विद्यया ऽ मृतमश्नुते

एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

National Achievement Survey

CLASS VIII
(CYCLE-3) 2014

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सब पढ़ें सब बढ़ें

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Preface

India has made a significant investment in its education. The Government's flagship programme Sarva Shiksha Abhiyan (SSA) has been successful in ensuring greater access, equity and quality in elementary education. In the year 2000, the programme of National Achievement Surveys (NAS), originally conceived by NCERT as an independent project, was incorporated into the Government's flagship project Sarva Shiksha Abhiyan. NCERT is responsible for planning, developing tools, conducting the surveys and reporting the results under SSA by the Ministry of Human Resource Development (MHRD).

The major objective of conducting National Achievement Survey is to know what the children in schools know and can do at different stages of elementary education. In other words, an accurate measure of the learning achievement of children at different stages of education can provide important insights as to whether the inputs made into the elementary education system had a beneficial effect or not. Such evidence is provided by the National Achievement Surveys (NAS) carried out by NCERT periodically. These survey cycles not only provides policy makers, planners, curriculum developers and other practitioners with a 'snapshot' of what students have learnt in core subjects, but also provides a baseline against which changes in educational standards can be monitored.

The present survey is the third cycle of Class VIII in which the children's learning achievement has been measured in Language, Mathematics, Science and Social Science. This report is based on the data collected from 6722 schools, 24486 teachers and 188647 students through tests and questionnaires from 33 States and Union Territories of the country.

This survey differs from earlier cycles of NAS Class VIII in several important aspects. Most importantly, in this survey student responses to questions in the tests were analysed using Item Response Theory (IRT) rather than the classical techniques used in earlier cycles. As a result, all the scores in this report are located on standardised scales from 0-500. (Scores on earlier surveys were reported simply as the percentage of correct answers– a value which varies according to the tests takers.) This practice is consistent with that of major international surveys such as the Programme for International Student Assessment (PISA), Progress in International Reading Literacy Study (PIRLS) and Trends in International Mathematics and Science Studies (TIMSS).

This report presents the national picture of Class VIII students' learning achievement in four subject areas: Language (Reading Comprehension); Mathematics; Science; and Social Science. For each subject, findings are reported in two complementary chapters. The first summarises achievement results for the participating states and UTs. The second describes what students at different levels of achievement know and can do in that particular subject based on evidence from the test results.

In addition to measuring student achievement in main curricular areas, questionnaires were administered to students, teachers and school principals to collect information about a wide range of background variables that learning may have association with. The data collected is summarised in this report giving an objective overview of the present situation. This information, together with the student results database, will be shared with states so that they can, in collaboration with NCERT, prepare state-specific reports and conduct further analysis for the benefit of states. NCERT is also trying to derive diagnostic feedback from the data with a view to capture learning gaps and most importantly the misconceptions. This report will be shared with states subsequently.

In conducting such surveys, the quality of data is of paramount importance. All efforts, therefore, have been made by the Educational Survey Division, NCERT to ensure quality in data collection, analysis and reporting. The Division has benefitted from the continuous support of the Technical Support Agency (TSA) under SSA. The agency has helped us to improve the study and, as a result, it has been possible to report on student achievement following international patterns. I am grateful for the valuable inputs provided by TSA's team at NCERT, and its international consultants.

Prof. Parvin Sinclair, Director, NCERT has been a great source of inspiration to accomplish this gigantic task. I am grateful for her guidance and active contribution. My thanks are due to MHRD for providing both financial and admisitrative support. Prof. B.K. Tripathi, Joint director, NCERT has extended full support to the Divison in accomplishing the activities of this survey. My thanks are due to him for his continuous support. I also acknowledge the support of NUFPA for providing DISE data.

The present study could not have been completed without the active participation of State Councils of Educational Research and Training (SCERTs) and other state agencies SCERTs, DTERTs, SIEs, Directorates of Education, School Education Boards, etc. The Directors and other associated staff from these organizations are worthy of compliments for completing the arduous task of administering tools in time.

I thank Dr Veer Pal Singh, Coordinator of the survey, and members of the project team who contributed in various activities of the survey. Special thanks are due to Dr Santosh Kumar and Dr Manika Sharma (Consultant) who worked hard in analysing and interpreting the data, and preparing the report. I also thank other project staff for their support.

Finally I thank one and all who have contributed to this study in some or other way. I earnestly hope that the report will be useful to policy makers, planners, researchers and all others in raising the quality of elementary education in the country.

Sridhar Srivastava
Professor and Head
Educational Survey Division
National Council of Educational Research and Training

New Delhi
September, 2014

Acronyms

AEC	Area Education Committee
AISES	All India School Educational Survey
BAS	Baseline Achievement Survey
BRC	Block Resource Centre
CRC	Cluster Resource Centre
CTT	Classical Test Theory
DI	Discrimination Index
DIF	Differential Item Functioning
DISE	District Information System for Education
ESD	Educational Survey Division
ETS	Educational Testing Service
EVS	Environmental Studies
FPC	Finite Population Correction
ICC	Item Characteristic Curves
IRT	Item Response Theory
JRR	Jackknife Repeated Replication Technique
MAS	Mid-term Achievement Survey
MHRD	Ministry of Human Resource Development
MTA	Mother Teacher Association
NA	Not Applicable
NAEP	National Assessment of Educational Progress
NAS	National Achievement Survey
NCERT	National Council of Educational Research and Training
NCF	National Curriculum Framework
NS	Not Significant
OMR	Optical Mark Recognition

PIRLS	Progress in international Reading Literacy Study
PISA	Programme for International Student Assessment
PPS	Probability Proportional to Size
PTA	Parent Teacher Association
RTE	Right to Education
SCERT	State Council of Educational Research and Training
SD	Significant Difference
SE	Standard Error
SIE	State Institute of Education
SMC	School Management Committee
SRS	Simple Random Sampling
SSA	Sarva Shiksha Abhiyan
TAS	Terminal Achievement Survey
TID	Tentative Item Difficulty
TIMSS	Trends in International Mathematics and Science Studies
TLM	Teaching Learning Material
TSA	Technical Services Agency
UEE	Universalisation of Elementary Education
UT	Union Territories
VEC	Village Education Committee

Executive Summary

Introduction

National Achievement Surveys (NASs) are conducted under the Government's flagship programme *Sarva Shiksha Abhiyan* (SSA) and Rashtriya Madhyamik Shiksha Abhiyan (RMSA). Each NAS is designed to provide information about the learning achievement of students studying at elementary or secondary stage of education in government and government-aided schools. This is achieved by administering standardized tests to students of Classes III, V, VIII and X cyclically. NAS also collects information about relevant background factors about the school environment, instructional practices, and the home backgrounds of students, teachers' qualification etc. NAS data gives policy makers, curriculum specialists, researchers and, other stake holders a 'snapshot' of what students know and can do in key subjects at a particular point in time. The results also serve as a baseline against which future progress in education may be evaluated.

Methodology

Sample Selection

This report presents the findings of the third cycle of national achievement survey of students studying in Class VIII. Selecting a representative sample in India is a challenging and arduous task. For selecting the representative sample for Class VIII NAS, government and government aided schools with Class VIII were included in sample frame. The selection was done at three levels.

- Level 1 – District selection, which is done by following the Probability Proportional to Size (PPS) sampling procedure within the state.
- Level 2 – School selection (PPS within the district)
- Level 3 – Student selection (Simple random sampling)

This survey was administered in 2012-13. Tests and questionnaires were administered on an adequate sample required to run the Item Response Theory (IRT). The survey comprises of sample of 1,88,647 students, and 24486 teachers from 6,722 schools across 33 States/Union Territories. The subjects covered in this survey were Language (including Reading Comprehension), Mathematics, Science and Social Science.

Tools Development

To measure the learning levels of class VIII students in valid and reliable manner, the achievement tests were developed in four subjects, viz. Language, Mathematics, Science and Social Science. Given the variations in the curriculum and course content across different States and UTs, developing meaningful tests nationally was a challenge. Before

undertaking the test development process, it was necessary to first understand what was being taught at Class VIII level in different states in the four subjects. To do this, syllabi and the text books of Language, Mathematics, Science and Social Science were collected from the States/UTs. These were analysed to arrive at common core content and competencies across the States and UTs. An assessment framework was developed for each subject based on the analysis. These frameworks layout the competencies/content to be covered in the tests, the number and type of items to be used for testing each competency. Two test forms for Mathematics, Science and Social Science were developed and each test form consisted of 60 multiple-choice items. Of these, 30 were anchor items which appeared in both the test forms. Thus, overall 90 unique items were used in Mathematics, Science and Social Science to measure learning achievement of Class VIII students. Each Language test form consisted of 35 multiple-choice items with 18 serving as anchor items. Lastly, the scoring keys were developed for each test form in each subject.

Further, all the tests were translated into 12 languages and back translated to ensure that the item remains valid and its meaning is not altered on translation from the source language, i.e. English or Hindi.

Tests Administration

The NCERT with the support of state agencies such as SCERTs/SIEs coordinated the NAS project in the States/ UTs. Each participating States/UTs designated a State Coordinator who was responsible for implementing the NAS in the States/UTs in accordance with the NAS guidelines. The state coordinators in turn selected district coordinators and assistant district coordinators at district level to facilitate the survey activities. All the coordinators were trained on field level data collection. A detailed guideline cum training manual was developed by Education Survey Department (ESD). In each selected district, team of field investigators was appointed by the district coordinators. Each team comprised of two field investigators. They were given rigorous training on selection of students in the sampled schools, administration of tools and recording of responses by students in OMR sheets. Post the administration of tools in the schools, OMR sheets, tests, questionnaires and field notes etc. were verified at the district level for correctness of numbers, codes and other information, and then sent to the state coordinators. The response sheets in OMR format were then dispatched by the state coordinators to the respective RIEs or NCERT for scanning, scoring and analysis. The massive data collection task for the National Achievement Survey would have not been possible without the support, dedication, competence, and experience of the state coordinators and their teams.

Use of Item Response Theory (IRT)

All the tests used in the survey constituted of multiple-choice items to measure students' abilities as they allow for more accurate and efficient scoring. The items were first developed in English and Hindi language and piloted in the States where the medium of instruction was either English or Hindi to ensure that the items functioned well in both the languages. The pilot data was then analysed and items were selected for the final tests. The tests were then translated into twelve regional languages. As a significant shift from earlier surveys, two tests booklets were prepared in each subject for the first time. Further, both the test booklets were linked to each other through a set of common items (anchors) and the scores of both booklets were placed on the same scale using the Item Response Theory (IRT).

In earlier two cycles of surveys, the data was analysed using Classical Test Theory (CTT) and average scores were reported as the 'proportion of answers correct'. However, this approach has significant limitations. To overcome these, data from the present Survey was analysed using Item Response Theory (IRT) in addition to the classical approach as is the practice of major international surveys. IRT uses a mathematical model to link a student's chances of success on a particular item to two main factors: the student's level of ability and the item's level of difficulty. In this model, the difficulty of an item does not depend on the group of test takers. This allows the use of multiple test booklets which can be linked. It also allows scores from tests used in different cycles to be compared - an essential characteristic for monitoring progress over time.

Throughout this report, results are reported using 'scale scores' calculated using IRT in place of the percentage correct scores. For this, the chosen scale is from 0 to 500. The average score for the whole population is initially set at 250. The standard deviation of the scale is initially set at 50 for the whole population. This means that the majority of students (about 70%) will have scores in the range 200 to 300.

Findings

This executive summary reports findings on selected background characteristics of schools, teachers and students. The achievement of Class VIII students in Language (Reading Comprehension), Mathematics, Science and Social Science are presented. The regression analysis was used to see the association of these background variables with the student achievement.

Our Schools, Students and Teachers

The characteristics reported here are based on the sampled schools, students and teachers of those schools.

Schools

- Out of the surveyed schools, nearly three-fourth of the schools were inspected in the academic session 2011-12.
- About 95% of the schools had 180-220 working days in academic year 2010-11.
- Most of the States/UTs had 6 working days per week.
- Majority of sampled schools (80%) were functioning in Pucca building.
- About 82% of the schools had separate toilets for girls.
- Computers were available in 62% of the schools.
- Mathematics laboratory existed in only 19% of the schools.
- Science laboratory existed in half of the surveyed schools.
- About two-third of the surveyed schools were using SSA grant for school maintenance.
- About 92% of the head teachers took classes.

Students

- Overall three-fourth students were of age group of 13-14 years.
- About 63% of the students spoke the same language at home as medium of instruction in schools.
- The percentage of physically challenged students was 7%.
- Fathers of 26% students and mothers of 39% students were illiterate.
- School was within 1 km of radius for 62% of the students.
- Nearly 98% of the students reported that they liked being in the school.
- About 87% to 94% of the students got home work in different subjects.
- Nearly 50% of the teachers checked homework.
- About 80% of students got help in their studies from different members of the families.
- Overall, 33 percent of the students took private tuition.

Teachers

- In the surveyed schools, nearly 43% of the teachers were female and 57% were male.
- About 15% of the teachers were below the age of 30 and about 17% were above 50 years of age.
- About 71% of the teachers had attended in service training programme.
- Overall, only 31% of the teachers attended a training programme based on NCF-2005.

- Only 67% of the teachers used revised text books based on NCF-2005.
- Nearly 88% of the teachers maintained the Teacher's Diary.
- Nearly 71% of the teachers used the Teacher's Handbook regularly.
- Only 68% of the teachers had received TLM grant.
- Overall 20% of teachers felt the need for significant repairs in the school building.
- Nearly 12% of the teachers had the opinion that parental support was high.

Student's Achievement in Language (Reading Comprehension)

In Reading comprehension, the average score of 33 states/ UTs was 247 with SE of 0.5. The average achievement of students varies greatly across the States and UTs of India. There is a significant difference between performance in high scoring States/UTs such as Kerala (277), Daman & Diu (273) and Maharashtra (267), and low scoring States such as Jammu & Kashmir (217), Meghalaya (229) and Arunachal Pradesh (234).

States also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges. Some States/UTs have relatively homogeneous cohorts whilst others have far more diverse performance.

Overall significant differences were detected in the average achievement of girls and boys. However, girls performed significantly better than boys. Similarly, significant difference was detected between the achievement level of rural and urban students although exceptions were found in a small number of States/UTs. Performance of urban students was significantly higher than rural students.

The survey results show that students from the General Category outperformed their peers in the SC, ST and OBC categories by a statistically significant margin.

Student's Achievement in Mathematics

In Mathematics average score of 33 states/ UTs was 245 with SE of 0.6.The average achievement of students varied greatly across the States and UTs of India. There was significant difference between performance in high scoring States/UTs such as Uttar Pradesh (278), Madhya Pradesh (267) and Tripura (264), and low scoring States such as Puducherry (227), Meghalaya (227) and Delhi (228).

States also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges. Some States/UTs have relatively homogeneous cohorts whilst others have far more diverse performance.

No significant difference was observed in the average achievement of girls and boys. Similarly, rural and urban students did not differ in their achievement level in as many as 24 States/UTs, although exceptions were found in a small number of States/UTs.

The survey did find that students from the General Category and Other Backward Classes (OBC) categories outperformed as compared to category students by a statistically significant margin.

Student's Achievement in Science

In Science average score of 33 states/ UTs was 251 with SE of 0.6. The average achievement of students varied greatly across the States and UTs of India. There is a significant difference between perfromance in high scoring States/UTs such as Daman & Diu (282) and Dadra & Nagar Haveli (277), and low scoring States/UTs such as Puducherry (230), Meghalaya (232) and Andhra Pradesh (237), Delhi (237) and Tamil Nadu (237).

States also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges. Some States/UTs have relatively homogeneous cohorts whilst others have far more diverse performance.

Overall no significant difference was observed in the average achievement of girls and boys. But, significant difference was detected between the achievement level of rural and urban students, although exceptions were found in a few States/UTs. Performance of rural students was significantly higher than urban students in Science.

Students' Achievement in Social Science

In Social Science average score of 33 states/ UTs was 247 with SE of 0.6.The average achievement of students varies greatly across the States and UTs of India. There is a significant difference between performance in high scoring States/UTs such as Daman & Diu (278), Uttar Pradesh (267), Madhya Pradesh (265), and Dadra & Nagar Haveli (263), and low scoring States such as Tamil Nadu (228), Meghalaya (226), Andhra Pradesh (232) and Puducherry (222).

States also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges. Some States/UTs have relatively homogeneous cohorts whilst others have far more diverse performance.

Overall, no significant differences were detected in the average achievement of girls and boys. Similarly, no significant difference was detected between the achievement level of rural and urban students although exceptions were found in a small number of States/UTs.

The survey did find that students from the General Category outperformed their peers in the SC and ST categories by a statistically significant margin.

What Students Know and Can Do?

Language (Reading Comprehension)

Locating information

Overall, 54% of the students were able to respond correctly on items based on locating information, i.e. retrieving information from the given text. Besides, majority of the items with lowest cognitive processes were of scaled score between 218 to 250.

Grasp Ideas/interpret

Overall, less number of students responded correctly on items based on Grasp Idea/Interpret as compared to cognitive process of locate/retrieve information.

Infer/Evaluate

Less than 50 % of the students could respond on each item for assessing this cognitive process. The range varied from 26% to 46% of the students.

The results show that students found 'Locating information' to be a simple task and 'Infer and Evaluate' competency as most difficult. The difficulty of the items testing 'Grasp ideas/ Interpret' fall in between the above stated two competencies.

Mathematics

In Mathematics, 6 content areas were tested. Performance of students on different content areas is as under:

Number System

The concept of 'number system' was represented by 40 items in the survey. The average difficulty of items related to number system is 32.6%. However, it varies from 16.7% to 60.8%.

Algebra

The concept of 'Algebra' is represented by 13 items in the survey. The average difficulty of the items related to the concept is 33%. Majority of the items in this concept vary in their difficulty between 27% to 40%.

Ratio and Proportion

The concept of 'Ratio & Proportion' is represented by five items in this survey. The average difficulty of these items is 25%. The difficulty of these items vary from 20.7% to 31.0%.

Mensuration

The concept 'Mensuration' is represented by 13 items in this survey. The average difficulty of items related to mensuration is 27.6%. The difficulty of items related to mensuration vary from 16.3% to 39.3%.

Geometry

The concept of 'Geometry' is represented by eleven items in this survey. The average difficulty of items related to the concept is 33.8%. The range of the difficulty of items related to the concept of geometry vary from 23% to 52.7%. Majority of items in this concept vary in the difficulty range 30% to 40%.

Data Handling

The concept of 'Data Handling' is represented by seven items in this survey. The average difficulty of items related to data handling is 41%. The difficulty of these items vary from 34% to 52%.

It may be concluded from the above findings that the items based on 'Data Handling' were easy as compared to 'Algebra' and 'Number System', whereas items based on 'Mensuration', 'Ratio and Proportion' were found most difficult for the surveyed students of Class VIII.

Science

In Science, 13 content areas were tested. Performance of students on different content areas is as under:

Crop production

In the content area of 'Crop Production' only 26% could respond correctly by recalling the weedicide used for controlling unwanted plants in the field. The average performance of students on this content area is about 39%. The range of percentage correct responses is between 26 to 65%.

Micro-organism

Items on content domain 'Micro-organism' were found to be quite difficult, as 29 to 38% students could respond on these items correctly.

Cell structure and function

Overall, one-third of the students could respond correctly to items of the area of 'Cell structure and functions'.

Reproduction

The average performance on the domain 'Reproduction' was 35%.

Biodiversity (Conservation of Plants and Animals)

On items related to 'Biodiversity' students responded correctly in the range of 35-41%. On an average about 38% students could respond correctly to items based on 'Biodiversity'.

Force and Pressure

The average performance on this content area was 31%.

Electric Current and Circuit

On an average, 37% of the students responded correctly on items based on the content domain 'Electric Current and Circuit'.

Light

On an average, about 31% of the students responded correctly on items of content domain 'Light'.

Star and the Solar System

In content domain 'Star and the Solar System', the average performance of students is 40%.

Synthetic fibers and plastics

Average performance of students in the domain of 'Synthetic Fibers and Plastics' is 40% and about 54% students could identify the fibers which are most skin friendly of human beings.

Metal and non-metals

In content domain 'Metal and non-metals', the average performance of students is 38%. About 51% of the students responded correctly that existence of oxygen is essential in nature for human life.

Coal and Petroleum

Average performance of students on content domain of 'Coal and Petroleum' is 35%. More than 50% students could identify the least polluting and exhaustible fuels found in nature.

Pollution of Air and Water

The average score of students in content domain 'Pollution of Air and Water' is 32%.

Overall, it can be said that content related to 'Star and the Solar System' and 'Synthetic Fibers and Plastics' were easy and content related to 'Light and Force and Pressure' were difficult for Class VIII surveyed students.

Social Science

Performance of students on different content areas is as under:

Education and British Rule

In the content area 'Education and British Rule' of History, only four items were used for analysis of students performance. Overall, less than one-third students could respond items correctly.

Women and Reform

In the content area 'Women and Reform' of History, only two items were retained for analysis. Both the items were responded to correctly by about 41% and 42% of the students respectively. Item based on 'Politics initiated by British after 1857 revolt' and 'Clash of ideologies during reform movement' were considered of average difficulty by subject experts.

The Nationalist Movement

In the content area 'The Nationalist Movement' of the History, only 34% to 45% students could answer most of the items correctly. However, 69% surveyed students were not aware about the freedom struggle of India.

The Revolt of 1857-58

In this content area, the average performance of students was 33%.

The Establishment of Company Power

On the basis of students' performance on different items based on 'The Establishment of Company Power', that the average performance was 35%.

Challenging the Caste System

There are two items in the content area, 'Challenging the Caste System'.On both the items less than 33% of the students could respond correctly. Hence, students performed poorly on these items.

Agriculture

Students' performance on the content area 'Agriculture' shows that the difficulty of items is directly related with the percent correct responses of the students, i.e.; higher the difficulty of the item, lesser the percent correct responses. The percent correct on these items ranges from 26% to 68%.

