variable rank high	Madhya Pradesh	Madhya Pradesh	--	--	Karnataka Kerala Orissa					Karnataka
ii) State rank high and variable rank high	Bihar Gujarat Haryana Punjab Rajasthan	Bihar Gujarat Haryana Punjab Rajasthan	Gujarat Haryana Punjab Rajasthan	Gujarat Haryana Punjab Rajasthan	Gujarat Haryana Himachal Pradesh Punjab Rajasthan	Gujarat Haryana Himachal Pradesh Kerala Punjab Rajasthan	Gujarat Haryana Himachal Pradesh Kerala Punjab Rajasthan Uttar Pradesh	Gujarat Haryana Himachal Pradesh Kerala Punjab Rajasthan Uttar Pradesh	Gujarat Haryana Himachal Pradesh Kerala Punjab Rajasthan Uttar Pradesh	Andhra Pradesh Assam Madhya Pradesh Maharashtra Orissa Tamil Nadu

## Educational Development Index for Infrastructural Facilities

In rural areas, the top five ranking states identified by both the Composite Variable Rank and Principal Component technique are Punjab, Rajasthan and Bihar. In addition, Gujarat and Haryana are leading states according to Composite Variable rank. Himachal Pradesh and Maharashtra on the other hand are among leading states according to Principal Component Analysis. In rural areas, both the methods have identified Orissa, Karnataka, Kerala and Madhya Pradesh as last ranking states. Moreover, Assam has also been identified as last ranking state by Principal Component Analysis.

In urban areas, both the techniques have identified Kerala, Punjab, Rajasthan and Gujarat as leading states. While, Haryana has been identified by Composite Variable analysis and Himachal Pradesh by Principal Component Analysis as one of the leading states. The last ranking states identified by both the methods are Orissa, Bihar, Karnataka, Madhya Pradesh and Assam.

**Table 6.33: Educational Development Index for Infrastructural Facilities: Higher Secondary Level**

States	Composite Variable		Principal Component	
	Rank		Analysis	
	Rural	Urban	Rural	Urban
Andhra Pradesh	10	9	8	12
Assam	11	10	14	14
Bihar	4	14	3	15
Gujarat	5	2	6	3
Haryana	3	4	7	6
Himachal Pradesh	NA	1	2	1
Karnataka	15	13	15	16
Kerala	14	1	16	2
Madhya Pradesh	13	11	13	13
Maharashtra	9	7	5	11
Orissa	16	12	17	17
Punjab	1	5	4	5
Rajasthan	2	3	1	4
Tamil Nadu	7	8	12	9
Uttar Pradesh	6	6	10	7
West Bengal	8	7	9	8
All India	12	10	11	10

Comparative Scenario of Development of Infrastructural Facilities among various levels of Education

In rural areas, Assam has highly backward status for elementary education. Whereas Madhya Pradesh and Karnataka have this status for Primary as well as high secondary level of education while. at higher secondary level Orissa has been identified as highly backward state. The other states which have this status for primary education are Andhra Pradesh and Bihar. In rural areas, Kerala has highly developed status for all levels of education except higher secondary level. Punjab has this status for upper primary and high secondary whereas West Bengal has this status for upper primary level only. The states which have this status in rural areas are Bihar, Rajasthan and Himachal Pradesh.

**Table 6.34: Stage-wise level of Development of Infrastructural Facilities: Rural Areas**

Level of Development	Primary	Upper Primary	High Secondary	Higher Secondary
Highly Backward	Assam, Madhya Pradesh, Karnataka, Andhra Pradesh, Bihar	Assam	Uttar Pradesh Karnataka Madhya Pradesh	Orissa
Backward	Rajasthan, Himachal Pradesh, Uttar Pradesh, Maharashtra, West Bengal, Gujarat, Orissa	Gujarat, Andhra Pradesh, Orissa, Madhya Pradesh, Uttar Pradesh, Bihar, Himachal Pradesh, Karnataka	Tamil Nadu Orissa Bihar Assam	Kerala, Karnataka, Assam
Developed	Punjab, Haryana	Haryana, Tamil Nadu, Rajasthan, Maharashtra	West Bengal, Gujarat, Haryana, Himachal Pradesh, Rajasthan, Maharashtra, Andhra Pradesh	West Bengal, Gujarat, Haryana, Maharashtra, Andhra Pradesh, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Punjab
Highly Developed	Kerala	Kerala, Punjab, West Bengal	Punjab, Kerala	Bihar, Himachal Pradesh, Rajasthan

In urban areas, Bihar has highly backward status for elementary education. Assam has this status for upper primary and high secondary level and Orissa has this status for upper primary and higher secondary level. Wherever, Karnataka has highly backward status for upper primary and Madhya Pradesh for high secondary level. In urban areas, Kerala is highly developed state at all levels of education. Gujarat is also leading at all levels except upper

primary level of education. Maharashtra is leading in primary and higher secondary level and Haryana is leading at high/higher secondary levels of education. At higher secondary level many other states like Andhra Pradesh, Himachal Pradesh, Punjab, Rajasthan, West Bengal, Uttar Pradesh and Tamil Nadu have high ranks.

**Table 6.35: Stage-wise level of Development of Infrastructural Facilities: Urban Areas**

Level of Development	Primary	Upper Primary	High Secondary	Higher Secondary
<b>Highly Backward</b>	<b>Bihar</b>	<b>Orissa, Assam, Karnataka, Bihar</b>	<b>Madhya Pradesh, Assam</b>	<b>Orissa</b>
<b>Backward</b>	<b>Karnataka, Assam, Orissa</b>	<b>Uttar Pradesh, Maharashtra</b>	<b>Tamil Nadu, Andhra Pradesh, Bihar, Karnataka, Uttar Pradesh, Orissa</b>	<b>Bihar, Karnataka</b>
<b>Developed</b>	<b>Uttar Pradesh, Rajasthan, Punjab, Madhya Pradesh, Haryana, Tamil Nadu, West Bengal, Andhra Pradesh, Himachal Pradesh</b>	<b>Haryana, Rajasthan, Tamil Nadu, West Bengal, Punjab, Gujarat, Andhra Pradesh, Madhya Pradesh, Himachal Pradesh</b>	<b>Punjab, Rajasthan, Maharashtra, West Bengal, Himachal Pradesh</b>	<b>Assam, Madhya Pradesh</b>
<b>Highly Developed</b>	<b>Maharashtra, Gujarat, Kerala</b>	<b>Kerala</b>	<b>Gujarat, Kerala, Haryana</b>	<b>Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Kerala, Punjab, Maharashtra, Rajasthan, West Bengal, Uttar Pradesh, Tamil Nadu</b>

## Chapter VII

### EXPENDITURE ON EDUCATION

Development of education to a large extent depends on the availability of financial resources . Although, numerous research studies on educational expenditure have shown that there may not necessarily be a significant relationship between the growth of education and the financial resources available. The states which are lagging far behind in education have much higher per student expenditure than the developed states and vice – versa. In previous Chapters we have studied the growth of various educational parameters in different states. In this Chapter an effort has been made to develop an index for the states based on expenditure on education. The Index would help to have a comparative view of the growth of education vis-à-vis the expenditure in various states.

#### Parameters for Expenditure on Education

The parameters selected for analysing the expenditure on education in different states include :

- Public Expenditure on Education as a percentage of state Domestic Product
- Plan Expenditure on Education as percentage of Total Plan Expenditure
- Non-Plan Expenditure on Education as percentage of Total Non-Plan Expenditure
- Percentage of Expenditure on Elementary Education to Total Expenditure
- Percentage of Expenditure on Secondary Education to Total Expenditure
- Per Student Expenditure on Elementary Education
- Per Student Expenditure on Secondary Education
- Plan Expenditure on Education
- Total Expenditure on Education

#### Principal Component Analysis

The Principal Component analysis on expenditure variables has extracted two PC's for the analysis. The first PC explains 50 percent variation among variables and has 7.45 as eigen value. The Second PC explains 16 percent variation and has 2.46 as eigen value. The two PC's together explains 66 percent of variation among variables.