Natural and Man-made Resources

Performance of students, on items testing the content area 'Natural and Man-made Resources' was not good, as it ranged from 32% to 45%.

Industries

The understanding of students, in the content area 'Industries', was tested through six items. The performance of students on these items varied from 26% to 49%. Out of six items, the performance of students on three items was below 30%.

Human Resources

There was large variation in performance of students on different items, ranging from 34% to 65% in the content area 'Human Resource'.

The Judiciary

Performance of the students on items testing the content area of 'The Judiciary' was not good, as it only ranged from 19% to 42%.

The Constitution

The performance of students on items, testing their understanding on content area 'The Constitution' was not satisfactory as about two-third of the students know the minimum age of voting for men and women as per the Constitution of India.

Parliamentary Government

Data indicates that students' performance on items testing their understanding on the content area 'Parliamentary Government' was average.

Social Justice and Marginalized

On the content area 'Social Justice and Marginalized', 25% to 37% students could respond correctly. It shows that this content area was difficult for them. Hence, there is a need of more understanding in this content area.

Economic Presence of the Government

Overall performance was very poor on the content area 'Economic Presence of the Government'. Majority of students do not know about the Economic Presence of the Government, i.e.; Lapse in enforcement of Law e.g. Bhopal Gas Tragedy.

Overall, all the content areas covered under Social Science were found difficult for Class VIII students. The order of difficulty may be organized in decreasing order as 'Economic Presence of the Government', 'Social Justice and Marginalised', 'Challenging the Caste System', 'Resources', 'Education and British Rule',..... and 'Women and Reform'.

Association of Background Variables

Key Variables

For the regression analysis the following three variables were considered as key variables:

- Socio-economic Index
- Language spoken at home
- Location of the school

School variables and student achievement

Variables such as government schools, co-education schools, school inspection, more working days per week, pucca school buildings, incentive schemes viz. mid day meal, free uniform and textbooks, school committees, teacher expectations for students' achievement, students' desire to do well in school and head teacher taking class(es) appear to had positive robust relationship or association with attainment of students in Mathematics, while behaviour problems had negative association with mathematical attainment.

Student Background and Achievement

Variables such as less distance to school from residence, mathematics as subject liking, mathematics activities in class, regular homework, checking of homework regularly, taking private tuition and home activities (reading magazines and playing games and sports) had a positive relationship with attainment in Mathematics in the sense that the relationship is statistically significant and are not extinguished by allowing for other important variables including home resources, speaking the language of instruction at home and location of the school. On the other hand, students from deprived social groups, being physically challenged and watching television had negative association with Mathematics achievement.

Limitations of the Study

The limitations of the survey are described below:

- The sampling for the survey was done based on the list of schools under District Information System for Education by NUEPA and 8th All India School Education Survey (AISES) conducted by NCERT, New Delhi. There were some discrepancies in the data observed during the time of actual field work.
- In some states, a few sampled schools were not covered by the field investigators as there were disturbances in those areas due to various socio political reasons. Hence, the data collected in such states may not be as representative as planned.
- In most of the states, the responsibility of data collection was assigned to the District Institute for Educational Training (DIET) faculty, who in turn allocated the task to their students. The training and hands on practice given to these field investigators may not have been sufficient resulting in inefficiencies in the data collection procedure as is evident from the increased demands during the data cleaning process.
- In order to meet the key objectives of this survey, schools and students were sampled in a systematic fashion. This meant that teachers could not be explicitly sampled in the same way. As a result, the analysis of teacher-related variables vis-a-vis student attainment could not be made in a comprehensive manner.
- In the previous Class VIII cycles, the CTT model was used for developing test and analysing the data. In this cycle, IRT was used. These two methodologies are quite different. Therefore, the results of this cycle are not directly comparable with the previous cycles of NAS Class VIII.
- In this cycle (III), NCERT used IRT for analysis of data instead of CTT. Therefore, mostly, results are reported in terms of scaled score rather than percentage correct scores. While this is a significant step towards adopting international best practices but currently there is not enough awareness about this approach in the country. This makes it difficult for most readers to interpret and understand the results. It is hoped that in coming years there will be greater awareness and understanding of IRT and its use.

CHAPTER - 1

Introduction

The National Achievement Survey (NASs) is a large scale survey being conducted periodically in India since the year 2001, to examine the health of the country's education system in general. The following report summarises the findings of the National Achievement Survey (NAS) of Class VIII students conducted in 2012-13 by the National Council for Educational Research and Training (NCERT) through its Educational Survey Division (ESD). It is based on the information gathered through tests and questionnaires administered to a sample of 1,88,647 students in 6,722 schools across 285 districts of 33 States and Union Territories (UTs). The subjects covered were Mathematics, Language (including Reading Comprehension), Science and Social Science.

The aim of each NAS is to provide reliable information about the achievement of students in the elementary level of education in government and government-aided schools. This is achieved by applying standardised tests to students and collecting information about relevant background factors including school environment, instructional practices, qualification and experience of teachers and home background of students. The data from each NAS gives the policy makers, curriculum specialists, researchers and, most importantly, school principals and teachers a 'snapshot' of what students are achieving in key subjects at a particular point in time. By repeating such measurements at regular intervals, trends can be explored providing an invaluable perspective from which to consider educational reform and improvement.

It should be noted that while each NAS provides achievement scores for the nation, for each participating state and for certain groups (e.g. females, students in rural schools, etc.). It does not give scores to individual students or schools.

1.1 History of NAS in India

In the year 2000, the National Achievement Survey was originally conceived by the NCERT as an independent project but in the year 2000 it was incorporated into the Government's flagship project *Sarva Shiksha Abhiyan* (SSA). Over the years, while NCERT has been responsible for developing and conducting these surveys, the necessary funding for the programme has been provided by the Ministry of Human Resource Development (MHRD).

Under SSA three cycles of NAS had been planned wherein each cycle had to cover three key grades: Class III, Class V and Class VII/VIII. The first and the second cycles of NAS were conducted in the period from 2001-2004 and 2005-2008. They were called the Baseline Achievement Survey (BAS) and the Mid-term Achievement Survey (MAS) respectively. The third planned cycle had been originally named as the Terminal Achievement Survey (TAS). However, given the importance of these surveys and the experience gained through the first two cycles, it was clear that this programme should be an on-going feature of the national education system and therefore, the current series of NAS is more correctly known as 'Cycle 3' as given in the following Table 1.1.

Table 1.1 | Timeline for NAS under SSA

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Cycle 1 (formerly BAS)				Cycle 2 (formerly MAS)				Cycle 3 (NAS)				
Class V		Class III		Class V		Class III			Class V			
	Class VII & VIII					Class VII & VIII			Class VIII*			
											Class III	

* The findings of the Cycle 3, Class VIII (NAS) are reported herein.

The NAS at the class III level covers assessment of two subjects i.e. Mathematics and Language. Whereas assessment for class V comprises of three subjects: Mathematics, Language and Environmental studies. For Class VII/VIII, four subjects are assessed, i.e. Language, Mathematics, Science, and Social Science.

The comprehensiveness and coverage of these surveys provide very useful data to capture the progress of the education system as well as enhance the quality of elementary education. This survey report represents a quantum leap forward in the method used to analyze the results. Furthermore, NCERT's commitment to make these surveys an ongoing feature of the national education system have encouraged the introduction of a new method of scoring the test results, namely Item Response Theory (IRT). Using IRT it is possible to link and thus compare, national and state test scores over time, even if different tests are used. The use of IRT necessitates the survey design to have set of items which are repeated between the tests and can be linked. The sampling and weighting details also need to be comparable.

1.2 Development of Tools

The tools for carrying out any large survey need to be simple, understandable, valid and reliable. To measure the learning levels of class VIII students reliably, the construction of the achievement tests in all the four subjects i.e. Language, Mathematics, Science and Social Science was a critically important activity. The tests needed to be pegged at a level wherein they measure the abilities of children across all the states. There exists a wide variation in the course content and other factors across the states and this posed a huge challenge in test development. Before undertaking the test development, it was necessary to know what was being taught at class VIII level in the states in different subjects. The syllabi and the text books of the required subjects from all the states/UTs were collected and analyzed to understand the content areas that had been covered and the competencies expected to be acquired by the students. This process led to the identification of common core content and competencies for developing the tests.

Based on the analysis, broader assessment frameworks were developed in different subjects. These frameworks described the competencies to be covered in the tests, the number and type of items to be used for testing each competency, the structure of the test forms and number of tests forms to be used.

In order to measure each learning outcome with sufficient precision, multiple test forms were constructed for separate subjects and a three dimensional grid for indicating the content areas to be covered, skills to be tested, the difficulty level of items under each skill along with the number of items for each of the subjects

Item Writing Workshop

GENERAL

The item writing workshop included plenary sessions on fundamental principles of test development and subject-specific workshops for writing and reviewing/editing draft items.

The general principles covered were:

- Characteristics of sample-based achievement surveys (national and international)
- Test specifications and their role in test development
- Item writing rules and guidelines
- Procedures and checklists for reviewing the quality of items
- Introduction to classical item statistics
- Filling of three dimensional grid.

1.2.1 Language

This subject area comprised of two sub-groups – English and Hindi. The work was guided by the draft specifications for the language test prepared by the ESD, text and item types from MAS and international examples from various sources including National Assessment of Educational Progress (NAEP). The following tasks were covered by the working groups:

- reading texts and questions (4-option mcq)
- drafting discrete items on 'language structures' (4-option mcq)

Apart from this, the Hindi group also checked whether the English reading passages could be translated and produced an original Hindi reading passage for translation into English.

Sufficient passages and discrete items were prepared and reviewed to create three booklets for piloting.

1.2.2 Mathematics

The tasks under this area were guided by the draft specifications for the Mathematics test prepared by the ESD, items from MAS, international examples from various sources (including NAEP and TIMSS), and traditional and modern textbooks used in schools for Mathematics.

Review of the textbooks revealed that the approach to teaching/learning Mathematics advocated by NCF 2005 was considerably different from that of the traditional syllabuses. There was a significant shift from formally setting out concepts and procedures to be learnt to an informal approach where topics related to Mathematics were discussed and explored through activities – rather than simply being presented by teachers and then practiced. This was also seen as an obvious phenomenon from the new textbooks which were noticeably different in terms of their content, complexity, language – even presentation.

The following steps were undertaken for item writing:

- Discussion on the content areas to be covered for development of items and explanations on the main principles of item writing and quality control.
- Drafting of about 300 items
- Peer-reviewing all the items drafted
- Development of items under following topics/contents:

  T1: Number System

  T2: Algebra

  T3: Ratio and Proportion

  T4: Mensuration

  T5: Geometry

  T6: Data Handling

1.2.3 Science

This subject area was guided by the draft specifications for the Science test prepared by the ESD, items from MAS and international examples from various sources (including NAEP). Traditional and modern textbooks used in schools were also considered for identifying the content areas in which the items were to be developed in Science.

Prior to the workshop, syllabi and other information were collected from the schools across states for identification of core content areas for development of items. Following this, analysis of the syllabi from different states indicated that while some states had developed their syllabi and textbooks in accordance to NCF-2005, the others had chosen not to adopt the same. Besides this, even in states where the new syllabi had been developed, many schools continued using the old textbooks and, as one suspected, traditional approaches as well.

This situation posed significant challenges for the development of Science test booklets for the achievement survey as it was difficult to decide on whether the items were based on the old syllabus, the new syllabus, or something in between. Given this dilemma, the subject group worked hard to generate items targeting fundamental concepts and principles of Science; wherein the focus was on what was important for both the students and the achievement survey.

The item writers developed a number of items designed to test 'enabling skills' such as reading information from figures and diagrams. Items targeting the skill of inference from the given unfamiliar information were also constructed. Besides this, for achievers at the lower end of the ability spectrum, several items based on pictorial information were developed to minimize the reading load.

All draft items were reviewed to ensure that major concerns were heard and that a consensus had been reached on the suitability of each item. In this way, more than 200 items were drafted covering all the major themes of Science.

1.2.4 Social Science

For development of items in Social Science, the same steps were used as in case of Science.

1.2.5 Finalization of Items for Piloting

After the development of the items, the following activities were carried out by the ESD faculty:

- Translation from the English versions of the items into Hindi language
- Reverse translation exercise was carried out to ensure that during the translations from English to Hindi the meanings were not altered and the items were still valid
- Electronic entry of all items including development of marking keys, etc.
- Development of artwork (maps, diagrams, charts, tables, etc.) for items, wherever necessary.
- Development of three test booklets containing 60 items per booklet for piloting.
- The items selected for the test booklets were matched with the grid to ensure that they represented each skill with difficulty of the items in sufficient number.
- Designing of cover page with identification codes, general instruction for field investigators and students
- Review of Test booklets and proof-reading
- Final checking of the booklets before they were made 'print ready' in both English and Hindi

1.2.6 Piloting of the Test Items

In order to standardize the tests, three test booklets containing 60 items in each subject were used for piloting .These were piloted in 11 states (6 for Hindi and 5 English) to see how the items functioned in English and Hindi languages.

For each item, the difficulty level (p-value) and discrimination index (DI) were computed using LERTAP software. Item Characteristic Curves (ICC) were prepared and carefully scrutinized to help select suitable items for the final tests and mostly those falling between 0.2 and 0.8 p-values were selected.

1.2.7 Sampling for Piloting

The sampling procedure for piloting of items was discussed amongst the faculty members of ESD and the following techniques were used to gather meaningful data:

- A sampling strategy based on DISE data for the school year 2008-09 was developed.
- The sample was not selected randomly but rather based on expert judgment taking into account the statistical requirement of having enough records for each item for analysis and at the same time diversity of the students/ schools in the education system.
- Districts to be included in the main survey were excluded from the pilot sample of test items.
- Schools in the state were selected taking into account the diversity of socio-economical background variables, i.e. some schools were selected from cities, some from small towns, some from rural areas, etc. (Since the average class size in rural schools is smaller than in urban schools, the overall number of selected rural schools were greater than urban schools.)
- A systematic procedure for drawing the sample for piloting was designed. An example to this was a 'rotational matrix' that was drawn up to assign subjects to schools.
- 40 students were randomly selected from one section of each selected schools for the purpose of piloting.
- The chosen students from the selected schools were tested on four subjects over a period of 2 days. On each day, two sessions were organized and each child was tested for two subjects.
- Each test booklet was piloted on a sample of approximately 1500 students, amounting to a total sample size of 9,000 students (12 booklets x 1500 students x 0.5)
- Each item appeared in only one booklet.

1.2.8 Administration of Tests for Piloting

- For the piloting, the ESD developed a guideline with training manual for district coordinators and test administrators.
- State coordinators were trained in the required procedures, who further trained the coordinators at the districts chosen for piloting.
- Lists of selected schools were prepared for selected districts.
- Field investigators were trained by district coordinators to administer tests in schools.
- A team of two field investigators visited each school for two successive days to enable selected students to take tests in all four subjects.
- Student responses were transferred to data sheets by the field investigators after completion of the tests. These data sheets were then received by ESD through state coordinators.

1.2.9 Data Analysis

- The data entry was carried out by a selected private data management agency.
- The quality of the data entry was supervised by ESD.
- The pilot data was analysed in ESD under the guidance of the faculty including a trial application of IRT to the data for tests.
- The data was analyzed to develop classical test and item statistics.
- Item parameters were used to select items in the context of national assessment surveys.

- In addition to the classical test theory parameters, some IRT calibrations such as Bilog-MG applied. Analyses were also reviewed by international experts and their comments and suggestions were taken into consideration to improve the items.
- Item characteristic curves were generated and shared with technical experts for further discussions for considering the various items.
- The performance of each item was reviewed in English and Hindi language.
- Poor performing and flawed items were rejected.

1.2.10 Test Booklet Construction

The following steps were undertaken for construction of booklets for the main survey:

- All 'new' items were reviewed using classical item statistics, parameters and 'fit' from the IRT analysis, and evidence of differential item functioning for different groups/languages.
- The 'old' items were reviewed including those considered for use as anchor items, by taking statistical evidences of previous performance for selection of 'good' items into consideration.
- Grouping of cognate items (i.e. by assessment of objective) into 'blocks'.

After carrying out the above activities, two forms were developed for separate subjects; with each comprising of a block of anchor items. In Mathematics, Science and Social Science, 30 anchor items were included. In Language, 18 items of Reading Comprehension were used as anchor. This led to each booklet containing three common passages along with two new passages.

The structure of the Mathematics, Science and Social Science booklets are presented below:

Table 1.2 | Exemplar Three Dimensional Grid for Tests

Skills / Contents	Skill 1	Skill 2	Skill 3	Total
Topic 1	easy-2 medium-1 hard-1	easy-3 medium-4 hard-2	easy-0 medium-4 hard-3	20 Items
Topic 2				20 Items
Topic 3				15 Items
Topic 4				20 Items
Topic 5				15 Items
Total	**30 Items**	**30 Items**	**30 Items**	**90 Items**

In all the subjects, the broader domains were identified which are as under:

Language	Mathematics	Science	Social Science
Language Elements	Arithmetic	Biology	History
Reading Comprehension	Algebra	Physics	Geography
-	Geometry	Chemistry	Civics

In each domain there were a number of sub domains i.e. topics. These items were again vetted by subject experts and each test was reviewed in the light of the content area and competency covered, appropriate language, estimated difficulty level and also the homogeneity of distracters. A similar procedure was used for developing test in different languages. While undertaking the translation activity, back translation was one of the ways used to authenticate whether the translated version retained the original meaning.

Finally, for the Class VIII (NAS), each test form for Mathematics, Science and Social Science consisted of 60 multiple-choice items. Thus, an overall of 90 unique items were used in each subject to measure the level of learning achievement. Apart from this, the scoring keys were also developed for each test form in each subject.

Consequently, the cover page of the test, instruction for students and example indicating how to record responses and change them in case of any mistake on the test booklet were also prepared and translated in various languages for all the four subjects.

1.2.11 Use of Scanning Technologies

In case of the Class VIII surveys, Optical Mark Recognition (OMR) sheets were used for obtaining students responses instead of the traditional answer sheets. Large scale scanning technologies were used involving specialised hardware, software and training etc.

The Division carried out the checking and modifications of the OMR sheet designed by ABBYY (Automated Form Processing Agency). During the process of designing, extra care was taken regarding the ID fields, simple and complex fields, fi length, separators, check boxes, captions and size of the paper (A4).

To check the functionality of implementation of OMR sheets in NAS Class VIII, a feasibility study was conducted in two districts of Haryana in December, 2011. This study was conducted on 500 students from 50 schools. The tests in all the four subjects were re piloted along with OMR sheets in these schools. Encouraging feedback was received from the field.

The OMR sheets received from the field were scanned by using scanners installed in ESD. The data was captured through ABBYY Form Reader in the sequence of creating a batch, adding images to a batch, recognition, validation and verification and finally exporting. At each step of the process starting from feeding of the OMR sheet data on to the computer to creating a database, problems were encountered; to which meaningful solutions were provided to by ABBYY software technologies.

On the basis of the piloting experience, the OMR sheets were redesigned and necessary changes were made in the software for the main survey.

1.2.12 Questionnaires

The questionnaires for the Class VIII (NAS) were built upon the experience garnered from the BAS, MAS and NAS Class V surveys conducted earlier and it also incorporated ideas from other international assessment instruments. For this survey, three questionnaires were developed to collect information on a) schools, b) teachers and c) pupils and their backgrounds. The process of development is detailed out as under:

- The process of drafting questionnaires began in October 2011 and questionnaires were piloted along with OMR sheets which were tried out to ensure feasibility of use of OMR sheets by Class VIII students in December 2011.
- Before piloting, draft questionnaires were prepared and sent to international experts for review.
- Amended pupil, teacher and school questionnaires were tried out, through test booklets, on students, schools and teachers in Fatehabad and Jind districts of Haryana. Responses from these were then analysed and linked with student scores.

- The final version of the pupil questionnaire was translated into twelve Indian languages.
- The school and teacher questionnaires were developed in Hindi and English only, as it was considered that school principals and teachers were proficient at least in one of the two languages.

The *pupil questionnaire* contained questions pertaining to the home background of students and other aspects covering parents' level of education and occupation; help available at home for studies from parents and siblings; and the study materials and resources available at home. The questionnaire also investigated the experience of pupils in school through questions about the class work and homework given to them by teachers and whether they liked going to school etc.

The *school questionnaire* sought information on– the location, enrolment and structure of the school, the number of school days and the school's infrastructure and environment. Other questions enquired about teachers' job satisfaction and their professional development opportunities, curriculum transaction strategies and problems existing in schools.

The *teacher questionnaire* comprised questions regarding the age of teachers, academic and professional qualifications, training programmes attended, teaching and evaluation practices, teaching materials available to them, interaction with other teachers and school head and their level of job satisfaction.

1.3 The NAS Sample

Since, the Class VIII (NAS) was designed to investigate the level of learning achievement in the government system at the States/UTs level, all the Class VIII children enrolled in government schools, local body schools and government aided schools formed a part of the target population for this survey. Students of private schools were not included in this survey as proportion of private school pupils varies from state to state.

In general, the sample design for each States/UTs involved a three-stage cluster design which used a combination of two probability sampling methods. At the first stage, districts were selected using Probability Proportional to Size (PPS) sampling principle. This meant that the probability of selecting a particular district depended on the number of Class VIII students enrolled in that district. At the second stage, requisite number of schools was selected from the chosen districts. Once again, PPS principles were used so that large schools could have a higher probability of selection than small schools. At the third stage, schools having multiple sections in Class VIII, all the sections were merged together and this was considered as the total population of Class VIII students in the sampled school. Out of this population, a maximum of 40 students were selected by using the Simple Random Sampling (SRS) method. However, there were some variations in selection of the schools and number of students within the schools in UTs. Details are given in Appendix - I.

In the survey, PPS sampling was based on Class VIII enrolment data obtained from the 8th All India School Education Survey (AISES) and DISE. Also, SRS sampling was conducted according to the class registers available in sampled schools. Appendix-I outlines the further details about the sampling design and procedures of the survey.