**Table 7.1 : Eigen Values for Expenditure**

Principal Component	Eigen Values			
	Eigen Value	Percentage total Variance	Cumulative Eigen value	Cumulative Percentage
I	7.445956	49.63971	7.445956	49.63971
II	2.459606	16.39737	9.905562	66.03708

The first Principal Component has very high factor loadings for the variables. 'Plan Expenditure' and 'Total Expenditure' on Education. This Principal Component can be marked as 'Plan/Total Expenditure on Education'. The second PC has high factor loadings for the variables 'Percentage of Plan expenditure on Elementary Education to Total Expenditure on Education' and 'Percentage of Expenditure on Secondary Education to Total Expenditure on Education.' This Principal Component can be named as 'Expenditure on Elementary/Secondary Education versus Total Expenditure and Education'.

**Table 7.2: Factor Loadings for Expenditure**

S.No.	Parameters	Factor Loadings	
		I	II
1.	Public Expenditure on Education as Percentage of state Domestic Product	-0.662526	-0.583217
2	Plan Expenditure on Education as Percentage of Total Plan Expenditure	0.036593	0.439261
3	Non-Plan Expenditure on Education as Percentage of Total Non-plan Expenditure	-0.07268	0.127173
4	Percentage of Expenditure on Elementary Education to Total Expenditure	-0.063178	-0.849004
5	Percentage of Expenditure on Secondary Education to Total Expenditure	0.00045	0.844271
6	Per Student Expenditure on Elementary Education	-0.113214	-0.352694
7	Per Student Expenditure on Secondary Education	0.019281	0.196257
8	Plan Expenditure on Education	0.989972	-0.094601
9	Total Expenditure on Education	0.995664	-0.038607

### **Index for Expenditure on Education**

Index for expenditure on education presented in table 7.3 shows that West Bengal, Maharashtra, Punjab, Uttar Pradesh and Tamil Nadu are the first five ranking states according to the expenditure on education. The states having last five ranks according to the expenditure on education are Orissa, Bihar, Assam, Kerala and Himachal Pradesh. The state to be noted in this category is Kerala which although has achieved excellent status for all stages of education, is spending comparatively very less amount for the development of education.



**Table 7.3 : Index for Expenditure on Education : Principal Component Analysis**

States	Index	Rank
Andhra Pradesh	0.135	6
Assam	0.064	14
Bihar	0.072	13
Gujarat	0.118	10
Haryana	0.111	11
Himachal Pradesh	0.032	16
Karnataka	0.127	7
Kerala	0.063	15
Madhya Pradesh	0.121	8
Maharashtra	0.18	2
Orissa	0.078	12
Punjab	0.161	3
Rajasthan	0.118	9
Tamil Nadu	0.135	5
Uttar Pradesh	0.159	4
West Bengal	0.183	1

The analysis of level of expenditure on education reveals that West Bengal, Maharashtra, Punjab and Uttar Pradesh are the states with high expenditure on education whereas Orissa, Bihar, Assam, Kerala and Himachal Pradesh are spending less resources on education. But Kerala despite the low expenditure has achieved high educational standard in the state.

**Table 7.4 : Levels of Expenditure on Education**

High	Medium	Low
West Bengal	Tamil Nadu	Orissa
Maharashtra	Andhra Pradesh	Bihar
Punjab	Karnataka	Assam
	Rajasthan	Himachal Pradesh
	Gujarat	
	Haryana	

High : Index 14-18      Medium : Index 8-13      Low: Index 1-7

### Composite Variable Rank

According to the Composite variable rank Maharashtra incurring maximum expenditure on education followed by Uttar Pradesh, West Bengal, Tamil Nadu, and Gujarat. The states which are incurring minimum expenditure on education are Haryana, Himachal Pradesh, Punjab, Assam and Orissa. The variable ranks and composite variable ranks for the states are presented in Table 7.5