1.4 Participating States and Sample Coverage

Although the survey intended to cover all 35 states and UTs in two phases, Assam and Lakshadweep could not participate in this endeavour. In phase I, 24 states and UTs were covered and in phase II, 9 states were covered. The survey was conducted in two phases because of the variation in academic sessions, i.e. from April to March summer closing states/UTs were surveyed (Phase I), whereas the same was done from January to December for schools having winter closing academic sessions (Phase II).

1.5 Characteristics of Participating States

Table 1.3 shows the greatly varying physical and demographic characteristics of the States and UTs that participated in this survey. For example, Bihar, Maharashtra and Uttar Pradesh each have populations of more than 100,000,000 while Daman & Diu, and the Andaman and Nicobar Islands have fewer than 400,000 inhabitants. Mizoram has a population density of just 52 people per square kilometer whereas the corresponding figure for Delhi is over 11,000. Besides this, there is also a great disparity in the literacy rate of states, such as from Goa, Kerala, Mizoram and Tripura (each with literacy rate 87.75 and above) to those with relatively low literacy rate such as Andhra Pradesh, Bihar, Jharkhand and Rajasthan (each with literacy rate 67% to 68%).

The significant differences in the provision of education at the Class VIII level also acts as important factors for this survey. For example, the target population for this survey is all the Class VIII students enrolled in government-run and government-aided schools. However, the proportion of Class VIII students in such schools varies significantly amongst states. For example, in Gujarat, West Bengal and Kerala nearly 100% of Class VIII students are in government schools with an insignificant proportion in the private sector. By way of contrast, in Rajasthan fewer than 50% of Class VIII students are enrolled in government schools.

These and associated factors are likely to influence student achievement and other educational outcomes. Therefore, when considering the findings of this survey and, in particular, when comparing the achievement levels of different states, it is important to take the prevailing conditions into account.

Table 1.3 | Selected Physical, Demographic and Socio-economic indicators for the States and UTs of India

States/UTs	Population+	Literacy Rate+	Sex ratio (female per 1000 males)+	Area (sq. km)	Population Density (per sq. km)+	Data Source	Class VIII enrolment (All schools)*	Class VIII enrolment (Gov. & Gov.-aided)*	Ratio Gov: All schs* (VIII)	Population Coverage
Andhra Pradesh	8,46,65,533	67.66	992	275,045	308	AISES	766329	11298	67.83	99.87%
Arunachal Pradesh	1,382,611	66.95	920	83,743	17	DISE	22355	705	31.71	99.14%
Bihar	10,38,04,637	63.82	916	94,164	1102	DISE	1092472	17422	62.71	99.28%
Chhattisgarh	2,55,40,196	71.04	991	135,194	189	AISES	359651	13191	27.26	99.15%
Delhi	1,67,53,235	86.34	866	1,483	11,297	AISES	292173	1236	236.39	100.00%
Goa	14,57,723	87.40	968	3,702	394	AISES	20619	363	56.80	99.68%
Gujarat	6,03,83,628	79.31	918	196,024	308	AISES	645925	5387	119.90	99.96%
Haryana	2,53,53,081	76.64	877	44,212	573	DISE	240113	5581	43.02	99.11%
Himachal Pradesh	68,56,509	83.78	974	55,673	123	AISES	126868	4467	28.40	99.39%
Jammu and Kashmir	1,25,48,926	68.74	883	222,236	124	AISES	133940	6206	21.58	98.54%
Jharkhand	3,29,66,238	67.63	947	79,700	414	DISE	379858	8674	43.79	97.53%
Karnataka	6,11,30,704	75.60	968	191,796	319	AISES	761040	12517	60.80	99.70%
Kerala	3,33,87,677	93.91	1084	38,863	859	AISES	477405	2587	184.54	99.96%
Madhya Pradesh	7,25,97,565	70.63	930	308,144	236	AISES	777188	25815	30.11	96.59%
Maharashtra	11,23,72,972	82.91	925	307,713	365	AISES	1585202	16090	98.52	99.98%
Manipur	2,721,756	79.85	987	22,327	122	AISES	15862	686	23.12	97.96%
Meghalaya	29,64,007	75.48	986	22,429	132	AISES	40542	882	45.97	97.05%
Mizoram	10,91,014	91.58	975	21,081	52	AISES	14404	404	35.65	98.14%
Nagaland	19,80,602	80.11	931	16,579	119	DISE	13443	383	35.10	99.23%
Odisha	4,19,47,358	73.45	978	155,707	269	AISES	573249	8794	65.19	99.17%
Punjab	2,77,04,236	76.68	893	50,362	550	AISES	305400	6782	45.03	99.18%
Rajasthan	6,86,21,012	67.06	866	342,236	201	DISE	615133	29035	21.19	98.44%
Sikkim	6,07,688	82.20	889	7,096	86	DISE	9165	293	31.28	96.26%
Tamil Nadu	7,21,38,958	83.33	995	130,058	555	DISE	985630	14181	69.50	99.56%
Tripura	36,71,032	87.75	961	10,492	350	AISES	57790	1680	34.40	96.89%
Uttar Pradesh	19,95,81,477	69.72	908	240,928	828	DISE	1553549	39483	39.35	97.78%

States/UTs	Population+	Literacy Rate+	Sex ratio (female per 1000 males)+	Area (sq. km)	Population Density (per sq. km)+	Data Source	Class VIII enrolment (All schools)*	Class VIII enrolment (Gov. & Gov.-aided)*	Ratio Gov: All schs* (VIII)	Population Coverage
Uttarakhand	1,01,16,752	79.63	963	53,566	189	DISE	129817	4776	27.18	99.06%
West Bengal	9,13,47,736	77.08	947	88,752	1029	DISE	1284668	11118	115.55	99.94%
A & N Islands	3,79,944	86.27	878	8,249	46	AISES	6523	135	48.32	96.83%
Chandigarh	10,54,686	86.43	818	144	9252	AISES	11426	93	122.86	99.89%
Puducherry	12,44,464	86.55	1038	492	2598	AISES	16313	212	76.95	99.90%
Dadra & Nagar Haveli	342,853	77.65	775	491	698	AISES	4908	60	81.80	100.00%
Daman & Diu	2,42,911	87.07	618	122	2169	AISES	3437	29	118.52	100.00%

Source: Census of India 2011, Provisional Population Totals
* The District Information System for Education 2009/10, 8th All India Educational Survey 2009/10

1.6 Administration of Tools

When conducting NAS, NCERT took the help of state agencies like SCERTs/SIEs to coordinate survey activities in the States/UTs. Each participating state designated a State Coordinator and Associate State coordinator who had the responsibility of implementing the NAS in their States/UTs in accordance with the NAS guidelines. The state coordinators, associate state coordinator and district coordinator were also given training on how to collect data in the field. For this a detailed guideline & training manual and field notes were developed by ESD. Further, in each selected district, district coordinators appointed 10 to 12 teams of field investigators who were trained rigorously by the district coordinator on the conduct of the main achievement survey. Teams were formed comprising of 2 field investigators each. During the training, field investigators were briefed about selection of students in the sampled schools, administration of tools, and use of OMR sheet by the students, and filling of the field notes. The filled OMR sheets, questionnaires and field notes were then collected by the district coordinators and sent to the state coordinator after checking the number, coding of schools, and whether they were filled properly by the investigators. Subsequently this material was dispatched by the state coordinator to the NCERT, where the OMR sheets were scanned and analyzed, and questionnaires were outsourced to a computer agency for data entry. Without the help, dedication, competence, and experience of the state coordinators and their teams, for which they should be commended, the massive task of data collection for the National Achievement Survey would not have been possible.

1.7 Monitoring

Financial provisions at the state and each district level were made and funds provided to carry out monitoring activities. It was communicated to the states that at least 10-15 schools are to be monitored randomly during the actual conduct of the survey by the SCERT faculty. Similarly 5-10 schools were required to be monitored by the DIET faculty in each district. Besides, at the national level, faculty, project staff from the ESD and the TSA staff also monitored the actual administration of the tools in most of the states. Although monitoring, of the actual administration of tools was found to be satisfactory in most of the cases, some flaws were also detected by monitoring teams here and there.

1.8 Data Management

The NCERT received material from all states regarding NAS field work; which were checked and organized school wise by the NCERT Project Team. Following this, batches with details about the school code, district code, number of OMR sheets, number of school information sheet, number of pupil, teacher and school questionnaire and field notes were prepared. The codes of questionnaires and OMR sheets were then matched and needful corrections were made in case of any discrepancy.

For transferring data of the questionnaires from physical mode to electronic mode, the work was outsourced to a computer agency. Data entry and analysis plans were developed in the ESD keeping in mind the objectives of the study and these were later provided to the computer agency for doing the task assigned in a systematic manner. This step was then followed by the computer agency providing soft copy of the data entered to the division. The data was further checked and verified by the Project Team for its quality and while problems of mismatch were sorted, the clean data files were finalized for end use.

Optical Mark Recognition (OMR) sheets were scanned in the Division by the project staff under the supervision of a consultant and the faculty. Data was captured through ABBYY Form Reader software and images were added to a batch which were recognized, validated and verified before exporting it finally for creating a data base of achievement responses. OMR sheets which were not filled up properly were sent for manual data entry. The percentage of such cases was nearly 5-10%.

Databases created in the division and data files received from the computer agency were cleaned before merging and analyzing. Data cleaning process particularly focused on correction of ID mismatches and mis–entries and test form mis–entries by checking against hardcopies of data sources and eliminating same pattern of responses (more than 2). Completely cleaned files from different sources (student responses, and student, teacher, and school questionnaires) were later merged together for analysis using both CTT and IRT.

1.9 Analysis of Data

Once the Class VIII NAS data was cleaned, preliminary analysis of the student responses was carried out by TSA experts using Item Response Theory (IRT) model in order to check item fit. In parallel with the IRT analysis, state-wise Differential Item Functioning (DIF) analysis of the test items was also conducted by ESD faculty and Consultant under the guidance of the TSA experts. Results from the analyses were scrutinized by experts to determine inclusion or exclusion of items in Class VIII NAS pooled data analysis. After the item fit checks, problematic items were excluded mainly due to mistranslation, non-existence of right answer, or multiple correct answers, in all four test subjects.

Finally, Class VIII NAS student response data was compiled for all states and sampling weights were assigned. Subsequently, data was analyzed by consultant in ESD with the two-parameter IRT model after the exclusion. Using this model, a separate scale was developed for each subject with the mean of each of these four scales being set to 250 and the standard deviation to 50. From this approach student scale scores were calculated for each student response in all four test subjects, which were then used to estimate state averages and percentiles and compare different subgroups such as gender, area and social group. Three questionnaires viz. Pupil, Teacher, and School questionnaires, were analyzed later, and frequencies of every question within each questionnaire were explored. In order to investigate associations between student achievement scores and background characteristics of the pupil, school and teachers, regression analyses to the Pupil and School questionnaire data was applied.

A detailed description of the IRT model used is discussed in subsequent chapters.

Omitted and Non-Reached Responses: In test administration each student got only one booklet. Items which were not included in the booklet were treated as 'not presented', i.e. they were ignored in the analysis of the data. Besides, students could not provide an answer to an item which was in their test booklet or due to various possible reasons such as they could fail to make an attempt on an item by mistake; they didn't feel it was worth attempting; or they had given up or run out of time before reaching the end of the test. Such type of items were considered 'not reached' when the item itself, all subsequent items and the item immediately preceding it were not answered. Such 'not reached' items were treated differently in estimating item parameters and student proficiency scores. In estimating the values of the item parameters, items in the assessment booklets that were considered not to have been reached by students were treated as if they had not been administered. Conversely not-reached items were considered as incorrect responses when student achievement scores were generated.

1.10 Understanding the Results

1.10.1 Average Scores

The average score reported for each participating state and UT is accurate for the chosen sample, however, the true average for the population may vary from the sample average. This likely variation is expressed in terms of what is known as 'Standard Error' and as a thumb rule the average score of the population is estimated to fall within a range of plus or minus two standard errors from the sample average. For example, in the table below, the average Mathematics score of all the states listed is '251' and the sampling error is estimated to be'0.7'. This means that we can be confident that the true average for this group of states is in the range of 251 ± 1.4.

When comparing two average scores, the standard errors of each must be taken into account. For example, in the table, State X has a mean score of '257' which looks higher than the group average score of 251. However, when we take the standard errors into account we see that the difference between the state's performance and that of the group is not statistically significant. Similarly, State X has a higher mean score than State P, but the observed difference in Mathematics achievement in these two states is yet not statistically different when the standard errors are considered. Hence, one can say that both are 'average' states when it comes to the achievement in subject of Mathematics.

Mathematics			
State or UT	Average Score	Standard Error	Significant Difference
State P	252	2.6	●
....	....	....	....
....	....	....	....
State X	257	3.2	●
State Y	298	3.1	↑
State Z	241	2.7	↓
Group Average	**251**	**0.7**	

● No significant difference between the average performance of rural and urban students.
↑ Rural students' average performance is significantly higher than that of urban students.
↓ Rural students' average performance is significantly lower than that of urban students.

1.10.2 Percentile Scores

In addition to the average scores, percentile scores are also reported in the NAS. Percentile tables and figures in NAS report illustrate the achievement within states at different percentiles. A percentile score indicates the scale score below which a certain proportion of students fall. For example, the 10th percentile score means that 10% of students may be found at or below it. (Hence, 90% of students can be found above it.) As shown in the exemplar table below, NAS reports list the scores achieved by students at key percentiles. Among these are the 25th (first quartile), 50th (second quartile or median), and 75th (third quartile) percentile. The range between the 25th and 75th percentiles (the inter-quartile range) represents the performance of the middle 50% of students. Hence, this is a good indicator of the state's degree of homogeneity in terms of the achievement of its students.

State or UT	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	Range 75-25	Range 90-10
....	....	....	....	....	....	....	....
State 1	185	212	228	271	291	59	107
State 2	178	204	230	275	321	71	143
State 3	185	212	226	248	273	36	88
....	....	....	....	....	....	....	....

In the table above, States 1 and 3 have similar median scores (228 and 226 respectively). However, State 1 has a significantly higher score at the 75th percentile than State 3 (271 compared with 248). This shows that while the average scores for the two states are comparable, the top 25% of students in State 1 are doing significantly better than their peers in State 3. By providing such data, NAS allows States to compare achievement not only for 'average students', but also across the full ability range.

1.10.3 Tables Related to Pupil and School Variables

Under the NAS Class VIII, a different type of treatment was given to the pupil and school related variables because of their distinct and unique nature.

The regression analysis of the outcomes was used to observe the impact of these variables in more detail. This analyses was conducted for a range of student and school factors, first for the factor on its own, and then after allowing for three 'key' factors which were:

a. Socio-economic status
b. Speaking language of instruction at home
c. Area/Location

Instead of taking in all variables simultaneously, only three 'key' variables were taken for the purpose of regression analysis, namely the socio-economic background, speaking the language of instruction at home and area In order to get unbiased standard errors, results were jackknifed.

The variables analyzed under Student and School Variables were of two types:

a. Dichotomous variables
b. Categorical variables (with more than two values)

Since the information provided in the data tables is complicated in nature, some examples for reading the tables and interpreting the data for each type of variable have been detailed below:

The given table shows the regression results between different intervening variables and Mathematics. The three columns under the subject show the relation between the variables and subject score without and with the key background variables, namely the socio-economic background variables and speaking the language of instruction at home.

To understand the data provided in the table an example for each type of variable is explained below:

1. Dichotomous Variables

In dichotomous variables such as gender, results are compared with a base category. To save space and because it is obvious, the base category is given the value of zero and is not shown. The interpretation of dichotomous variables is given below:

Regression Results – Private tuition

Private Tuition	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Yes	3.16	1.32	*	2.56	1.34	NS

*Significant if P<.05, NS-Not Significant

In case of private tuition, students not taking private tuition are considered as the base category and thereafter a coefficient value of 3.16 is obtained for those taking the tuitions (without including key variables). This indicates that students taking tuition are performing better than those who are not taking tuition by 3.16 scale score points and the difference is statistically significant. In other words, it can be concluded that private tuition has a positive impact on performance of students in Mathematics. When key variables were entered, no significant differences were observed.

2. Categorical Variables (with more than two values)

The interpretation of categorical variables (with more than two values) is given below:

Regression Results – School type

School Gender	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Girls	6.46	4.63	NS	7.5	4.35	NS
Co-ed	10.67	3.64	*	7.42	3.15	*

*Significant if P<.05, NS-Not Significant

Under this variable there are three possible responses namely Schools only for boys, Schools only for girls and schools for both boys and girls (co-education). Schools only for boys is taken as the base category, and its scores taken as the zero point. Regressions for the other categories was expressed as deviations from this, thus, on average, students from coeducation schools perform better by 10.67 score points than the students from boys schools. Also, the output indicates that both schools only for girls and coeducation schools did better than only boys' school. However, the difference was significant only in case of only boys' schools and coeducation schools. After including key variables in the above set of data the same kind of trend was observed.

1.11 Organization of the Report

This report contains twelve chapters including the introduction and the appendices have been provided to support the outcomes. The contents of each chapter from chapter two to twelve have been briefly described below:

Method applied for result processing: In chapter 2 concepts of IRT needed to understand various IRT models, computation method applied to derive scale scores and estimation of sampling variance have been discussed.

Our schools, students and teachers: Chapter 3 contains information on background characteristics of school, student and teachers. It provides details of resources available to students at home and schools and to teachers at school. Besides this, it also gives information about teaching learning process and support to teachers, schools and students at both the home and the school level. Further, an attempt has also been made to address the extracts on classroom practices, professional development activities and community support/ home school interaction

Student achievement: In Chapter 4, 5, 6 and 7 achievement of class VIII students in Language, Mathematics, Science and Social Science have been separately reported. In addition, information about differences in achievement by students' gender, school location and social category have also been provided.

What Students Know and Can Do: In Chapter 8, 9, 10 and 11 item mapping, students performance on some sample items, what students can do on different content areas/competencies in different subjects have been discussed.

Association of background variables: Finally in chapter 12, an attempt has been made to see the impact of student and school related variables on students' achievement by using regression analysis.

Besides the above stated chapters, the report contains a number of appendices providing more information about Sample Design and Procedures, State wise tables on some important variables, list of Surveyed States, Districts, Schools, Teachers and Students, List of State Coordinators, etc.

1.12 Limitations

This survey has observed the following limitations:

- The survey used the list of schools under 8th AISES and DISE conducted by NCERT, New Delhi in which some discrepancies were noticed at the time of actual field work.
- In some states, very few sampled schools were covered by the data personnel because of disturbances in states due to various reasons. Hence, the data collected in such states may not be as representative as initially planned.
- In most of the states, responsibility of data collection was given to DIET faculty who, in turn, used their students as field investigators. On reflection, the training and hands on practice given to these field investigators was realized to may or may not be sufficient, resulting in inefficiencies in the data collection procedure and, hence, increased demands during the data cleaning process.
- In order to meet the key objectives of this survey, schools and students were sampled in a systematic fashion, which meant that teachers could not be explicitly sampled in the same way. As a result, the analysis of teacher-related variables vis-a-vis student attainment could not be made in a comprehensive manner.
- In previous Class VIII cycles, the CTT model was used for developing test and analysing the data, while IRT was used in this cycle. These two methodologies are quite different. Therefore, the results of this cycle are not directly comparable with the previous cycles of NAS Class VIII.
- In this cycle (III), NCERT used IRT for analysis of data instead of CTT. Therefore, mostly, results are reported in terms of scaled score rather than percentage correct scores. While this is an important step towards emulating international best practice, little awareness about this approach has undoubtedly made it difficult for the common reader to interpret results. It is hoped that as IRT becomes more widely used in India, understanding will improve.

CHAPTER - 2

Methods Applied for Result Processing

In the earlier surveys (i.e. BAS and MAS), the learning achievement data was analysed using Classical Test Theory (CTT) and average scores were reported simply as the percentage of correct answers. While this approach is valid, it has significant limitations. In particular the results are linked to specific tests and groups of sampled students and so it is very difficult to use multiple tests or link results from one year to another. Therefore, it was decided to analyse the data for the present and future surveys using Item Response Theory (IRT) in addition to the classical approach. This is in line with the best practice of major international surveys such as Programme for International Student Assessment (PISA), Progress in International Reading Literacy Study (PIRLS) and Trends in International Mathematics and Science Studies (TIMSS). In this survey, a two-parameter logistic model was used.

Universally, it is accepted that IRT is a powerful tool for use in measurement of candidate ability, test item selection and test form equating, with respect to applications in computer-based testing. IRT allows to evaluate student ability and to describe how well items on the test are performing. Instead of treating ability solely as a function of a student's score, IRT uses the concept of an Item Characteristic Curve (ICC) to show the relationship between students' ability and performance on an item. In IRT, both ability of students and item parameters are estimated which are based on student's response patterns on the test. The number of item parameters to be estimated determines which IRT statistical model will be used. These models involve complex mathematical procedures; but the basic concepts are easy to understand.

2.1 Item Parameters

Item parameter is a fundamental concept of IRT and is used to judge the quality of an item within both Classical Test Theory as well as in IRT itself. Common IRT models are based on one, two, or three parameters.

2.1.1 Item Discrimination (The *a* Parameter)

A good test item should have a characteristic that high-ability students may more frequently answer it correctly than lower-ability students. The a parameter expresses how well an item can differentiate among students with different ability levels. This is judged by studying the correlation between the right/wrong scores that students receive when their scores are summed up across the remaining items. Good items usually have discrimination values ranging from 0.5 to 0.7. In Item Characteristic Curve (ICC), steeper slope of an item means high discrimination value which further indicates that higher-scoring students tend to answer the item correctly, while lower-scoring students tend to answer it incorrectly. In the table given below an attempt has been made to interpret the discrimination values with respect to quality of an item.

Table 2.1 | Range of Discrimination Value and its Interpretation

D-Value	Interpretation
>0.40 (>40%)	Strong, positive discrimination
0.25–0.40 (25% –40%)	Moderate, positive discrimination
0.10–0.25 (0%–25%)	Weak discrimination
0.00 (0%)	No discrimination
<0.00 (<0%)	Negative discrimination

2.1.2 Item Difficulty (The *b* parameter)

Item difficulty is most commonly measured by calculating the percentage of students who answer the item correctly. If the item is responded to correctly by only a few students out of a large number of students then that item is considered to be difficult. For example if out of 100 students only 30 students respond to an item correctly then its difficulty will be 0.3 (30/100).

ITEM DIFFICULTY

p value for an item = (number of students responding correctly) / (number of students taking the test)

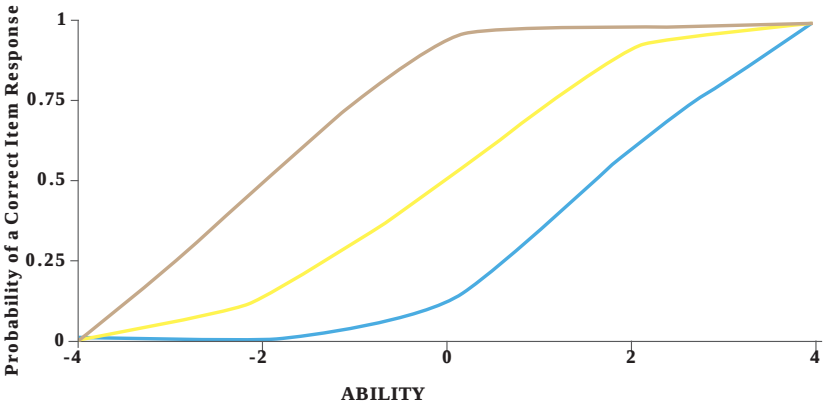
Generally, items with p values between 0.21 to 0.79 are considered for inclusion in a tests where the average difficulty scores is nearly 0.5. Items with difficulty levels between 0 - 0.2 and 0.8 - 1.0 are not considered because they are either too difficult or too easy, respectively because these items are not differentiating the sample. The various ranges of item difficulty and its interpretations are shown in the table 2.2 given below:

Table 2.2 | Level of Difficulty and its interpretation

P-Value	Interpretation for dichotomous items
1.00	Extremely easy–everyone gets it right
0.80	Easy–80% get it right
0.50	Medium difficulty – half get it right
0.30	Hard – 70% get it wrong
0.00	Impossibly hard – everyone gets it wrong

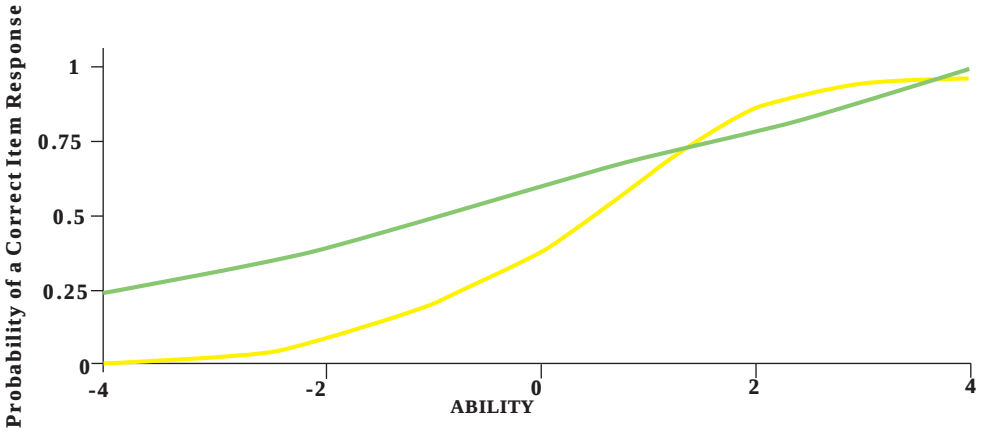
The difficulty of an item is also known as the *b* parameter in IRT and it is represented by the point where the S-shaped curve has the steepest slope. The more difficult an item is, the higher a student's ability must be in order to answer the item correctly. Items with high *b* values are hard items, which low-ability students are likely to answer incorrectly. Whereas items with low *b* values are easy items, which most students, including those with low ability, will have at least a moderate chance of answering correctly.

For all the items in the following figure, the slope is steepest where the probability of answering correctly is 0.5, or 50 percent and all these items have equal *a* parameters. What differentiate these items are their *b* parameters, i.e., the ability level necessary for an examinee to achieve a 0.5 probability of answering correctly. The red curve herein represents an easy item because of its ability value of only –2.0 needed to have a 0.5 probability of answering correctly. The black curve represents a hard item because an examinee must possess a much higher ability to have a 0.5 probability of choosing the correct answer for it. Although in this example, the *b* parameter corresponds to the ability level associated with a 0.5 probability of answering an item correctly, however, this relationship between examinee ability and the probability of a correct answer will vary according to the specific IRT model adopted.



2.1.3 Pseudo-Guessing (The *c* parameter)

Some IRT models include a pseudo-guessing parameter, known as the *c* parameter. This provides information about the students with very low ability of guessing the correct response to an item and therefore has a greater-than-zero probability of responding correctly. Suppose a student randomly selects responses to items that have four options, then he/she should answer these items correctly about 1 out of 4 times meaning that the probability of guessing correctly is about 0.25. Representing this, the ICC shows the S-shape with the lowest point on the curve being greater than zero. While the blue curve represents an item that includes the guessing parameter in the model, the red curve shows one without a guessing parameter. Notice that the highest point of both curves is equal to 1.0. This is because no student will ever have a probability greater than 1.0— or a 100 percent chance—of answering an item correctly.



2.2 Item Calibration and Ability Estimation

In CTT, test scores of the same student may vary from one test to another, depending upon the test difficulty. But in IRT item parameter calibration is sample-free while examinee proficiency estimation is item-independent.

Table 2.3 | Students Responses on Various items

	Item 1	Item 2	Item 3	Item 4	Item 5	Average
Student 1	1	1	1	1	1	1
Student 2	0	1	1	1	1	0.8
Student 3	0	0	1	1	1	0.6
Student 4	0	0	0	1	1	0.4
Student 5	0	0	0	0	1	0.2
Average	**0.8**	**0.6**	**0.4**	**0.2**	**0**	

In table 2.3 above, student 1 answering all five items correctly, is tentatively considered as possessing 100% proficiency whereas student 2 has 80% proficiency, student 3 has 60%, etc. These scores in terms of percentage are considered tentative because firstly, in IRT there is another set of terminology and scaling scheme for proficiency and secondly, a student's ability cannot be judged just based on the number of correct items; but rather the item attribute should also be taken into account. For example, two students (student 6 and 4) have the same raw scores.

	Item 1	Item 2	Item 3	Item 4	Item 5	Average
Student 4	0	0	0	1	1	0.4
Student 5	0	0	0	0	1	0.2
Student 6	1	1	0	0	0	0.4

Therefore, it is difficult to draw a firm conclusion that both students have the same level of proficiency because Student 4 answered two easy items correctly, whereas Student 6 scored two hard questions instead. However, on the basis of above the example, the portion of correct answers for each person 'tentative student proficiency' (TSD) and the pass rate for each item 'tentative item difficulty' (TID) may be derived. Hence, both the item attribute and the examinee proficiency should be taken into consideration in order to conduct item calibration and proficiency estimation. This is an iterative process in the sense that tentative proficiency and difficulty derived from the data are used to fit the model which is then employed to predict the data. As a result of this, there are some discrepancies between the model and the data in the initial steps and it takes many cycles to reach convergence. In light of the preceding tentative information, experts predict the probability of answering a particular item correctly given the proficiency level of an examinee by the following equation:

Probability = 1/(1+exp(-(proficiency – difficulty)))

2.3 Setting the Scale

For computing the comparable scale scores across various test forms, analyst use a process known as scaling and equating. In scaling, raw scores are transformed into a new set of scores by using either linear or nonlinear method, within a scale decided for reporting. These are known as scaled scores and are reported to the test score users. In the process of scaling, out of many test forms administered at the same time one form is considered as base or reference test form. Within a range of scores on all subsequent forms are placed on the same scale as the case of base form this process is known as equating.

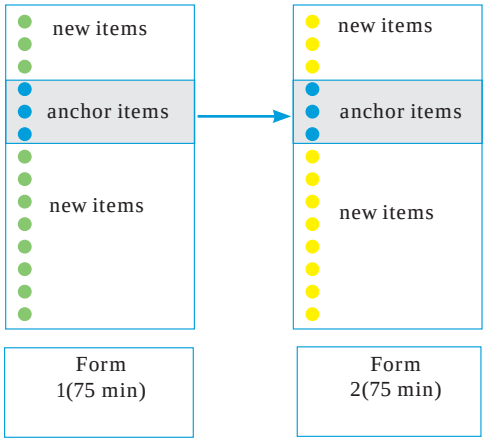
The Scaled Score in IRT results are reported using scaled scores. Scaled scores are computed by statistically adjusting and converting raw scores onto a common scale to account for differences in difficulty across different test forms. For example, on an easier test form, a student needs to answer slightly more items correctly to get a particular scaled score. But in case of a difficult test form, a student will get the same scaled score if the student has answered slightly less number of questions correctly.

2.3.1 Advantages of the Scaled Score

Scaled scores are a better option for meaningful score interpretations and minimizing misinterpretations and inappropriate inferences. Scaled scores help in providing information related to content, norm or reference groups and also help in meaningful interpretation of the scores due to their precision. Although, percent-correct scores without any doubt are easy to compute and understand; yet they are often misinterpreted, particularly where multiple forms of a test are being used.

2.3.2 Equating

In equating the raw scores on a different test form are adjusted to consider the differences in form difficulty from a base or reference form. The difference in form difficulty is the difference in average performance on the two forms. Scores on the new form can be statistically adjusted to make average performances on both the forms equal. If two different groups of students are administered with the two forms simultaneously or at different times, then these two groups of students could have different average abilities, the difference in average performance on the two forms could indicate the existence of both group ability differences and form difficulty differences. Hence, in order to isolate and quantify the difference in form difficulty, a common set of test questions called an *anchor item* is included in all forms. Therefore students in different groups answer the same set of anchor questions and the difference in average performance on these anchor questions provides an indication of group ability differences. When the group ability difference is quantified and removed from the difference in average performance on the different forms, then the remaining figure for average performance indicates the difference in form difficulty. Further, scores on the new form can then be adjusted statistically to remove the impact of the form difficulty difference. An example of anchor items in two different forms in a subject is given below:



2.3.3 Item Mapping

Item Response Theory allows for increasing the meaning and interpretability of scaled scores through item mapping. Item Mapping helps in identifying ability levels corresponding to particular levels of item performance. The idea behind item mapping is that given students' characteristics, items could be systematically located on the test score scale based on some criteria. In most cases, the criterion used is the likelihood that examinees of a specified proficiency level have a high probability of success on the item. In this report item maps for different subjects were created and these have been presented in subject specific chapters.

2.3.3.1 Advantages of Item Mapping

Item mapping has been used for three main purposes:

- score reporting,
- scale anchoring,
- standard setting.

In score reporting and scale anchoring, item mapping has mostly been used to identify items that could be used to describe the knowledge and skills that students at a specified proficiency level posses. In this sense, item mapping helps to make score scales and score reports more understandable to stakeholders. More precisely, item mapping can be understood as method used to describe what students at a particular grade can do.

2.4 IRT Models

Item response models are classified on the basis of item parameter(s) used in it. Some of them are described as under:

i. **One–parameter model:** It includes only the item difficulty parameter *(b)*
The expression for P_{ij} the probability of the i^{th} examinee, ability, being successful on the item, difficulty is given by

$$P_{ij} = \frac{\exp(\theta_i - b_j)}{1+\exp(\theta_i - b_j)}$$
$$= \frac{1}{1+\exp[-(\theta_i - b_j)]}$$

There is only one parameter for each item, namely the difficulty. The one parameter logistic model is mathematically equivalent to the Rasch model (Andrich, 1988).

ii. **Two–parameter model:** It includes difficulty *(b)* and discrimination *(a)* of the item
The expression for P_{ij} the probability of the i^{th} examinee, ability θ_i, being successful on the item, difficulty is given by (Thissen and Wainer, 2002)

$$P_{ij} = \frac{\exp[a_j(\theta_i - b_j)]}{1+\exp[a_j(\theta_i - b_j)]}$$
$$= \frac{1}{1+\exp[-a_j(\theta_i - b_j)]}$$

This is comparable to the 1-PL model with the addition of a scaling or slope parameter which varies between items. (This parameter is related to the item's power of discrimination across the ability scale.)

iii. **Three–parameter model:** It includes item difficulty *(b)*, item discrimination *(a)*, and guessing *(c)*.

The expression for P_j the probability of the i^{th} examinee, ability θ_i, being successful on the j^{th} item, difficulty b_j is given by (Thissen and Wainer, 2002)

$$P_{ij} = c_j + (1-c_j)\frac{\exp[a_j(\theta_i - b_j)]}{1+\exp[a_j(\theta_i - b_j)]}$$
$$= c_j + (1-c_j)\frac{1}{1+\exp[-a_j(\theta_i - b_j)]}$$

Where a_j is a scaling parameter which varies between items, and c_j is the lower asymptote, or 'pseudo-guessing' parameter.

Generally, two important functions are derived from IRT parameters that are used to explain how well a test is functioning. These functions are as follows:

- Test Characteristic Function: It represents the average of all ICCs on the test,
- Test Information Function: It reflects the test's reliability by providing the overall test precision information.

Both test characteristic function and test information function play a critical role in test development and test evaluation.

2.4.1 Advantages of IRT are:

IRT may be used as a tool by the test developer to produce a test that has the desired precision of measurement at nearly any defined ability level. IRT uses a mathematical model to link a student's probability of responding correctly to a particular item, thus taking care of the two main factors, i.e. the student's level of ability and the item's level of difficulty. Therefore, analysis in IRT is more complex than traditional methods like Classical Test Theory. IRT has many advantages over the traditional methods such as-

- IRT measures the true ability of students regardless of the different levels of tests difficulty, by calculating the probability of a student to respond to an item correctly
- IRT analysis places students and test items on the same numerical scale and it provides us to create meaningful 'maps' of item difficulty and student ability.
- In IRT, the difficulty parameter for an item does not depend on the group of test takers.
- Multiple test booklets may be used in IRT to increase measurement points in any subject and these can also be linked.
- IRT makes it possible to compare scores from tests used in different NAS cycles – which may help in monitoring progress in the system over time.

2.5 Use of IRT in National Achievement Survey (NAS)

The IRT scaling approach used for NAS has been similar to that used in the international survey Trends in Mathematics and Science Study (TIMSS). This was originally developed in the US by Educational Testing Service (ETS) for use in the National Assessment of Educational Progress (NAEP) and in the UK by the National Foundation for Educational Research for the Assessment of Performance Unit (Beaton [ed.], 1987; Foxman, Hutchison and Bloomfield, 1993). The psychometric model was used in scaling the Class VIII (NAS) data and for this commercially available software BILOG-MG 3 (Zimowski, Muraki, Mislevy and Bock, 1996) was used in order to apply IRT models.

In order to calibrate the test items, the 2-PL model was used in NAS. Under assumptions of the 2-PL model, the probability of a response to an item is modeled based on the examinee's ability, the item difficulty and the item discrimination. This model was chosen over the 1-PL or Rasch Model because the inspection of the item characteristics showed that the item discriminations were not comparable across the pool of items (an assumption of the Rasch model). Furthermore, the 2-PL was chosen over the 3-PL model because the 3-PL model has stricter assumptions over the other models, and also has higher requirements with respect to sample size and coverage of the ability distribution for obtaining reliable estimates of item parameters, in particular the guessing parameter. This results in unstable and often inestimable parameters for some of the test items. Considering these limitations, the 2-PL offered a widely acceptable compromise between the lesser and the more restrictive IRT models available.

Item calibration for the Class VIII (NAS) 2013 was conducted using the commercially-available BILOG software (Zimowski et al 1996). All student samples were weighted so that each state contributed equally to the item calibration.

Using this approach, a separate scale was developed for each subject; wherein the mean of each of these four scales was set to 250 and the standard deviation to 50. This meant that for Language, Mathematics, Science and Social Science the achieved scores ranged approximately from 100 to 450.

The joint probability of a particular response pattern across a set of items is given by:

$$P(x|\theta, params) = \prod_{i=1}^{n} P_{ij}$$

where P_{ij} is the probability of the i^{th} individual being successful on the j^{th} item.

This likelihood function is maximized to estimate item parameters and in turn these parameters are used to score observed student responses on the assessments.

2.5.1 Item Fit

The fit of the 2-PL model to the items was examined graphically using a chi-squared fit index and this was done on a state to state basis. Items identified as problematic were investigated to see if there were any obvious faults and these were rectified wherever possible. Moreover, if it proved impossible to remedy the problems of an item, then that item was dropped from the scoring for the state concerned.

2.5.2 Reliability

Reliability of the test score scales was estimated from the IRT scaling BILOG (Zimowski *et al*, 1996) runs. For simplicity and familiarity the marginal reliability coefficient is quoted here, rather than showing test information graphs (Thissen and Wainer, 2001). This is given by

$$\bar{\rho} = \frac{\sigma_\theta^2 - \sigma_e^2}{\sigma_\theta^2}$$

Where σ_θ^2 is the variance of the test score scale in the sample and σ_e^2 is the mean error variance of scores; both available from BILOG output.

2.5.3 Estimating Sampling Variance

The NAS Class VIII sampling design applied a stratified three stage cluster sampling technique to the process of student selection. This design was administratively convenient and caused minimal upheaval in schools. However, since pupils within a school are generally more similar to each other than they are to the population in general, this approach of effective sampling provides less independent information than a simple random sample of the same size. Further, this design effect means that standard errors cannot be accurately estimated using the usual formulae which are derived for use with the simple random sample designs.

The procedure used follows the variation on the JRR technique used in TIMSS 2007 (Foy, Galia and Isaac 2008). It assumes that the primary sampling units (PSUs) can be paired in a manner consistent with the sampling design, with each pair regarded as members of a pseudo-stratum for variance estimation purposes. When used in this way, the JRR technique appropriately accounts for the combined effect of the between- and within-PSU contributions to the sampling variance.

The jackknife repeated replication technique (JRR) was used to calculate standard errors because it is computationally straightforward and provides approximately unbiased estimates of the sampling errors of means, totals and percentages. The general application of JRR entails systematically assigning pairs of schools to sampling zones. Following this, while one of the schools is selected at random to have its contribution doubled, the other school in the pair has its contribution set to zero. This constructs a number of 'pseudo-replicates' of the original sample. Conclusively, the statistic of interest (e.g. the state's mean achievement score) is computed once for the entire original sample and once again for each jackknife pseudo-replicate sample. The resultant variation between the estimates for each of the jackknife replicate samples and the original sample is the jackknife estimate of the sampling error of the statistic.

To produce a jackknife estimate of the sampling variance of a statistic *t* for a state, the schools in that state were paired to produce up to 100 paired zones and 100 jackknife replicate samples were then created. For the $t(j_h)$ zone one of the two schools was selected at random and its weight was doubled; while at the same time the weight of the other was set to zero leaving all the other zones unchanged. The h^{th}, the value of the statistic for the replicate sample was then estimated and this process was repeated for all such strata. Subsequently, the jackknife sampling estimate for the sampling variance was given by the following equation:

$$V_{irr}(t) = \sum_{h=1}^{H} \left[t(Jr) - t(s) \right]^2$$

where *H* is the total number of sampling zones in the sample of the state under consideration, in this case 100. The term *t(S)* corresponds to the statistic of interest for the state computed with the overall sampling weights unchanged.

These calculations were carried out using the IDB Analyzer (Foy and Olson 2009), which automatically computes standard errors as described in this section. Some specially written SPSS routines were also used.

2.5.4 The Reporting Scale

In NAS class VIII, the scale chosen is from 0 to 500 and the average score for the whole population is initially set at 250. However, if educational standards improve, the overall average will rise from this 'baseline'. The standard deviation of the scale is initially set at 50 for the whole population, which means that the majority of students (about 70%) will have scores in the range of 200 to 300 and on a scale like this, a score of more than 400 would represent an extraordinarily high level of achievement (see figure below).

The average score for the whole population tested is initially set at 250, with a standard deviation of 50. However, if educational standards improve the overall average will rise.

Throughout the NAS Class VIII report, results are reported using 'scale scores' calculated using IRT and these replace the percentage correct scores that were used in previous reports. This change brings along important advantages; with the most vital being that the scale will be fixed so that results from future surveys can be reported on the

The Reporting Scale

same scale by incorporating common items that provide adequate linking procedures. A score of, say, 270 today will be equivalent to a score of 270 in three years' time, even though the items used are not the same. This is obviously an advance on using percentage correct scores where there is no rationale for assuming that a score of 70% will be true for another test.

Scores are reported for Mathematics, Reading Comprehension, Science and Social Science. But, unfortunately the tests do not contain sufficient items in subcategories to produce subscales within the four overall subjects. So if, for example, over a three- year period a state's average score in Mathematics rises from 248 to 254, scores can be compared and meaningful conclusions can be drawn about changes in student achievement. This is possible because even though the scores have been derived from different students taking different tests at different times, the reporting scale is fixed.

International Support: ETS experts after doing preliminary analyses decided what kind of classical test analyses and IRT model may be used for analysis of the data received from 33states/UTs. Under CTT the performance of students on anchor items was carried out by computing percent correct; mean percent, standard deviation and t-values between different groups. Under IRT model a detailed analyses was carried out to determine the scaled scores, standard error of measurement, significant differences between the groups and percentile scores, etc.

This means that the majority of students (about 70%) will have scores in the range 200 to 300. On this scale, a score of more than 400 would represent an extraordinarily high level of achievement.