**Table 7.5 : Composite Variables Rank for Expenditure on Education**

State	Pub. Exp. As Percentage of state Domestic Product	Plan Exp.as Percentage of Total Plan Exp.	Non Plan Exp. On Edu. As Percentage of Total Exp.	Percentage of Exp.on Elementary Education to total Exp.	Percentage of Exp. On Secondary to total Exp.	Per Student Expenditure Elementary	Per Student Expenditure Secondary	Expenditure on Education		
								Plan	Total	Composite Rank
Andhra Pradesh	7	7	3	13	9	14	16	8	4	6
Assam	2	8	16	3	12	8	11	7	12	13
Bihar	5	16	15	1	13	9	12	14	7	11
Gujarat	11	13	11	6	10	5	1	13	8	9
Haryana	13	9	9	11	5	3	15	11	14	15
Himachal Pradesh	1	12	1	7	4	2	6	15	16	14
Karnataka	10	3	8	8	11	11	4	16	15	8
Kerala	3	11	10	10	11	1	14	4	9	13
Madhya Pradesh	8	1	5	2	15	13	7	3	6	4
Maharashtra	14	14	13	12	3	6	8	5	2	3
Orissa	4	15	2	4	14	10	13	2	11	10
Punjab	13	5	7	15	1	6	3	10	13	12
Rajasthan	6	6	12	5	7	4	2	6	10	5
Tamil Nadu	9	4	6	9	6	7	5	9	3	2
Uttar Pradesh	9	10	14	5	8	12	9	1	1	1
West Bengal	12	2	4	14	2	15	10	12	5	7

### Variable Rank

The states where both Plan and Non-plan expenditure on education is high are Madhya Pradesh and West Bengal whereas in Bihar and Maharashtra the expenditure is low. The Maharashtra, Punjab and West Bengal are incurring less expenditure on elementary education than on Secondary education. On the other hand, per student expenditure is high both for Elementary and Secondary stages in the Gujarat and Rajasthan and the expenditure in both cases is low in the state of Andhra Pradesh. The Plan and Total Expenditure on education is high in Maharashtra and Uttar Pradesh and in Himachal Pradesh and Karnataka. In West Bengal Plan Expenditure is low but Total Expenditure on education is high.

**Table 7.6 : States According to the Ranks of Expenditure Variables**

Variables	Variable Rank		
	High (1 to 5)	Medium (6 to 11)	Low (12-16)
Public Expenditure on Education as Percentage of state	Assam, Bihar Himachal Pradesh Kerala ,  Orissa	Uttar Pradesh, Andhra Pradesh, Gujarat,  Karnataka, Madhya Pradesh,  Rajasthan, Tamil Nadu	Haryana Maharashtra Punjab  West Bengal
Plan Expenditure on Education as Percentage of Total Plan Expenditure	Karnataka, Madhya Pradesh  Punjab, Rajasthan Tamil Nadu, West Bengal	Andhra Pradesh, Assam,  Haryana, Kerala, Uttar Pradesh	Bihar, Gujarat Himachal Pradesh  Maharashtra, Orissa
Non-plan Expenditure on Education as Percentage of total Expenditure	Andhra Pradesh Himachal Pradesh,  Madhya Pradesh Orissa West Bengal	Tamil Nadu Gujarat,  Haryana Karnataka, Kerala Punjab	Uttar Pradesh Assam  Bihar Maharashtra Rajasthan

**Table 7.6 : States According to the Ranks of Expenditure Variables( contd..)**

Variables	Variable Rank		
	High (1 to 5)	Medium (6 to 11)	Low (12-16)
Percentage of Expenditure on Elementary Education to total Expenditure	Assam, Bihar Madhya Pradesh Orissa Rajasthan Uttar Pradesh	Gujarat Haryana Himachal Pradesh, Kerala Karnataka Tamil Nadu	Andhra Pradesh, Maharashtra Punjab West Bengal
Percentage of Expenditure on Secondary to total Expenditure	Haryana Himachal Pradesh, Maharashtra Punjab West Bengal	Andhra Pradesh, Gujarat, Karnataka Kerala Rajasthan Uttar Pradesh Tamil Nadu	Assam Bihar, Madhya Pradesh Orissa