It should be noted that the adoption of this more sophisticated reporting scale means that it is not possible to make direct comparisons with the values reported in earlier surveys.

In this report, all values related to the achievement of students are given on scales calibrated to have 250 in the center as described above. However, the scores for Mathematics, Reading Comprehension, Science and Social Science are derived by applying the same principles but independently. Therefore, it is important that readers do not compare scores across subjects.

The main reason for administering the tests in this study is to obtain an estimate of the overall ability of the students tested. Previous studies have reported the proportion correct on a range of items. This survey has seen the mode of reporting scores change to the more widely accepted Item Response Theory (IRT) method. IRT assumes that there is a statistical connection between the difficulty of an item, the ability of the student, and the probability of being successful on the item. Students with higher ability scale scores are more likely to succeed on any item than their peers of lower ability, while at the same time all students are less likely to succeed on items with higher difficulty scores. In fact, a student's probability of success on a particular item is dependent on the difference between the ability of the student and the difficulty of the item.

It is true that IRT method makes the analysis more complex than traditional methods, however, it has many advantages. Firstly, it places students and test items on the same numerical scale which enables us to produce meaningful 'maps' of items and students. Secondly, in IRT, the difficulty parameter for an item does not depend on the group of test takers. This allows us to use multiple test booklets which can be 'linked' or equated, thus facilitating the comparison of scores from tests used in different years/cycles - an essential characteristic for monitoring progress over time.

CHAPTER - 3

Our Schools, Students and Teachers

The National achievement Survey Class VIII cycle-3 was designed to get an insight into the learning achievement of students in both government and government aided schools at the States/UTs level. For this purpose, while schools were identified using rigorous sampling techniques, students studying in them were selected through a systematic random sampling procedure. Besides, teachers teaching the selected students were as well considered for the study. Furthermore, it is a known fact that learning never takes place in isolation and is influenced by the school environment. Hence, before presenting the learning achievement of students in different subjects, there arises a need for making the readers aware of where these students study, what background they come from, what kind of facilities they have at home, who supports them in their studies, etc. Similarly, what is the learning environment in the schools, what type of infrastructural facilities are there, etc. and also who are teaching, what are the educational and professional qualification of teachers, whether they have undergone in-service training programme or not, what strategies they use for teaching students, what is their employment status, how do they interact with fellow colleagues, what is their opinion about the school in general, etc.

In India, there are lots of variations in facilities available in schools, characteristics of teachers and home background of students and learners' achievement might be associated with these variations . Therefore, it is advisable that before considering the learning achievement of students, factors related to school, students and teachers are kept in mind. In this present chapter, an attempt has been made to provide highlights on some of the important variables.

3.1 Schools

Clearly, the success of schools in delivering quality teaching is something that both federal and provincial governments need to monitor. This helps in identifying the characteristics of a healthy learning environment which further maximizes student achievement.

In order to access the school related variables, a questionnaire was used to collect information from the School Principals. These variables were grouped into four categories:

- School Background
- Home-School Interaction
- Teaching Learning Process
- School Social Climate

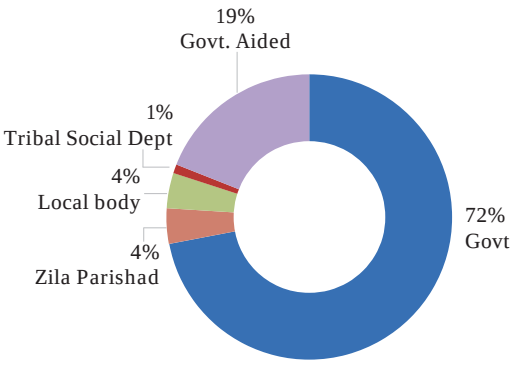
3.1.1. School Background

The variables under the category of school background were school management, location, type of school, classes available in the school, inspection of the school, resources available in the school, working days in an academic year and working days per week.

3.1.1.1 School Management

Of the schools surveyed, approximately 72% were managed by the State Government and rest were managed by independent bodies and benefited from the aids provided by the government. The schools managed by the Tribal Social Department constituted only 1% of the sample. Figure 3.1 shows the proportion of each school type.

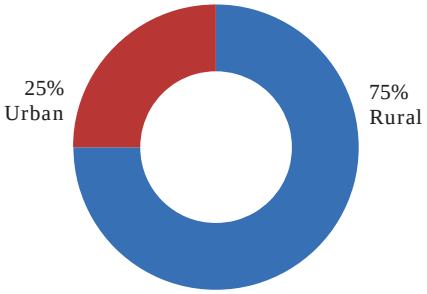
Figure 3.1 | Schools by Management Type



3.1.1.2 School Location

Of the sample surveyed, while one fourth of the schools were urban, the rest were rural (Figure 3.2). Survey of schools in Himachal Pradesh, J&K, Rajasthan, Sikkim, Uttar Pradesh and Dadra & Nagar Haveli showed that more than 90% schools were located in rural areas. Besides, Puducherry was the only UT, where nearly 48% schools were from urban areas (refer Table A-2.1, Appendix II).

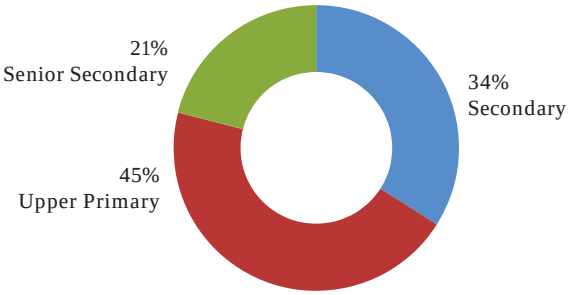
Figure 3.2 | Location of School



3.1.1.3 Class up to which School is Providing Education

Figure 3.3 indicates that of the schools surveyed, 45% were upper primary, 34% were secondary and rest 21% were senior secondary schools.

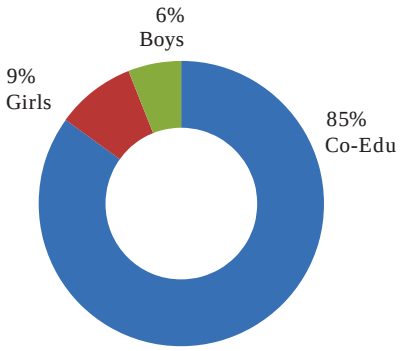
Figure 3.3 | School having Classes



3.1.1.4 Type of School

Figure 3.4 shows that of the schools surveyed, 85% were co-education, 9% were girls schools and rest 6% were boys schools.

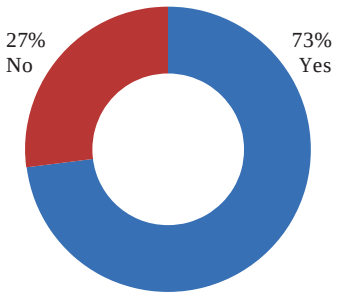
Figure 3.4 | Type of School



3.1.1.5 School Inspection

Inspection of schools by authorities is an important component of improving the learning environment of schools and also helps in understanding the ground realties of the institution for planning interventions. Figure 3.5 shows that about 73% schools were monitored in the academic session 2011-12.

Figure 3.5 | School Inspection

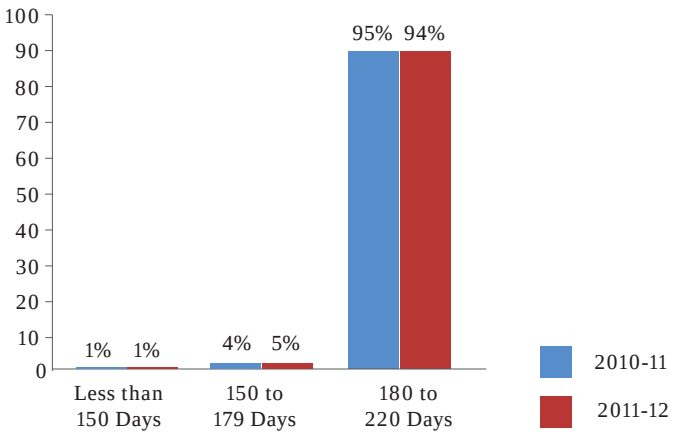


However, Goa was the only state where 74% schools were not inspected. Whereas in Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu nearly half of the surveyed schools were not inspected during the same academic year. In contrast to this, all the sampled schools were inspected in Madhya Pradesh, Dadra & Nagar Haveli and Daman & Diu (see Table A-2.2, Appendix II)

3.1.1.6 Working Days in Academic Year

Figure 3.6 shows that out of the surveyed schools, 95% in 2010-11 and 94% in 2011-12 worked for 180 to 220 days respectively, whereas only 1% schools worked for less than 150 days. Further, while all schools in Andhra Pradesh, Goa, Karnataka, Chandigarh and Daman & Diu worked for 180-220 days in the academic session 2010-11,only schools from Chandigarh and Daman & Diu worked for similar number of days in the academic session 2011-12 (see Table A-2.3 & Table A-2.4, Appendix II).

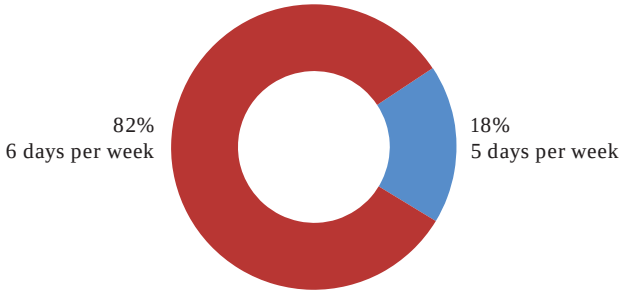
Figure 3.6 | Number of Working Days



3.1.1.7 Working Days Per Week

Of the sample surveyed, 82% schools had 6 working days per week (Figure 3.7). However, in Kerala, Meghalaya, Mizoram, Nagaland, Tamil Nadu and Puducherry, majority of surveyed schools had only five working days per week (see Table A-2.5, Appendix II).

Figure 3.7 | Number of working days per week



3.1.1.8 Facilities Available in the School

The data regarding the availability of various facilities in the schools was collected and categorised into three groups, i.e.

1. *Physical facilities:* Type of building, electric connection, safe drinking water, furniture, toilets, separate toilets for girls, playground facilities and staff room.
2. *Teaching learning materials:* Mathematics and science kits, mathematics and science laboratory, library and computers.
3. *Ancillary facilities:* Games and sports material, annual medical checkup, material for drawing and painting.

Figure 3.8 shows that the basic physical facilities were substantially available in most of the sampled schools. Approximately two thirds of the schools had playground facilities, three quarters had separate toilets for girls and 88% had safe drinking water. Further, 80% of the schools had electric connection, 92% had toilet facilities and 80% of the schools had Pucca buildings.

Figure 3.8 | Physical facilities

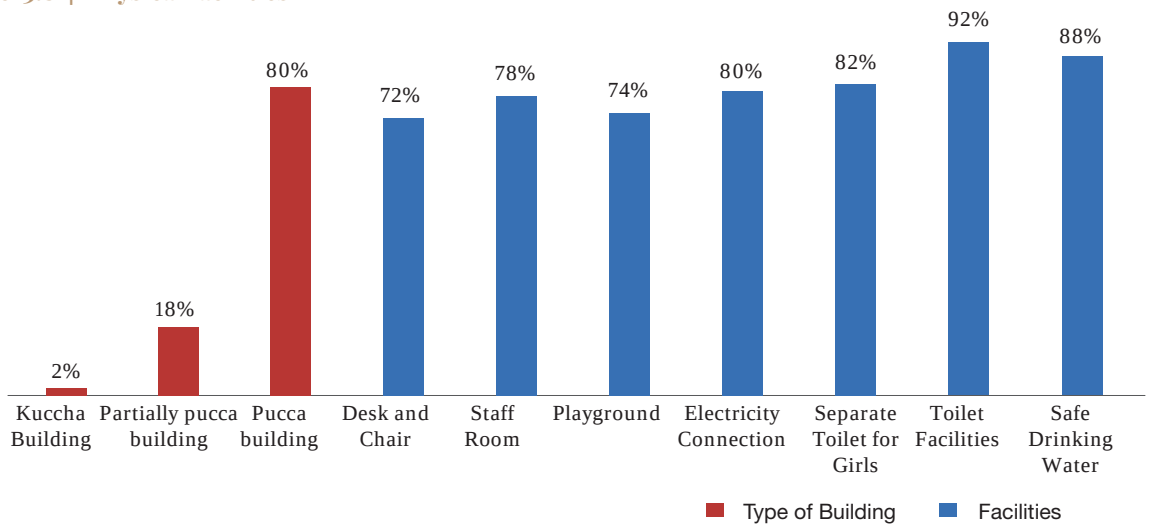
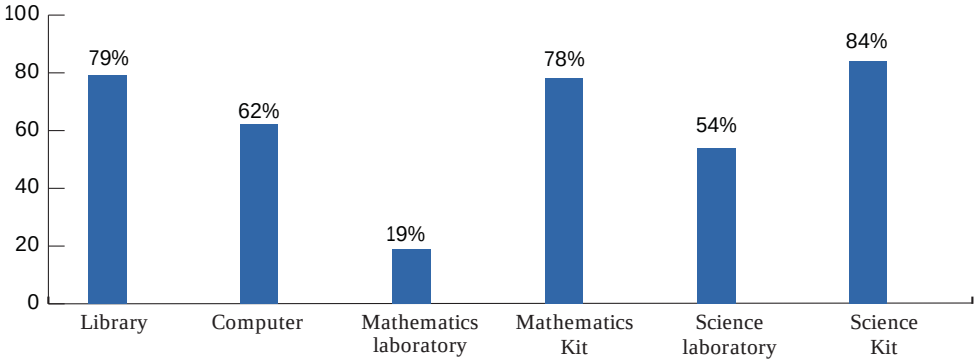


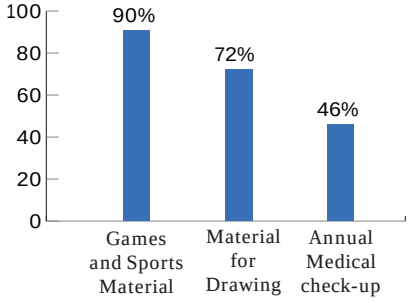
Figure 3.9 shows the availability of teaching learning materials in the sampled schools. Mathematics kit, science kit and library were available in more than 70% of the schools. Although under the SSA programme, state governments had put in place reforms to improve the delivery of computer systems in schools, computers were still available in only 62% of the schools. Further, science laboratory were available in 54% of the schools, whereas mathematics laboratory were available in only 19% of the schools.

Figure 3.9 | Teaching Learning Material



Under SSA, health registers were to be maintained in all the schools. The Nodal Officer was identified and nominated by the Department of School Education for each school for health checkups. Of the ancillary facilities available, in over 70% of the schools a medical checkup was carried out. Games equipment were available in 90% of the schools, whereas materials for drawing and painting were available in only 46% of the schools (Figure 3.10).

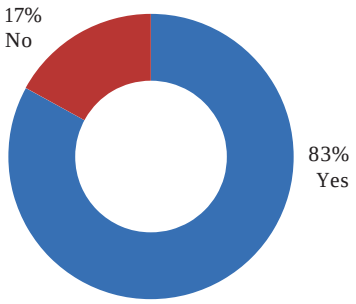
Figure 3.10 | Ancillary Facilities



3.1.1.9 School Grants Received for the Year 2011-12 Under SSA And its Utilization

Data from Figure 3.11 shows that of the surveyed schools, about 83% of the schools received grants. However, Gujarat was the only state where 84% of the schools did not receive school grants under SSA, in the academic year 2011-12. Only half of the schools received grants in Karnataka and Odisha (see Table A-2.6, Appendix II).

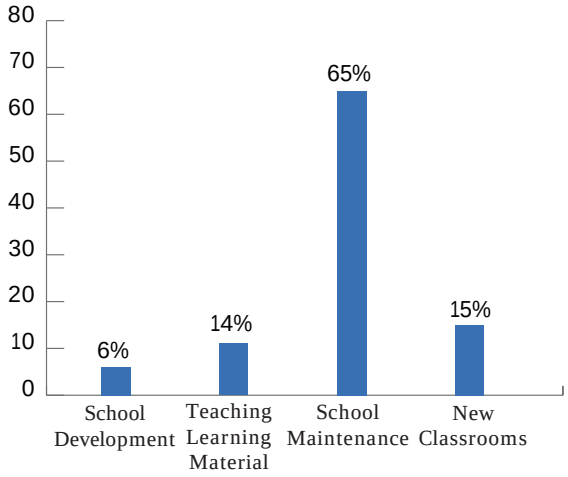
Figure 3.11 | School Grants



Utilization of School Grant

The school grants received under SSA were mainly being used for school maintenance work (65%). Only 15% of the surveyed schools were using it for construction of new class rooms and 14% of the schools were using it for purchasing teaching learning materials (figure 3.12). In West Bengal, about 56% of the schools were using grants for new classrooms. Similarly, in Gujarat about 49% of the schools were using grants for purchase of teaching learning materials (see Table A-2.7, Appendix II).

Figure 3.12 | Utilization of School Grants



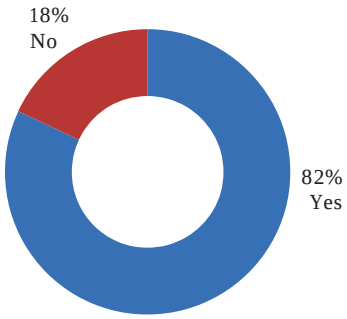
3.1.2 Home-School Interaction

The involvement of parents in various school activities like attending special events, raising funds, membership of school committees, etc. contributes towards a healthy learning atmosphere and effective home-school interaction.

3.1.2.1 School Visited by BRC/CRC Personnel

Data of the surveyed schools shows that about 82% of the schools were visited by BRC/CRC personnel (Figure 3.13). In most of the States/UTs, it was above 70%, barring Gujarat (20%), Andhra Pradesh (50%), Maharashtra (61%) and Rajasthan (61%). Dadra & Nagar Haveli was the only place, where all the surveyed schools were visited by BRC/CRC personnel (see Table A-2.8, Appendix II).

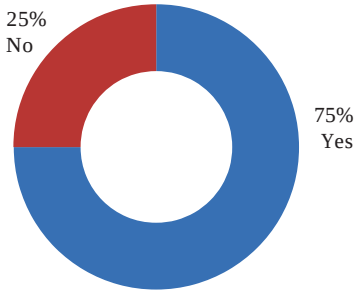
Figure 3.13 | School visited by BRC/CRC



3.1.2.2 Mother Teacher Association and Parent Teacher Association

Figure 3.14 indicates that 75% of the schools either had the Mother Teacher Association or the Parent Teacher Association. In the surveyed schools of Arunachal Pradesh, Jharkhand, Madhya Pradesh and Meghalaya, less than 50% of the schools had such kind of an association. Further, in Gujarat, Bihar, Himachal Pradesh, Karnataka, Manipur, Nagaland and Dadra & Nagar Haveli up to 50% to 55% of the schools had an association of such a kind (see Table A-2.9, Appendix II).

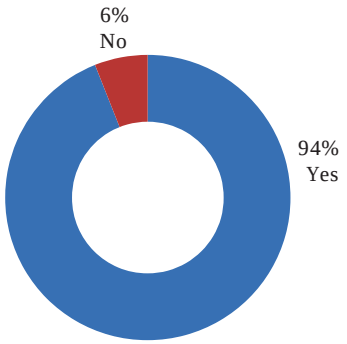
Figure 3.14 | MTA and PTA



3.1.2.3 Parents Attended Special Events in School

About 94% of the surveyed schools reported that the parents attended special events organized by the school (Figure 3.15). However, in Manipur, Mizoram and Nagaland about 25-35% of the parents did not attend special events in the schools. Whereas, 100% attendance of the parents was observed in case of Gujarat, A & N Islands and Dadra & Nagar Haveli (see Table A-2.10, Appendix II).

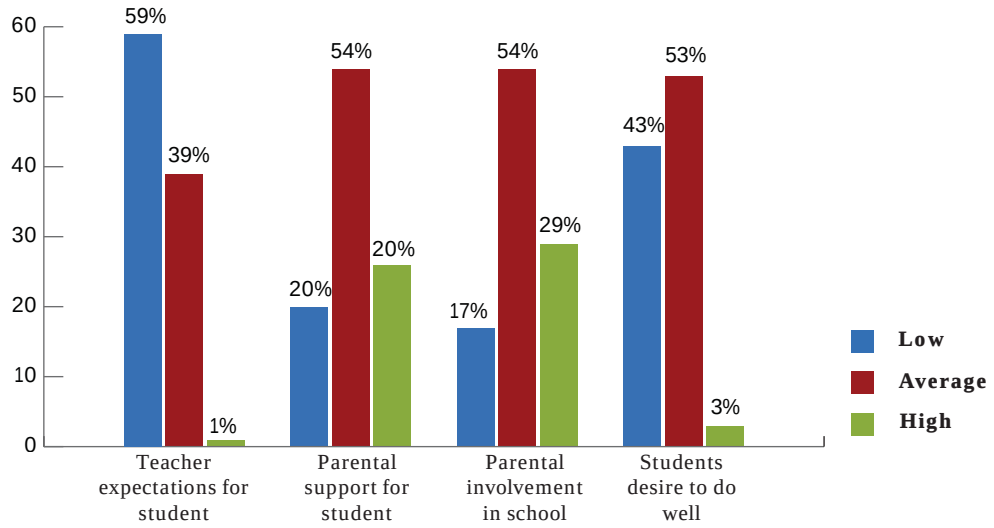
Figure 3.15 | Attend Special Events



3.1.2.4 Attitudes of Students, Teachers and Parents Towards the School

The attitudes of the primary stake-holders, i.e. students, teachers and parents, towards education in general are extremely important variables affecting the teaching-learning process. This study collected information on the following factors: teachers' expectations for students' achievement, parental support for students' achievement, parental involvement in school activities and students' desire to do well in school. All the above factors were collected at three levels, high, average and low. More than 50% of the schools reported teachers' expectation of student achievement to be high (Figure 3.16). Approximately 54% of the schools reported parental support for student achievement and parental involvement in the school activities as average and about 53% of the schools rated students' desire to do well in school as average.