Per Student Expenditure on Elementary Education	Gujarat Haryana Himachal Pradesh, Kerala Rajasthan	Assam Bihar Karnataka Maharashtra Orissa, Punjab	Andhra Pradesh, Madhya Pradesh Uttar Pradesh West Bengal
Per Student Expenditure on Secondary Education	Gujarat Tamil Nadu Karnataka Punjab Rajasthan	Assam Himachal Pradesh, Madhya Pradesh Maharashtra Uttar Pradesh West Bengal	Andhra Pradesh, Bihar Haryana Kerala Orissa
Plan Expenditure on Education	Kerala Madhya Pradesh Maharashtra Orissa Uttar Pradesh	Andhra Pradesh Assam Haryana Punjab Rajasthan Tamil Nadu	Bihar Gujarat Himachal Pradesh Karnataka West Bengal
Total Expenditure on Education	Andhra Pradesh West Bengal Maharashtra Tamil Nadu Uttar Pradesh	Bihar Gujarat Kerala Madhya Pradesh Orissa Rajasthan	Assam Haryana Himachal Pradesh Karnataka Punjab

### Index for Expenditure on Education

#### The Principal Component Rank and Composite Variable Rank

Table 7.7 presents an Index based on Principal Component Analysis and Composite Variable Rank for 'Expenditure on Education Parameters'. The top ranking states according to both the methods are West Bengal, Maharashtra, Tamil Nadu and Uttar Pradesh. In addition, Punjab has been ranked among first five states according to Principal Component Analysis. The states among last five ranks according to both the methods are Himachal Pradesh, Orissa and Assam. The Principal Component Analysis has identified Kerala and Bihar and Composite Variable Rank as identified Haryana as last ranking state.

**Table 7.7 : Index for Expenditure on Education**

States	Principal Component Rank	Composite Variable Rank
Andhra Pradesh	6	6
Assam	14	13
Bihar	13	11
Gujarat	10	9
Haryana	11	15

Himachal Pradesh	16	14
Karnataka	7	8
Kerala	15	13
Madhya Pradesh	8	4
Maharashtra	2	3
Orissa	12	10
Punjab	3	12
Rajasthan	9	5
Tamil Nadu	5	2
Uttar Pradesh	4	1
West Bengal	1	7

## Chapter – VIII

### SUMMARY AND CONCLUSIONS

This chapter presents Comparative Scenario of the states for all the educational development parameters. The analysis of status of sub-parameters of education among states have been done in previous chapters for each level i.e. Primary, Upper Primary, High and Higher Secondary for Rural and Urban areas separately but for the parameters 'Literacy' and 'Expenditure on Education'. The parameter 'literacy' does not relate to any of the level of education and the analysis of parameter 'Expenditure on Education' has not been done for different levels due to paucity of requisite data for analysis. This chapter would deal with the comparison of following five educational development parameters among states;

- (i) Literacy
- (ii) Achievement
- (iii) Quality of Teaching
- (iv) Infrastructural Facilities
- (v) Expenditure

This chapter would not be covering the sub-parameters for these parameters which have already been dealt with in depth in previous chapters. The analysis will be done for each level of education separately.

#### Primary Education

It emerges from the analysis of education parameters at Primary level that Bihar is a highly backward state for all the educational parameters both in rural as well as urban areas. At the same time it has been noted that Bihar is incurring low expenditure for the development of education in the state. Next to Bihar is the state of Assam which has highly backward status for 'Infrastructural Facilities' for both rural and urban areas. Also it is highly backward in the area of 'Achievement in Education'. Rajasthan is highly backward in 'Achievement in Education' both in rural as well as urban areas. Andhra Pradesh also has highly backward status for three educational parameters i.e. 'literacy', 'Infrastructure and Achievement'. Other states, which have highly backward status in one of the parameters, are Uttar Pradesh, Karnataka, Orissa, Madhya Pradesh and Himachal Pradesh.

The low expenditure states include two categories of states. First those states with high level of achievement in education but low expenditure like Kerala and Himachal Pradesh. Secondly, states with low achievement in education and low expenditure like Orissa, Bihar and Assam. The states which are incurring high expenditure on education but still have highly backward status for one or more parameters are Madhya Pradesh and Uttar Pradesh.

Himachal Pradesh has developed status for all the parameters but for 'Infrastructural Facilities' for which it has backward status both for rural and urban areas. The states which have highly developed status for all variables both for rural and urban areas is Kerala followed by the states of Maharashtra, Tamil Nadu, Gujarat, Himachal Pradesh and Punjab. In Punjab,

the education parameters are more developed in rural areas than the urban areas. Haryana has highly developed status for 'Infrastructural Facilities' in rural areas and Uttar Pradesh has the same status for urban areas. Karnataka and Madhya Pradesh has highly developed status for 'Achievement in Education' in urban areas.