Figure 3.16 | Attitude towards School



3.1.3 Teaching Learning Process

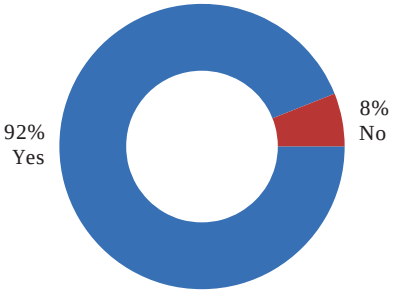
Teaching - learning is a process that includes many variables that interact and facilitate the learners towards achieving their goals and incorporate new knowledge, behaviors and skills, that add to their learning experiences. The present survey included the following variables:
Head teacher teaches class

- Availability of computers with internet facility
- Sections made on the basis of ability groups
- Remedial classes in different subjects

3.1.3.1 Head Teacher Teaches Class

Figure 3.17 shows the responses of the head teachers of the surveyed schools. In 92% of the schools, head teacher were found to take class (es). Kerala was the only state, where 70% of the head teachers were not taking any class. Besides, in Sikkim (21%), Daman & Diu (21%) and Nagaland (33%), head teachers were not taking classes (see Table A-2.11, Appendix II).

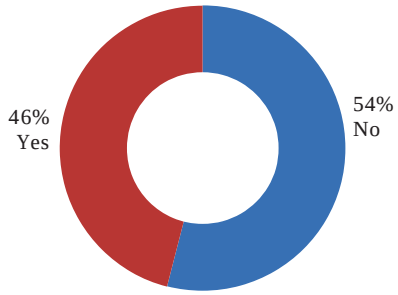
Figure 3.17 | Head Teacher takes Class



3.1.3.2 Computers with Internet Facility

Of the surveyed schools, only 46% had computers with internet facility. Further, in Madhya Pradesh, Mizoram, Nagaland, Tripura, Uttar Pradesh, Uttarakhand and Dadra & Nagar Haveli, less than one third of the schools had computers with internet facility. In contrast to this, in Delhi and Chandigarh, 80% and above of the schools had computers with internet facility (see Table A-2.12, Appendix II).

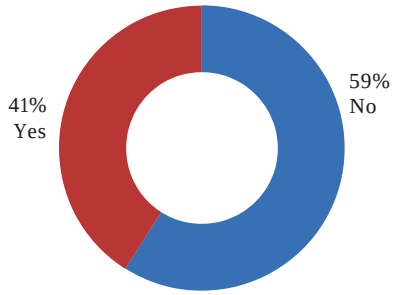
Figure 3.18 | Computers with Internet Facility



3.1.3.3 Sections Made on the Basis of Ability Grouping

Of the surveyed schools, about 41% of the schools had sections at the class VIII level, on the basis of ability grouping (Figure 3.19). In J&K (80%) and Manipur (92%) of the schools were following this procedure (see Table A-2.13, Appendix II).

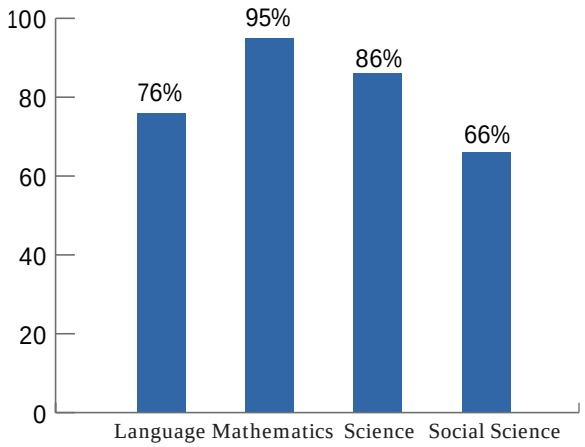
Figure 3.19 | Section based on Ability Grouping



3.1.3.4 Remedial Classes

Amongst the surveyed schools, most were organizing remedial classes for class VIII students in different subjects. About 95% of the schools were organizing remedial classes in Mathematics and 66% of the schools in Social Sciences (Figure 3.20).

Figure 3.20 | Remedial Classes



3.1.4 School Social Climate

The school climate is concerned with the psychological context in which school behavior is rooted and is considered to be a relatively enduring quality of the school. It is experienced by teachers and students and in turn influences their behaviors. The school social climate category here consists of problematic behaviors amongst students.

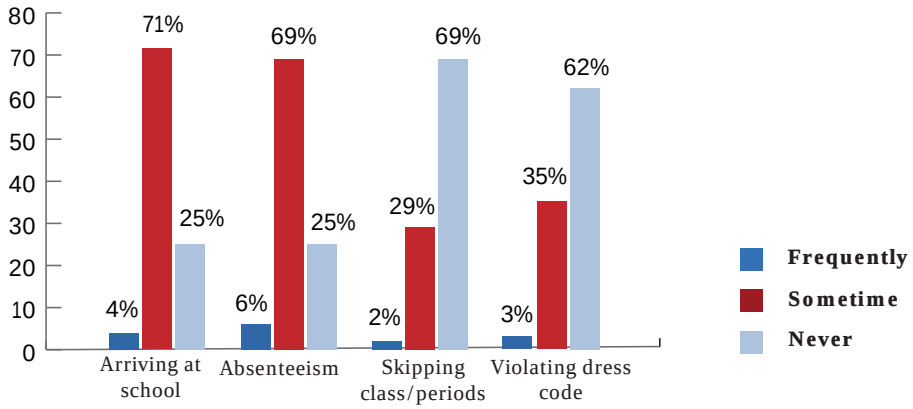
3.1.4.1 Problem Behaviours amongst Students

Behavioural problem areas of the students were graded into three categories on the basis of their frequency of occurrence i.e. never, sometimes and frequently. The major areas probed were:

- Late arrival at school
- Absenteeism
- Skipping classes
- Violating dress code

Such aberrant behavior was rarely seen amongst most of the sampled schools (Table 3.21). Nearly 25% of the schools 'never' saw late arrival of students, whereas absenteeism was 'sometimes' observed in 69% of the schools. Further, while in 69% of the schools, skipping classes by students was 'never' observed, non-adherence to the school dress code was 'never' observed in 62% of the schools. The problem of arriving late at school was 'sometimes' observed in about 71% of the schools. Results indicate that such types of problems did not occur 'frequently' in the schools surveyed.

Figure 3.21 Problem Behaviours amongst Students



3.2 Students

The data was collected from 1,85,017 students studying in 6701 schools of 285 districts of from 33 states and UTs all over the country. The given section details the information gathered from students regarding the various student related variables, categorised as follows:

- Students' background
- Resources available at home
- Resources available in school
- Students' activities outside the school

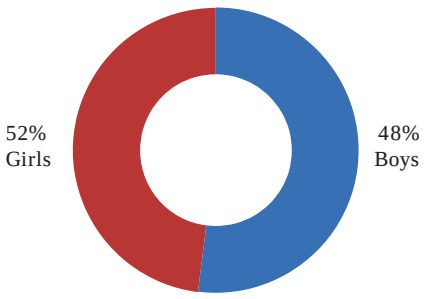
3.2.1 Students' Background

The variables covered here are gender, age, social groups, language used in home and school, number of siblings, and whether they are physically challenged. A detailed description of these variables along with some significant variations across the states are also given.

3.2.1.1 Students' Gender

The gender distribution of students is given in Figure 3.22. Overall, the sample comprised of 48% of the boys and 52% of the girls. However, in Meghalaya and Madhya Pradesh the percentage of girls was about 59% (Highest) whereas the percentage of boys in Madhya Pradesh was 41% (Lowest) (see Table A-2.14, Appendix II).

Figure 3.22 | Gender

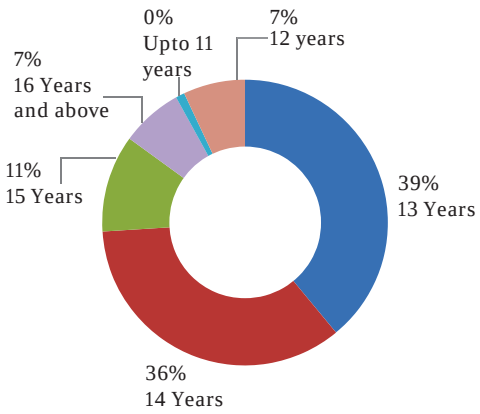


3.2.1.2 Students' Age

The age distribution of the students is given in the Figure 3.23, which shows that overall 75% of the students were of the age group of 13-14 years. Moreover, only 11% were 11 years and below it.

- In Gujarat, Puducherry, Manipur, Kerala and Tamil Nadu 85-90% of Class VIII students were in the age group of 13-14 years.
- In Nagaland and Sikkim, 36-44% students were 16 years and above of age (see Table A-2.15, Appendix II).

Figure 3.23 | Age

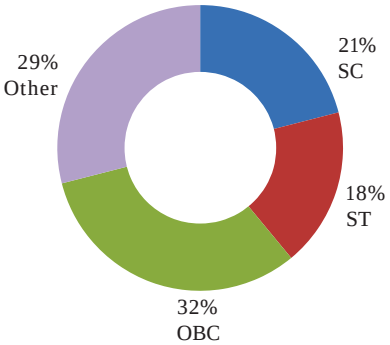


3.2.1.3 Category Wise Distribution of Students

Figure 3.24 shows that 21% of the students in the survey were SC students, 18% were ST students, 32% OBC students and 29% were Other category students.

- Data from the Appendix II, Table A-2.16 shows that in Mizoram the percentage of SC students was 1.8%; which was the lowest in the country, whereas in Punjab it was highest (56%). ST students were highest in Mizoram (98%).

Figure 3.24 | Category wise Distribution of Students



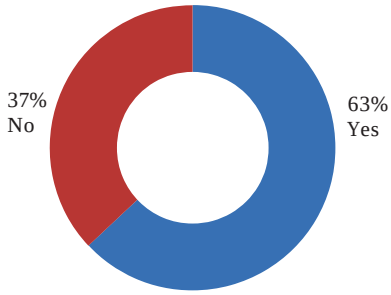
3.2.1.4 Language Used at Home

Figure 3.25 shows that 63% of the students spoke the same language at home as their medium of instruction in school.

- In Arunachal Pradesh, Meghalaya, Nagaland and Sikkim, 83-89% of the students were studying with a different medium of instruction vis-à-vis the language spoken at home.

- Tamil Nadu and Kerala were the states where 96-97% of the students studied in the same language which was spoken at their homes (see Table A-2.17, Appendix II).

Figure 3.25 | Language used at Home

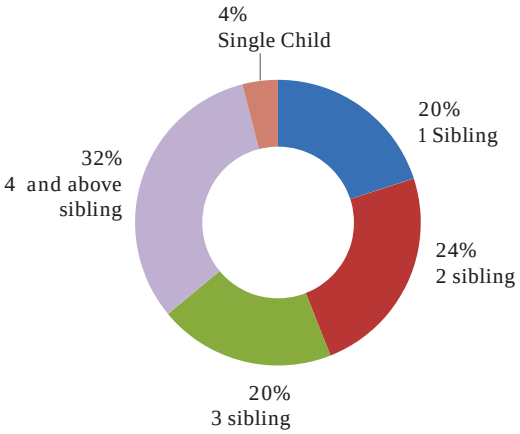


3.2.1.5 Number of Siblings

Figure 3.26 shows the percentage distribution of numbers of siblings, categorised into single child, one sibling, two siblings, three sibling and 4 and more siblings. The data depicts that 32% of the students had 4 or more siblings and only 4% of the students were the only child of their parents.

- West Bengal was the only state where 18% of the students were without any siblings.
- In Arunachal Pradesh, Bihar, J&K, Madhya Pradesh, Meghalaya, Nagaland, Rajasthan, UP and Uttarakhand, 51-68% of the students were having four and more siblings (see Table A-2.18, Appendix II)

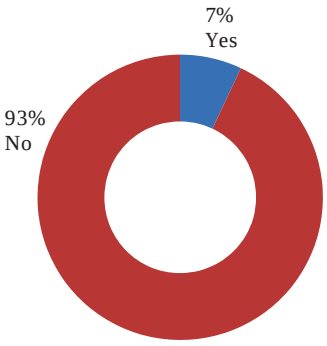
Figure 3.26 | Number of Siblings



3.2.1.6 Physically Challenged Students

Figure 3.27 indicates the percentage of physically challenged students. 7% of the students were physically challenged.

Figure 3.27 | Physically Challenged Students



3.2.2 Resources Available at Home

Students with more educational resources tend to achieve better than those who do not have any. This survey focused on some of the variables such as parents' level of education, their occupation and resources available at the home that often tends to facilitate students' learning.

3.2.2.1 Educational Status of Parents

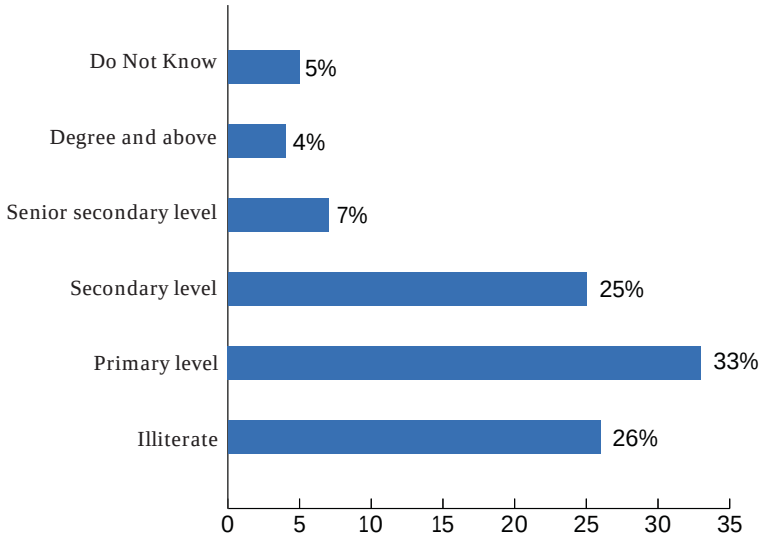
Parents are the first teachers of the child and they play a pivotal role in the development of their child. The educational status of the surveyed students' father and mother are depicted as under:

Educational Status of Father

Figure 3.28 indicates that about 26 % of the students' fathers were illiterate, nearly 33% of the students fathers were educated upto the primary level and only 4% of the students' fathers had a degree and above educational qualification.

- In Andhra Pradesh about 49% of the students' fathers were illiterate and about 39% were educated upto the primary level.
- About 76% of the students' fathers of the state of Kerala possessed secondary and above level of qualification (see Table A-2.19, Appendix II)

Figure 3.28 | Father's Education

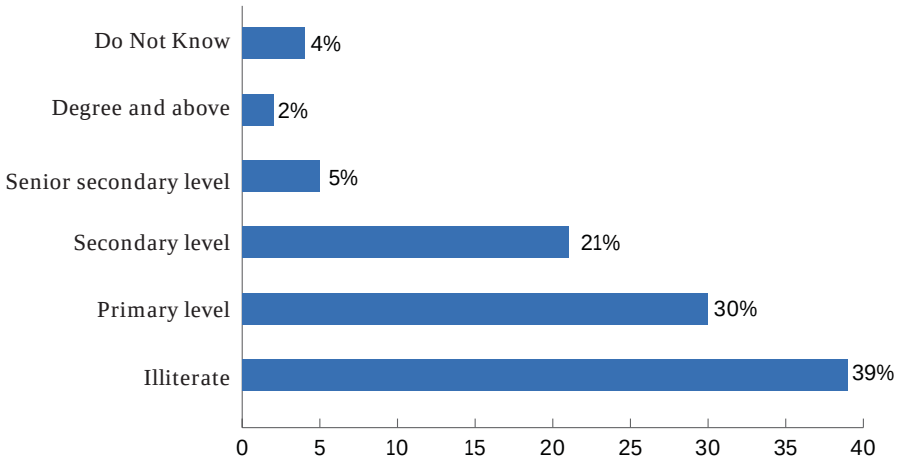


Educational Status of Mother

Figure 3.29 indicates that about 39% of the students' mothers were illiterate, nearly 30% of the students' mothers were educated upto the primary level and only 2% of the students' mothers had a degree and above of educational qualification.

- In UP, Rajasthan and J&K, 61-76% of the students' mothers were illiterate.
- In Goa and Kerala 27-31% of the students' mothers possessed senior secondary and above level of qualification (see Table A-2.20, Appendix II).

Figure 3.29 | Mother's Education

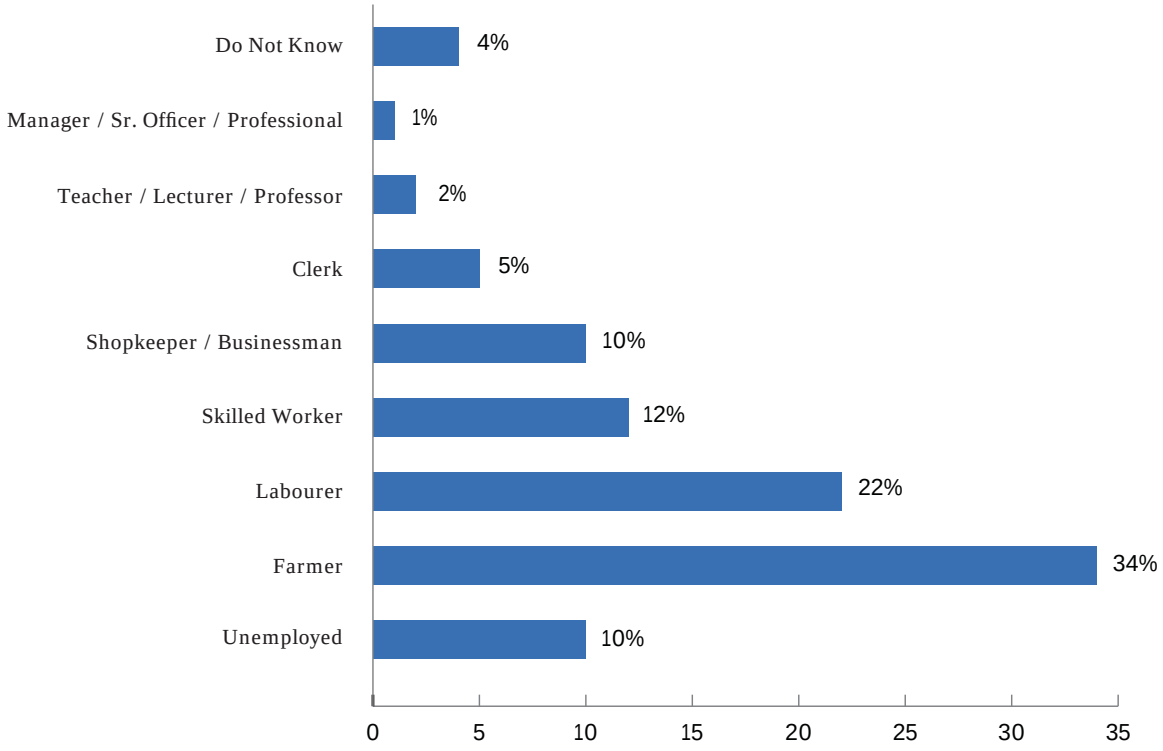


3.2.2.2 Occupational Status of Parents

Occupational Status of Father

Figure 3.30 provides the distribution of students on the basis of their fathers' occupation. Results indicate that 10% were unemployed, 34% were farmers, 22% were labourers and only 1% were manager/senior officer/ professional.

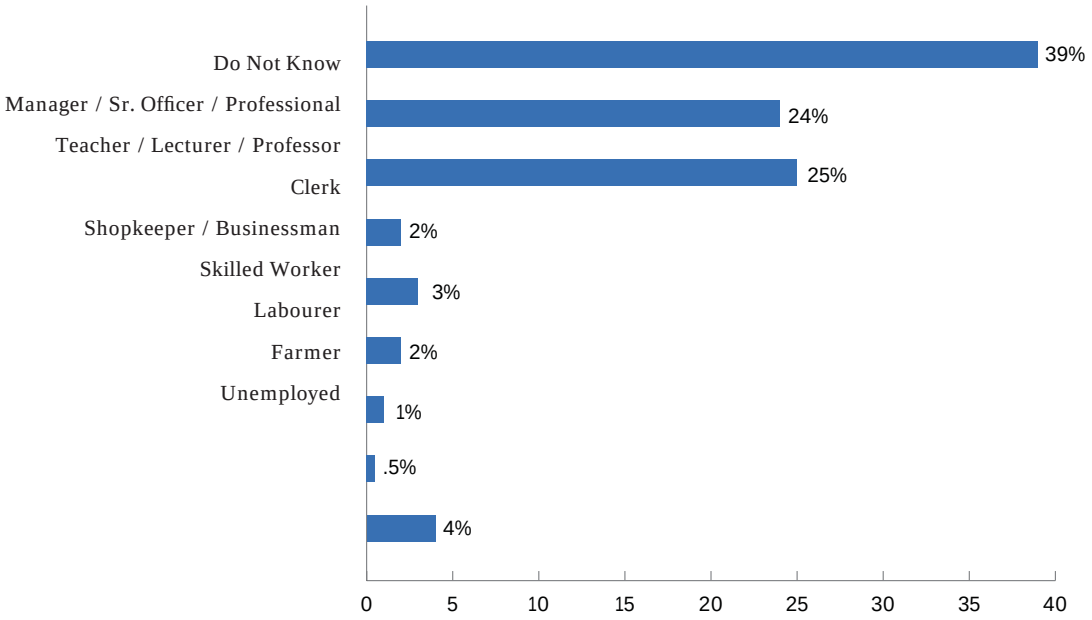
Figure 3.30 | Father's Occupation



Occupational Status of Mother

Figure 3.31 shows that mothers of 39% of the students were unemployed/ housewife, 24% of the farmers, 25% laborer and remaining 8% were skilled worker /shopkeeper/ businessman/ clerk/ teacher/ lecturer/ professor/ manager/ seniors/ officer/ professional.