### **Upper Primary**

At upper primary stage also Bihar is the most backward state in all facets of educational development both in rural as well as urban areas including 'Achievement in Education', 'Quality of Teaching' and 'Infrastructural Facilities'. Madhya Pradesh has highly backward status for 'Achievement in Education' and 'Quality of Teaching' parameters whereas Uttar Pradesh has this status for 'Achievement in Education' and 'Infrastructural Facilities' both in rural as well as urban areas. Other states which have highly backward status for rural areas are Andhra Pradesh and Himachal Pradesh for 'Infrastructural Facilities'. The states which have highly backward status for urban areas are Karnataka and Orissa for 'Infrastructural Facilities', Rajasthan for 'Quality of Teaching' and West Bengal for 'Achievement in Education'.

The states which have highly developed status both for rural and urban areas are Kerala followed by Himachal Pradesh, Tamil Nadu, Haryana, Punjab and Maharashtra. Other states having highly developed status for rural areas are Assam for 'Achievement in Education', Gujarat for 'Quality of Teaching' and West Bengal for 'Infrastructural Facilities'. The states having highly developed status for urban areas include Andhra Pradesh for 'Quality of Teaching' and Rajasthan for 'Infrastructural Facilities'.

The states which have highly backward status for Primary level of education has backward status for upper primary level of education also except West Bengal and Karnataka which has this status only for upper primary level and for 'Achievement in Education' parameter in urban areas. Other status which have backward states for Primary level but do not have same status for upper primary level in urban areas are Uttar Pradesh and Himachal Pradesh. All the states which have highly developed status for primary level in rural areas have the same status for upper primary level also except for the state of Assam. In urban areas, on the other hand, the states which have highly developed status for primary level have same status for upper primary level also except for the states of Haryana, Andhra Pradesh and West Bengal. Gujarat has highly developed status for upper primary level but not for primary level.

### **High Secondary**

At High Secondary level also Bihar is the highly backward state for all educational parameters for both rural and urban areas. Other highly backward states at this level of education are Assam, Madhya Pradesh, Uttar Pradesh and Orissa. The states which are highly backward only in one area are Karnataka, Rajasthan and West Bengal. All the states which lack development in rural areas also lack development in urban areas as well, except for Karnataka and Orissa.

The most developed states at this level of education are Kerala, Punjab, Gujarat, Haryana, Tamil Nadu, Himachal Pradesh, Maharashtra and Andhra Pradesh. Among these states Kerala and Punjab has highly developed status for all educational whereas Gujarat and Haryana has this status for 'Infrastructural Facilities' for both rural and urban areas and for

'Quality of Teaching' for rural areas only. Tamil Nadu, Andhra Pradesh, Himachal Pradesh and Maharashtra have highly developed status for 'Quality of Teaching' in urban areas only. Tamil Nadu has high 'Quality of Teaching' in rural areas also.

### **Higher Secondary**

Highly backward states at Higher Secondary level of education are Karnataka followed by Bihar and Uttar Pradesh. The states which lack in one area only are Madhya Pradesh, Orissa, Andhra Pradesh, Maharashtra and Kerala.

The states which have highly developed status at this level are Haryana, Kerala, Punjab and Rajasthan. The states which have highly developed status for one area of education are Gujarat, Tamil Nadu, Himachal Pradesh and Bihar.

The states which have highly backward status both for high and higher secondary levels are Bihar, Karnataka, Madhya Pradesh, Uttar Pradesh and Orissa. On the other hand, the states which have highly developed status both for high and higher secondary level are Gujarat, Haryana, Kerala, Punjab, Tamil Nadu and Himachal Pradesh.