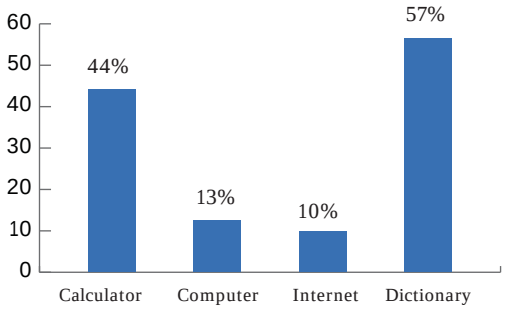
Figure 3.31 | Mother's Occupation



3.2.2.3 Literacy Resources at Home

In the view of the importance of literacy resources in enhancing students' learning, information was sought about the availability of some literacy resources e.g., calculator, computer, internet facility at home and dictionary. In relation to this, a wide variation was observed in the usage of these facilities at home, i.e. only 10% students were using internet facility at home, whereas 57% students were found using dictionaries. Details are presented in Figure 3.32.

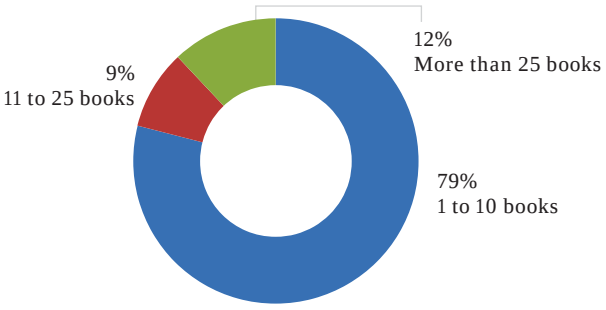
Figure 3.32 | Resources at Home



3.2.2.4 Books at Home

The availability of books at home was categorised into having 10 books, 11-25 books and more than 25 books. Figure 3.33 shows the results with 79% of the students reported to have 1-10 books at home, only 12 % reporting to have more than 25 books and 9 % had 11-25 books.

Figure 3.33 | Books at Home



3.2.3 Resources Available at School

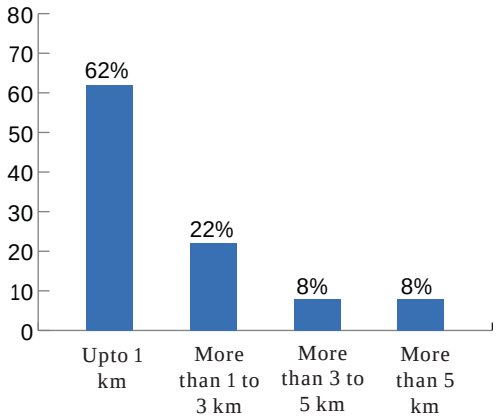
Schools are almost like a second home for children as they usually spend one third of their time in school. The survey conducted covered some of the important variables like distance from home to school, availability of computers and its usage, availability of library and its usage, liking to be in school, homework given by teachers and checked in school.

The outcomes of responses in percentages are presented as under:

3.2.3.1 Distance from Home to School

Figure 3.34 shows that for 62% of the surveyed students, school was within one kilometer distance from their residence. Only 16% of the total sample students reported to travel three or more kilometers to reach the school. In Goa (45%), Kerala (35%), West Bengal (49%), A & N Islands (43%) and Dadra & Nagar Haveli (47%) students resided within a kilometer, while in Daman & Diu, schools were reported to be within a kilometer for almost 80% of the students (see Table A-2.21, Appendix II).

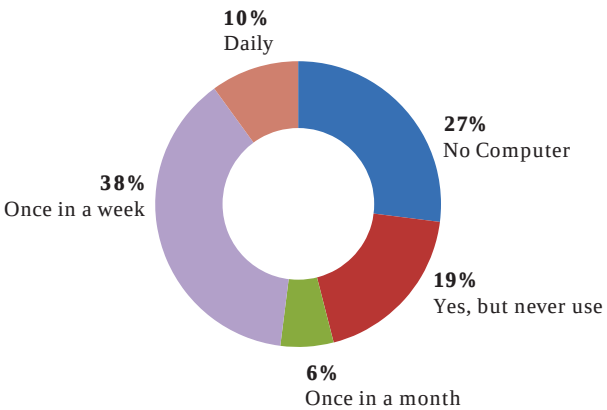
Figure 3.34 | Distance from Home to School



3.2.3.2 Availability and use of Computer

Figure 3.35 shows that only 73% of the students had computers in their schools. Out of these students, 10% students reported to use computers daily, 38% reported to use it once in a week, 6% once in a month, and 19% reported to never have used a computer in their schools. Punjab is the only state, where nearly one-fourth of the students used computers daily (see Table A-2.22, Appendix II).

Figure 3.35 | Availability and use of Computer

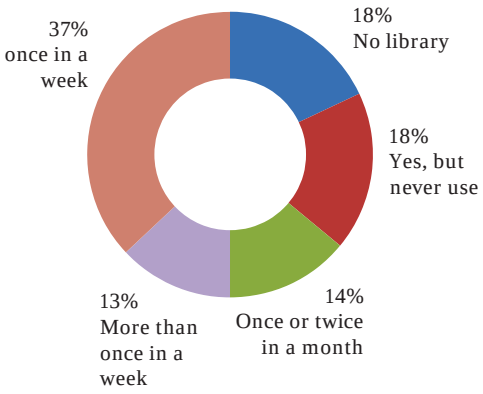


3.2.3.3 Availability and use of Library

Figure 3.36 shows that of the surveyed schools, 18% did not have a library. In the remaining 82% of the schools, the situation was as under:

- In 18% of the schools, students never used the library.
- About 37% of the students were using library once in a week, 13% more than once in a week and 14% once or twice in a month.

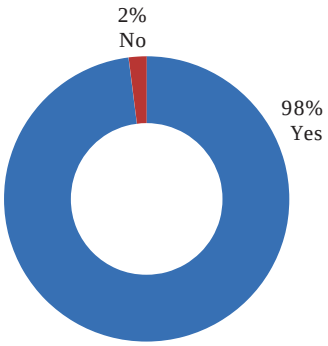
Figure 3.36 | Availability and use of Library



3.2.3.4 Students being in School

The survey revealed that 98% of the students liked being in the school (Figure 3.37). This indicates that school's environment was conducive and it encouraged students to be in schools. In Tripura, more than 99% students liked to be in the school. But, in Gujarat, only 95% students liked being in the school. (refer Table A-2.23, Appendix II)

Figure 3.37 | School Liking



3.2.3.5 Homework given by Teachers

Data in Table 3.1 clearly indicates that 87% to 94% of the students got home work in different subjects. However, the frequency of getting home work varied from one subject to another. In spite of that, 49% to 66% students got home work every day in different subjects. Students got home work almost regularly (given by the teachers) in Mathematics.

Table 3.1 | Homework given by Teachers in Different Subjects

Subjects	Everyday (%)	3 or 4 times a week (%)	1 or 2 times a week (%)	Never (%)
Language	58.9	18.5	16.8	5.8
Mathematics	65.5	16.1	11.4	7.0
Science	51.5	19.3	19.9	9.3
Social Science	48.9	17.3	21.2	12.6

3.2.3.6: Homework Checked by Teachers

Table 3.2 shows that home tasks given to students in different subjects were checked by 41% to 53% teachers every day. Further, Mathematics teachers managed to get at the top in terms of checking the home work everyday as compared to other subjects.

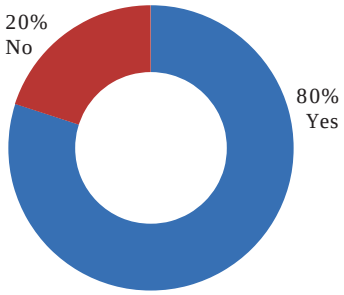
Table 3.2 | Homework Checked by Teachers in Different Subjects

Subjects	Everyday (%)	3 or 4 times a week (%)	1 or 2 times a week (%)	Never (%)
Language	49.3	20.4	23.7	6.7
Mathematics	52.8	19.1	19.3	8.8
Science	43.2	21.2	25.2	10.4
Social Science	41.0	19.1	26.1	13.8

3.2.3.7 Help in Studies

Figure 3.38 shows the percentage of students getting help from family members with respect to their studies. About 80% of students reported that they got help in their studies from different members of their families and 20% of students reported that they did not get any help in their studies.

Figure 3.38 | Help with Homework

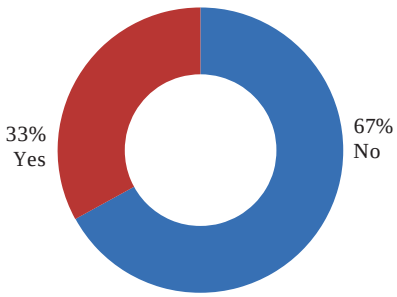


3.2.3.8 Private Tuition

Taking private tuition is a common practice nowadays although quality education should be provided by the teachers in the classroom. With this view, the government has banned the school teachers from providing tuition. However, this practice continues to exist in one form or the other in response to parental demand.

Figure 3.39 shows the percentage of students taking private tuition. Overall, 33 percent of the students said they took private tuition.

Figure 3.39 | Taking Private Tuition



3.2.4 Students' Activities Outside the School

All-round development of students is dependent on they learn both in the school, and also from activities outside the school. The survey gathered information on some of the important activities outside the school, such as students' reading habits, books, magazines, watching television and helping family in household chores.

The data in Table 3.3 indicates that, nearly 67% of the students watch TV daily and when asked about helping their family in the household chores, about 77% of the students reported that they helped in the household chores daily.

Table 3.3 | Students Participation in Activities outside the School

Activities	Daily (%)	Once a Week (%)	Once a Month (%)	Never (%)
Watch Television	66.6	21.3	4.3	7.8
Read Magazine	45.4	29.4	7.9	17.3
Read a Book	37.5	36.5	12.1	13.9
Play Games	63.7	19.9	7.9	8.5
Help in Household Activities	77.0	7.9	2.1	13.0

3.3 Teachers

Teachers are a vital component of the educational process and it is important to know the characteristics of teachers, the strategies they use in the classroom and their general attitudes towards teaching in schools. The section given below provides information about some of the important characteristics of the Class VIII teachers, such as teacher background, teaching experience and training, teaching practices, teachers' opinion about the school, etc. Also, teachers teaching the sampled students in subjects tested as a part of the survey, were asked to complete a Teachers' Questionnaire. Table 3.4 represents the responses collected from a total of 24,486 teachers

Table 3.4 | Teachers Included in Survey

S.No.	States/UTs	Number responding
1	Andhra Pradesh	1029
2	Arunachal Pradesh	873
3	Bihar	878
4	Chhattisgarh	773
5	Delhi	928
6	Goa	708
7	Gujarat	896
8	Haryana	771
9	Himachal Pradesh	846
10	Jammu & Kashmir	898
11	Jharkhand	721
12	Karnataka	877
13	Kerala	929
14	Madhya Pradesh	655
15	Maharashtra	956
16	Manipur	948
17	Meghalaya	562

S.No.	States/UTs	Number responding
18	Mizoram	950
19	Nagaland	324
20	Odisha	897
21	Punjab	864
22	Rajasthan	988
23	Sikkim	522
24	Tamil Nadu	919
25	Tripura	895
26	Uttar Pradesh	613
27	Uttarakhand	848
28	West Bengal	856
29	A & N Islands	371
30	Chandigarh	272
31	Puducherry	739
32	Dadra & Nagar Haveli	123
33	Daman & Diu	57
	Total	**24486**

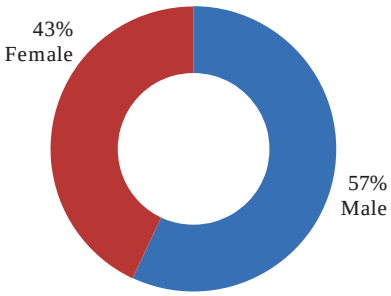
3.3.1 Teachers' Background

The questionnaire collected information on a wide range of background factors as set out in the paragraphs that follow.

3.3.1.1 Gender

Of the surveyed Class VIII teachers, nearly 43% were females and 57% were males (See Figure 3.40).

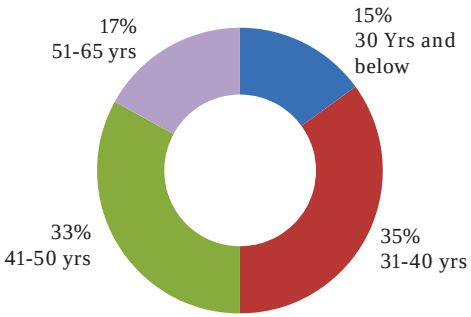
Figure 3.40 | Male and Female Teachers



3.3.1.2 Age

Figure 3.41 depicts the age profile of the teachers as filled in the survey questionnaire. In the sample, 15% of the teachers were below the age of 30, while about 17% were above 50 years of age (Figure 3.41).

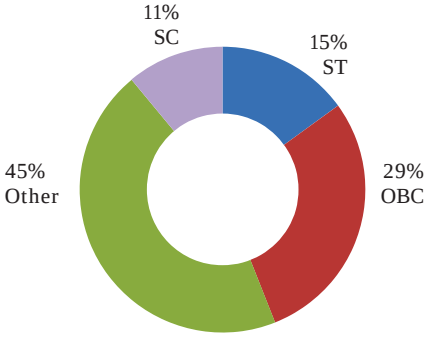
Figure 3.41 | Age of Teachers



3.3.1.3 Category

Figure 3.42 indicates that 45% teachers belonged to the Others category, 29% to OBC, 15% to the ST category and only 11% were from the SC category.

Figure 3.42 | Social Category of Teachers



3.3.1.4 Educational and Professional Qualification

In the survey, teachers were asked about their highest educational and professional qualification. The results in table 3.5 show that overall, 89% of the teachers in the sample were graduates or post graduates, or M Phil/PhD. Amongst the M Phil/PhD degree holders, about 24% had M.Ed and other PG degrees. More than 74% of the graduates and above degree holders'had a B.Ed degree.

Table 3.5 | Educational and Professional Qualification of Teachers

Educational Qualification		Professional Qualification			Total
		Primary/ Elementary Teaching Certificate	Graduate Training	MEd and others	
Secondary	N	604	0	0	604
	%	100%	-	-	100%
Higher/Senior Secondary	N	1454	0	0	1454
	%	100%	-	-	100%
Graduate	N	2089	7321	131	9541
	%	22%	77%	1%	100%
Post graduate	N	1078	7991	692	9761
	%	11%	82%	7%	100%
M.Phil./Ph.D	N	12	332	107	451
	%	3%	74%	24%	100%
Total	**N**	**5237**	**15644**	**930**	**21811**
	%	**24%**	**72%**	**4%**	**100%**

3.3.2 Teaching Experience and Training

To ensure high quality education in schools, it is necessary that teachers are trained. There are two types of teacher training programmes prevalent in our education system, namely pre-service training and in-service training. The basic pre-service qualification which is necessary to be appointed as a regular teacher in any school, is a certificate diploma or degree programme, e.g. JBT, B.Ed., M.Ed. etc. In-service training is provided for further development of teachers.

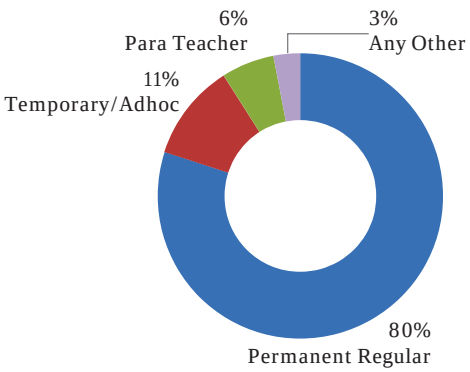
3.3.2.1 Teachers' Employment Status

In India, states differ from one another on policies and recruitment of teachers. Under Sarva Shiksha Abhiyan (SSA) and the Right to Education Act (2009), enrolment in schools up to the upper primary level has substantially increased. The Government of India and State governments have made efforts to provide all the schools with the basic infrastructure to meet their immediate demands and for this many States have appointed Para teachers/ Shikshakarmi/part time teachers.

The employment status of teachers is presented in Figure 3.43. While majority of teachers, nearly four fifth, were regular or full time teachers, around 11% were working as temporary teachers and 6% as Para teachers. The para/ shikshakarmi/ part time teachers were appointed by some of the states to meet the immediate demand of teachers in schools.

The percentage of temporary teachers was more as compared to other types of teachers in the country. The arrangement of part time/ Para teachers etc. was 55% in Chhattisgarh and 45% in Jharkhand. Chhattisgarh was the only state where 40% teachers were permanent/regular. Besides, in Andhra Pradesh, Delhi, Gujarat, J&K, Karnataka, Kerala, Maharashtra, Tamil Nadu and Uttar Pradesh, above 90% teachers had permanent/regular position. Moreover, there were no part time/ Para teachers in Sikkim (see Table A-2.24, Appendix II)

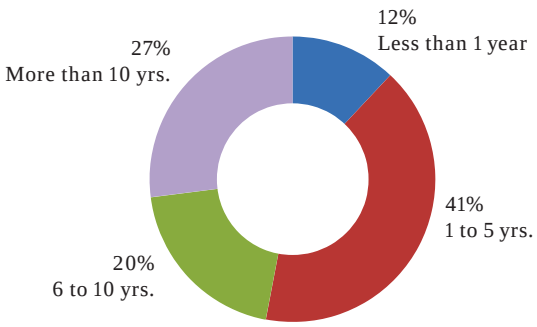
Figure 3.43 | Employment Status



3.3.2.2 Number of Years in Present School

Figure 3.44 reveals that about 27% of the teachers were posted in the same school for more than 10 years and about 41% teachers were in the same school for the past 1 to 5 years.

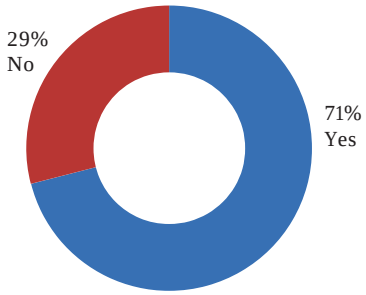
Figure 3.44 | Years in Present School



3.3.2.3 Attended in-service Training Programmes

Observations from figure 3.45 reveal that out of the total sampled teachers, about 71% had attended in service training programme. Further, around 52-56% teachers had attended in service training programmes during the academic session 2011-12 and 2012-13 in the states of Karnataka, Meghalaya, Arunachal Pradesh and Odisha. However, Manipur was the only state where merely 49% teachers had attended the in service training programmes during the last two academic sessions. Moreover, in most of the states, above 70% teachers had attended in service training programmes during the last two academic sessions (see Table A-2.25, Appendix II).

Figure 3.45 | Attended In-service Training Programmes

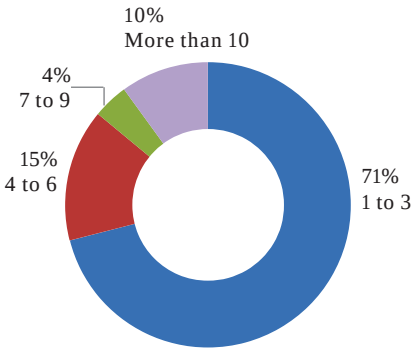


3.3.2.4 Number of Training Programmes Attended

At the State level, various agencies such as SCERT, DIET, BRC, CRC etc. organize in-service teacher training programmes for teachers to update them with the latest trends and build their capacity for classroom teaching. Teachers were asked about the number of such programmes attended by them during the last two years. The information collected as a part of this question, reflects the activeness of the various academic agencies in organizing in-service training programmes.

Figure 3.46 shows that while about 71% of the teachers attended 1-3 programmes, 15% attended 4-6, 4% attended 7-9 and 10% of the teachers attended more than 10 training programs in the last two academic years. Further, the percentage of teachers in Tamil Nadu, who attended more than 10 programmes was far more than those who attended only 1-3 in-service programmes. Besides, percentage of teachers in Kerala, who attended 1-3 in-service training programmes was the lowest amongst all the states (see Table A-2.26, Appendix II).

Figure 3.46 | In-service training programmes attended by teachers

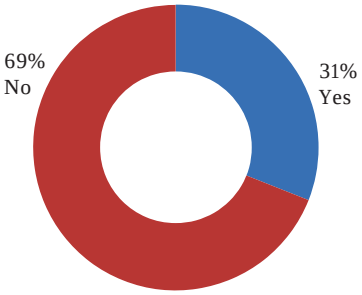


3.3.2.5 Attended Training Programmes Based on National Curriculum Framework-2005

NCERT provides academic help to States for conducting training of teachers under NCF 2005. Further, NCERT also organises many training programs in Delhi and in the States to train key resource persons. Figure 3.47 indicates that overall 31% of the teachers attended training programmes based on NCF-2005. Punjab was the only state where less than 10% of the teachers attended training programmes based on the NCF-2005.

Besides, in many States/UTs, less than one fourth of the teachers attended any training programme based on NCF-2005. However, Uttar Pradesh was the only state where 68% of the teachers had attended training programmes based on the NCF-2005 (see Table A-2.27, Appendix II).

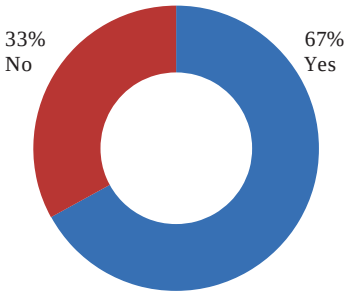
Figure 3.47 | Teachers Attended Training Programme based on NCF-2005



3.3.2.6 Use of Revised Textbooks Based on NCF-2005

Revised text books for classes I to XII based on the NCF-2005 were developed by NCERT and the States were supposed to adopt/adapt these books. But, data in figure 3.48 indicates that only 67% of the teachers were using the revised text books based on the NCF-2005, with 35% in Karnataka and 38% in Tamil Nadu (see Table A-2.28, Appendix II).