**Parameters and Sub-Parameters for  
Educational Development Index-States and All India Level\***

**Parameters**

- I) Literacy
- II) Progress in Education
- III) Quality of Teaching
- IV) Infrastructural Facilities in Education
- V) Expenditure

**Sub-parameters***I. Literacy*

1. Literacy Rate Male
2. Literacy Rate Female
3. Literacy Rate for Scheduled Castes Male
4. Literacy Rate for Scheduled Castes Female
5. Literacy Rate for Scheduled Tribes Male
6. Literacy Rate for Scheduled Tribes Female

*II. Progress in Education (Level-wise)*

1. Male Enrolment Rate.
2. Female Enrolment Rate
3. Male Enrolment in class VI as a Percentage of Male Enrolment in Class I.
4. Female Enrolment in Class VI as a Percentage of Female Enrolment in Class-I
5. Continuance Rate (Male)
6. Continuance Rate (Female)

*III. Quality of Teaching (Level-wise)*

1. Teachers Pupil Ratio
2. Female Teachers
3. Trained Teachers
4. Schools with more than equal to two Teachers at only primary level of education

*IV. Infrastructural Facilities (Level-Wise)*

1. i) Rural Population having Primary Schools within 2 Kms  
ii) Rural Population having Upper Primary Schools within 3 Kms  
iii) Rural Population having Secondary Schools within 8 Kms  
iv) Rural Population having higher Secondary Schools within 8 Kms
2. Schools with Urinal Facilities
3. Schools with Urinal Facilities separately for Girls
4. Schools with Lavatory Facilities
5. Schools with Drinking Water Facilities

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\* All variables converted into percentages.

· Level of Education - Primary, Upper Primary, High / Higher Secondary

6. Schools with one or more rooms
- V Expenditure*
1. Public Expenditure on Education as a Percentage of State Domestic Product (SDP).
  2. Plan Expenditure on Education to Total Plan Expenditure.
  3. Non-Plan Expenditure on Education to Total Non-plan Expenditure.
  4. Plan Expenditure to Total Expenditure on Education.
  5. Expenditure on Elementary (Primary and Upper Primary) Education to Total Expenditure on Education.
  6. Expenditure on Secondary Education to Total Expenditure on Education.
  7. Per Student Expenditure on Elementary Education.
  8. Per Student Expenditure on Secondary Education.
  9. Non-salary Expenditure as a Percentage of Salary Expenditure

## Educational Development Index : Technical Notes

### I. Factor Analysis with Principal Components Method

The method of Principal Components has wide applications in the Social Sciences. The method is also being used in the field of index numbers. With the application of Principal Components, we can know about the proportion of the total variation among different educational development parameters accounted for by educational development. The method of Principal Components will construct out of set of a educational variables,  $X_j$ 's ( $j=1,2,--- k$ ), the new variable ( $P_i$ ) called Principal Components, which are linear combinations of the  $X$ 's:

$$\begin{aligned} P_1 &= a_{11}X_1 + a_{12}X_2 + \dots + a_{1k}X_k \\ P_2 &= a_{21}X_1 + a_{22}X_2 + \dots + a_{2k}X_k \\ P_k &= a_{k1}X_1 + a_{k2}X_2 + \dots + a_{kk}X_k \end{aligned}$$

The  $a$ 's, called factor loadings are chosen so that the constructed principal components satisfy two conditions: a) the principal components are uncorrelated and (b) the first principal component  $P_i$  absorbs and accounts for the maximum possible proportion of the total variation in the set of all  $X$ 's, the second Principal Component absorbs the maximum of the remaining variation in the  $X$ 's (after allowing for the variation accounted by the first principal component) and so on.

The process of estimation of factor loadings ( $a$ 's) begin with the correlation matrix among educational variables. We obtain the loadings ( $a_{ij}$ ) for the first principal component  $P_i$  by dividing each column (row) sum by the square root of the grand total in the correlation matrix.

$$A_{ij} = \frac{\sum_{i=1}^k R_{X_i X_i}}{\sqrt{\sum_{i=1}^k \sum_{j=1}^k R_{X_i X_j}}}$$

Where  $R_{X_i X_j}$  represents correlation Coefficient  
among  $i^{\text{th}}$  and  $j^{\text{th}}$  variables

The first Principal Component (PC) will capture highest variation among variables. The factor loadings will represent proportional contribution of each variable to this PC. The factor loadings of the PC will help to explain the contribution of each variable in educational development.

The sum of the square of the loadings of each Principal Component is called the eigen value of this component. The eigen value of PC provides an indication of the importance or significance of PC in terms of the amount of the total variation that the particular PC has extracted from the set of educational variables.

Next step in Principal Component analysis is to form a new 'residual correlation matrix from the original one, by removing the part of the total variation which has been absorbed by  $P_i$ . This is achieved by subtracting from each element the product of the factor loadings  $a_i a_j$  ( $i = 1, --- k, j=1, ---, k$ ). The new table of residual correlation's will be the starting point for the extraction of the second principal components following the same procedure. Similarly, the other Principal Components will be extracted.

## Test for the Significance of Loadings

The next step in Principal Component analysis is to decide whether the factor loadings  $a$ 's are statistically significant. Several tests have been suggested for assessing the significance of the loadings. A very crude rule of thumb is to consider only those loadings as significant which have a value greater than + 0.30 provided that the sample contains at least 50 observations. The second method is based on the level of significance (standard errors) of the Pearson correlation coefficients. Loadings are in effect similar to correlation coefficients as they are tested for significance in the same way as the Pearson correlation coefficients. Table A-1 presents standard errors for Pearson product moment correlation coefficients. We use same values as standard errors for the loadings.

**Table A-1 : Critical Value for the Significance of Pearson Correlation Coefficients**

Sample Size	Critical Values of Correlation's required for Significance	
	At 5% level	At 1% level
5	0.755	0.875
10	0.576	0.714
15	0.483	0.605
20	0.425	0.538
25	0.380	0.488
30	0.338	0.440
35	0.320	0.417
40	0.300	0.394
45	0.280	0.370
50	0.262	0.346
60	0.248	0.328
70	0.233	0.308
80	0.220	0.290
90	0.206	0.272
100	0.194	0.255
150	0.158	0.209
200	0.137	0.182
250	0.125	0.163
500	0.088	0.115

Source : D.Child, Essentials of Factor Analysis, 1970, p.95.

This test do not take into account the number of variables in the set, and the order of extraction of the Principal Components. The Burt-Banks suggested

$$S(l_{mj}) = [S(R_{X_i X_i})]^{1/2} (k / k+1-m)$$

Where  $k$  = number of X's in the set

$m$  = Subscript of P, that is, the order of its extraction (the position of P in the extraction process)

## Criteria for the Number of Principal Components, P's to be Extracted

The principal component analysis will provide as many PC's as number of variables in the study. Next step in the analysis is to decide how many PC's are significant which are explaining maximum variation among variables. We have to decide how many PC's to retain in for our Study? Various criteria's have been suggested for taking this decision;

#### *Kaiser's Criterion*

As per this criterion, only Principal Components (P's) having eigen value greater than one are considered as essential and should be retained in the analysis. It is suggested that this criterion is most reliable when the number of variables (k) is between 20 and 50.

#### *Cattell's Scree Test*

The decision rule is to retain the P's up to the point where the resulting curve has some curvature and reject the P's for which the curve becomes a straight line. The point at which curve straightens out is the point beyond which P's are unreliable and are heavily affected by factors which are common to all X's.

#### **Standardisation of Variables**

The method of principal components can be applied by using the original values of the X's or their deviations from their mean or the standardised variables (measured as the deviations of the Xj's from the means and subsequently divided by the standard deviations). We adopt latter procedure because it can be applied to variables measured in different units.

## **II. Composite Index based on Variable Ranks**

The second technique applied for estimating educational development index is based on the ranking of each variable separately for sixteen states and the All India literacy level. Composite Educational Development Index has been worked out by estimating the average of variable ranks. The Composite Index for educational development among states is given by

$$EDI = \frac{\sum R_i}{n}$$

Where  $R_i$  = Rank of Variable  $i$ ,  
 $i = 1, 2, \dots, n$   
 $n$  being number of variables

#### **Growth Index (1993-97)**

Growth index for variables has been worked out by using the formula;

$$\text{Growth Index} = V_n / V_0$$

where  $V_0$  : Variable in the base year (1993 or 1991)  
 $V_n$  : Variable in the nth year (1997-98)