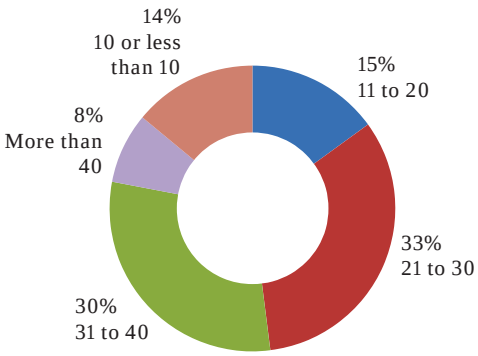
Figure 3.48 | Revised Textbooks used Based on NCF-2005



3.3.2.7 Periods Taught by Teacher Per Week

Figure 3.49 shows that while about 63% teachers were teaching 21-40 periods per week, 8% teachers were teaching above 40 periods per week and only 14% teachers were teaching less than 10 periods in a week.

Figure 3.49 | Periods Taught per week



3.3.2.8 Teacher's Diary

Teachers are provided with a 'Teacher's Diary' to maintain their day to day record of activities planned and executed in the class. This helps teachers as well as supervisors to know what teachers did on a particular day in a class. Further, it also helps teachers in planning for a lesson to be taught in class as well as to note down specific queries

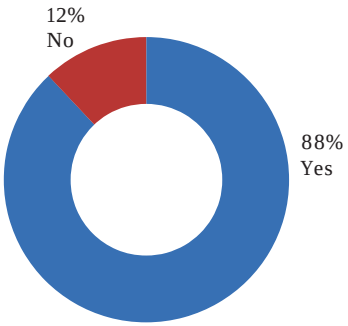
made by the students on particular topics. Moreover, the teacher's diary may also be used as a tool for assessment of teachers' work in the school, if required.

Figure 3.50 indicates that 88% of the teachers reported that they were maintaining a Teacher's Diary.

However, there was lot of variation across states. 68-99% of the teachers responded that they maintained a Teacher's Diary. Mizoram was the only state where more than half (54%) of the teachers reported that they were not maintaining a Diary.

Apart from this, in Arunachal Pradesh, Bihar, Jharkhand, Manipur, Nagaland, West Bengal and Puducherry, about 28% to 32% teachers reported that they were not maintaining a Teacher's Diary (see Table A-2.29, Appendix II).

Figure 3.50 | Teacher's Diary



3.3.3 Teaching Practices

The introduction of the NCF 2005 created a paradigm shift in the teaching learning process. The new approach was constructive approach which believes that pupils construct their own knowledge and the teacher is a facilitator who guides the pupils to think, solve problems and learn on their own. This requires a change in the role of teachers, learning environment, instructional strategies, curriculum and assessment of students' achievements. Information on some of the above variables such as teaching style, academic facilities and modification of curriculum according to NCF-2005 etc. was sought in this questionnaire.

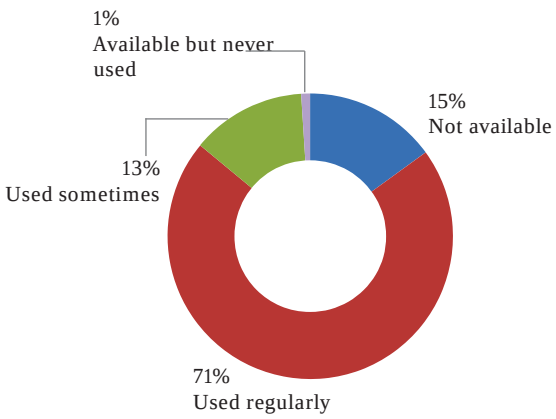
3.3.3.1 Use of Teacher's Handbook

Teacher's Handbook is a tool which helps teachers to modify their teaching style in ways that it facilitates learners to understand the concepts in a better way.

Figure 3.51 indicates that nearly 71% of the teachers were using the Teacher's Handbook regularly. Besides, about 15% reported that the Teacher's Handbook was not available to them. Further, in Arunachal Pradesh about 46% reported that the Teacher's Handbook was not available to them.

Kerala was the only state where about 92% teachers were using the Teacher's Handbook. In majority of States/UTs, 60-80% teachers were using the Handbook (see Table A-2.30 & Table A-2.31, Appendix II).

Figure 3.51 | Teacher's Handbook

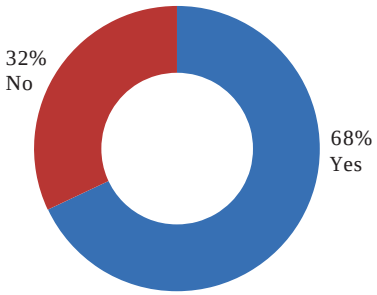


3.3.3.2 TLM Grants

Under SSA, teachers are provided with an annual grant for developing Teaching Learning Materials (TLM), so that these could be used during teaching for better understanding of contents. Figure 3.52 shows that only 68% of the teachers were getting the TLM grants.

Across the States/UTs, there is a lot of variation in the percentage of teachers who reported that they received the TLM grants i.e. from 26% in Gujarat to 92% in Dadra & Nagar Haveli (see Table A-2.32, Appendix II).

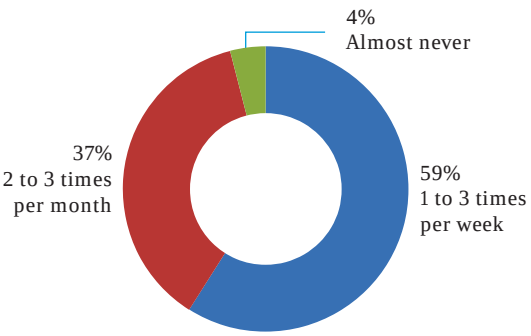
Figure 3.52 | TLM Grants



3.3.3.3 Teacher Interaction

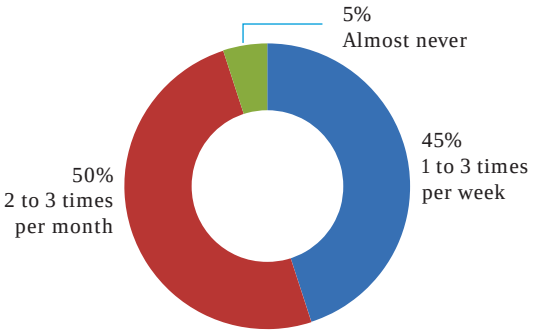
Interaction among teachers helps to clear up doubts in organising content for development of lesson plans and using teaching learning materials. It also helps teachers to improve teaching methodology and cover concepts in an improved way. Anecdotal evidences suggest that the practice is fairly unusual and no concrete measures were taken to encourage such a practices. To verify this perception teachers were asked about their experience in this regard.

Figure 3.53 | Discuss how to Teach a Particular Concept



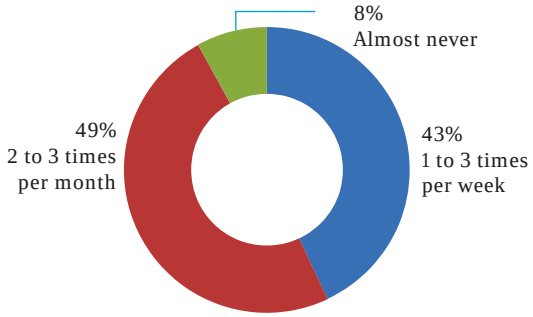
Discussion about how to teach a particular concept: According to Figure 3.53, 59% of the teachers reported that discussion among teachers about how to teach a particular concept took place "1 to 3 times per week", 37% reported "2 to 3 times per month" and 4% teachers said that such discussions almost never took place amongst them.

Figure 3.54 | Working on Preparing Instructional Materials



Working on preparing Instructional Materials: Figure 3.54 shows that 45% teachers were interacting with colleagues 1-3 times in a week to develop instructional materials, 50% teachers were interacting 2-3 times a month and 5% teachers almost never interacted in this way.

Figure 3.55 | Informal Observation of Classroom by another Teacher



Informal observation of my classroom by another teacher: Figure 3.55 indicates that overall 8% teachers reported that their classroom teaching was almost never observed by another teacher, 49% teachers were observed 2-3 times per month by another teacher and 43% teacher's were observed 1-3 times per week by another teacher.

3.3.4 Problems in School

Under the drive of Universalizing Elementary Education, Central Government and State Governments have made heroic efforts to bring all the children of the age group of 6-14 years to school. Further, in order to give it a legal backup, the Government of India passed the Right to Education Act (2009). In addition, under SSA, since 2000 the Government of India has provided large sums of money to States for implementing the minimum required infrastructure for schools to provide quality education to children. In spite of the efforts made under SSA there is a need to work more in this area. The observations of teachers on certain aspects are given as under:

a. *School building needs significant repair:* Figure 3.56 shows that overall 20% teachers felt that the need of significant repair of the school building was a serious problem, whereas 45% teachers felt that it was a minor problem. Overall, only one third of school buildings did not need any repairing.

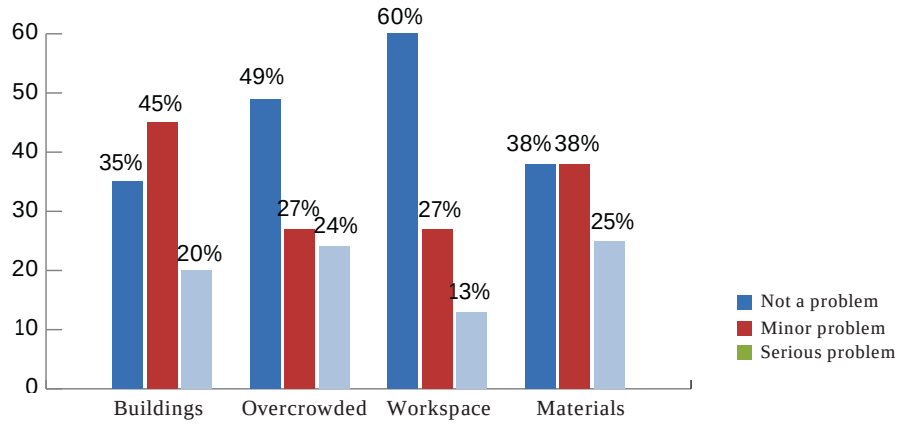
b. *Classrooms are overcrowded:* For a healthy atmosphere in the classroom, the teacher-pupil ratio should be appropriate and there should be a proper space for students to sit. Figure 3.56 shows that overall 24% teachers considered it as a serious problem, 27% as a minor problem and for the rest it was not a problem.

c. *Inadequate workspace outside the classroom:* Teachers need some space outside the classroom for preparation of TLM and organising relevant activities. Hence, they were asked to respond about the working space outside

the class room. The responses are presented in Figure 3.56. While 13% teachers reported not having adequate workspace outside their classroom as a serious problem, 27% teachers considered it as a minor problem and the remaining 60% did not consider it as a problem at all.

d. *Materials are not available:* Figure 3.56 indicates that 25% teachers reported non-availability of material as a serious problem, 38% reported it as a minor problem and 38% did not consider it as a problem.

Figure 3.56 | Problems in School



3.3.5 Teachers' Opinion about the School

It is important to know how well teachers are aware about the curriculum goals, whether they are satisfied with their job and what are their expectations from students and parents. Also, opinion about these factors directly or indirectly indicates teacher's motivation and school environment where he/she is teaching.

The responses on the said aspects were analysed separately (Figure 3.57) and are presented below:

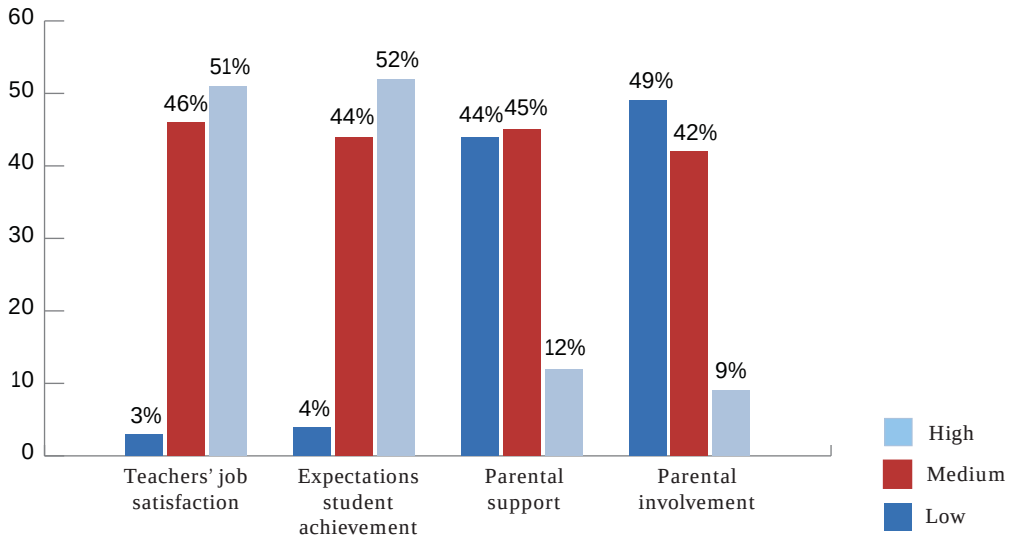
a. *Teacher's job satisfaction:* 51% teachers reckoned that the teaching staff in their school was highly satisfied with their job, while only 3% reckoned that the teachers were having a low job satisfaction.

b. *Expectations for students' achievement:* 52% teachers reported that their expectations for the students were high, whereas only 4% teachers reported a low expectation level for the students.

c. *Teachers view regarding parents support and involvement:* 12% teachers had the opinion that parental support was high, whereas 44% teachers reported parental support to be low.

d. *Parents' involvement in school activities:* Overall, 9% teachers reported parents' involvement to be high, whereas 49% teachers reported it as low.

Figure 3.57 | Teachers' Opinion about School Related Factors



Schools

- Out of the surveyed schools, nearly three-fourth schools were inspected in the academic session 2011-12. But, in Goa it was reverse.
- About 95% schools were having 180-220 working days in academic year 2010-11.
- Most of the States/UTs were having 6 working days per week, except Meghalaya, Mizoram, Nagaland, Tamil Nadu, Kerala and Puducherry.
- Majority of sampled schools (80%) were functioning in Pucca building.
- About 82% schools have separate toilets for girls.
- Computers were available in 62% schools.
- Mathematics laboratory was available only in 19% schools.
- Science laboratory is available in half of the surveyed schools.
- Annual medical check-up facility was available in about 72% schools.
- About 17% schools have not received SSA grant in academic grant 2011-12.
- About two-third of the surveyed schools were using SSA grant for school maintenance.
- About 92% head teachers took classes, but in Kerala 70% head teachers were not taking class.
- Only 46% schools have computer with internet facility.
- About 95% schools were organizing remedial classes for students in mathematics.
- Problem of absenteeism of students was reported by about two-third of surveyed schools

Students

- Overall three-fourth students were of age group of 13-14 years. But, in Nagaland and Sikkim, 61-68% students were 16 years and above.
- About 63% of students spoke the same language at home as medium of instruction in schools. But, in Arunachal Pradesh, Meghalaya, Nagaland and Sikkim 83-89% students were studying in a different medium of instruction vis-à-vis the language spoken at home.
- Of the surveyed schools, 32% of students had 4 or more siblings. In contrast to this, West Bengal is the only state where 18% of students were single child of the family.
- The percentage of physically challenged students was 7%.

- About 26 % students' father were illiterate. However, in Andhra Pradesh about 49% students' father were illiterate and about 39% were educated up to primary level. In Kerala, about 76% students' father were secondary and above.
- About 39% students mother were illiterate. But in UP, Rajasthan and J&K 61-76% students' mother were illiterate.
- Of the surveyed students, 10%fathers and 39% mothers were unemployed/housewife.
- About 13% students were having computer at home and 73% students were having computers in their schools. Out of these students, 10% students use computer daily.
- About 79% students were having 1-10 books at their home.
- Schools were within 1 km of radius for 62% students.
- 18% students reported that they were not having library in their school.
- Nearly 98% students reported that they liked being in the school.
- About 87% to 94% students were getting home work in different subjects. But, in Nagaland, only 17% students were getting homework in Language.
- Nearly 50% teachers were checking homework.
- About 80% of students were getting help in their studies from different members of their families.
- Overall, 33 percent of students were taking private tuition.
- About 77% students were helping in household activities daily.

Teachers

- In the surveyed schools, nearly 43% teachers were female and 57% were male.
- About 15% of teachers were below the age of 30. But, about 17% were above 50 years of age.
- Overall, 89% of the teachers were graduates or post graduates, or M Phil/PhD.
- About 71% teachers had attended in service training programme.
- Overall, only 31% of teachers attended a training programme based on NCF-2005. But, in Uttar Pradesh 68% of the teachers attended the training programme based on NCF-2005.
- Only 67% of the teachers were using revised text books based on NCF-2005. But, in Karnataka (35%) and Tamil Nadu (38%) teachers were using revised text books based on NCF-2005.
- About 63% teachers were teaching 21-40 periods per week.
- Nearly 88% teachers were maintaining Teacher's Diary.
- Nearly 71% teachers were using Teacher's Handbook regularly.
- Only 68% teachers had received TLM grant.
- About half of the teachers in the surveyed schools discuss with each other on a particular concept 1-3 times in a week.
- About 45% teachers interact with colleagues to develop instructional materials 1-3 times in a week.
- Overall 20% of teachers felt that the need of significant repair in the school building was a serious problem.
- Overall 24% of teachers reported that overcrowded classes were a serious problem in their schools.
- About 13% of teachers reported that they did not have adequate workspace outside their classroom and were considering it a serious problem.
- About 25% teachers reported non-availability of material as a serious problem.
- Nearly 51% teachers stated that they were highly satisfied with their job.
- About 52% of teachers reported high expectations for their students.
- Nearly 12% teachers had the opinion that parental support was high.
- Overall, 9% of teachers reported parents' involvement was high and very high whereas 49% of teachers reported it as low.

CHAPTER - 4

Students' Achievement in Language

The Language tests used in the National Achievement Survey (NAS) comprised of two categories of items viz. those testing 'reading comprehension' and those testing 'language-specific elements' such as vocabulary and grammar. These tests were administered in 12 languages and the reading comprehension passages along with their associated items were translated directly and, hence, were comparable. The language-specific items, of necessity, were unique to each language. Therefore, this report focuses on student achievement in the reading comprehension domain only. Information from the other language items will be subjected to secondary analysis and reported separately.

The overall achievement in the reading comprehension domain is reported for each of the participating states and union territories in this report. In addition, information about differences in achievement by student gender, school location and social category is also provided.

4.1 How Did the States and Union Territories Perform in Reading Comprehension?

Table 4.1 shows the distribution of student achievement for the 33 participating States and UTs. States are listed in alphabetical order in each of the given tables.

The tables list each state's average score on a scale from 0 to 500 with a SD of 50. The 'standard error' is given for each score to indicate the degree of imprecision arising from the sampling process. Finally, these tables indicate whether a state's average score is significantly different from the overall average of 33 States/UTs or not.

Table 4.1 | Average Reading Comprehension Scores for States and Union Territories

State or Union Territory	Average Score	Standard Error	Significant Difference
A & N Islands	243	3.4	●
Andhra Pradesh	244	1.3	↓
Arunachal Pradesh	234	2.2	↓
Bihar	242	2.0	↓
Chandigarh	264	1.9	↑
Chhattisgarh	245	2.1	●
Dadra & Nagar Haveli	248	3.5	●
Daman & Diu	273	2.7	↑
Delhi	248	1.8	●
Goa	258	2.1	↑

State or Union Territory	Average Score	Standard Error	Significant Difference
Gujarat	247	2.1	●
Haryana	250	2.3	●
Himachal Pradesh	259	7.7	●
Jammu & Kashmir	217	2.1	↓
Jharkhand	242	2.4	↓
Karnataka	244	1.4	↓
Kerala	277	1.8	↑
Madhya Pradesh	246	1.9	●
Maharashtra	267	3.9	↑
Manipur	239	2.3	↓
Meghalaya	229	3.0	↓
Mizoram	244	3.7	●
Nagaland	245	4.0	●
Odisha	245	2.2	●
Puducherry	233	1.9	↓
Punjab	260	1.8	↑
Rajasthan	241	2.3	↓
Sikkim	248	1.6	●
Tamil Nadu	241	1.7	↓
Tripura	239	2.3	↓
Uttar Pradesh	247	3.1	●
Uttarakhand	250	1.7	●
West Bengal	259	1.7	↑
Overall	**247**	**0.5**	

● The state's average score is not significantly different to that of the overall.

↑ The state's average score is significantly above that of the overall.

↓ The state's average score is significantly below that of the overall.

Table 4.1 indicates that the average score for 33 States and UTs was 247 (with a standard error of 0.5). Further, the results reveal substantial differences in Reading Comprehension achievement between the highest performing state (277 for Kerala) and the lowest performing state (217 for Jammu & Kashmir). Also, while seven states/UTs showed average scores significantly above that of the group; twelve states/UTs depicted average scores significantly below that of the overall average and fourteen states/UTs presented average scores that were not significantly different from that of the overall.

The participant group included ten states/UTs in which the language of assessment was Hindi and a wide range of results was seen amongst them. At a time when Himachal Pradesh displayed the highest average level of achievement (259), Rajasthan showed the lowest level (241). The performance levels of the other states in the Hindi group as well fell between extremes with: Bihar (242), Chhattisgarh (245), Delhi (248); Madhya Pradesh (246); Uttar Pradesh (247); Haryana (250); Jharkhand (242); and, Uttarakhand (250).

4.2 Percentile Scores in Reading Comprehension for States and Union Territories

The following table 4.2 and figure 4.1 illustrate the range of achievement within and across the states. The table list the scores achieved by students at key percentiles. For example, the score at the 25th percentile is the score which 75% of students achieve or surpass: the score at the 90th percentile is the score that 10% of students achieve or surpass.

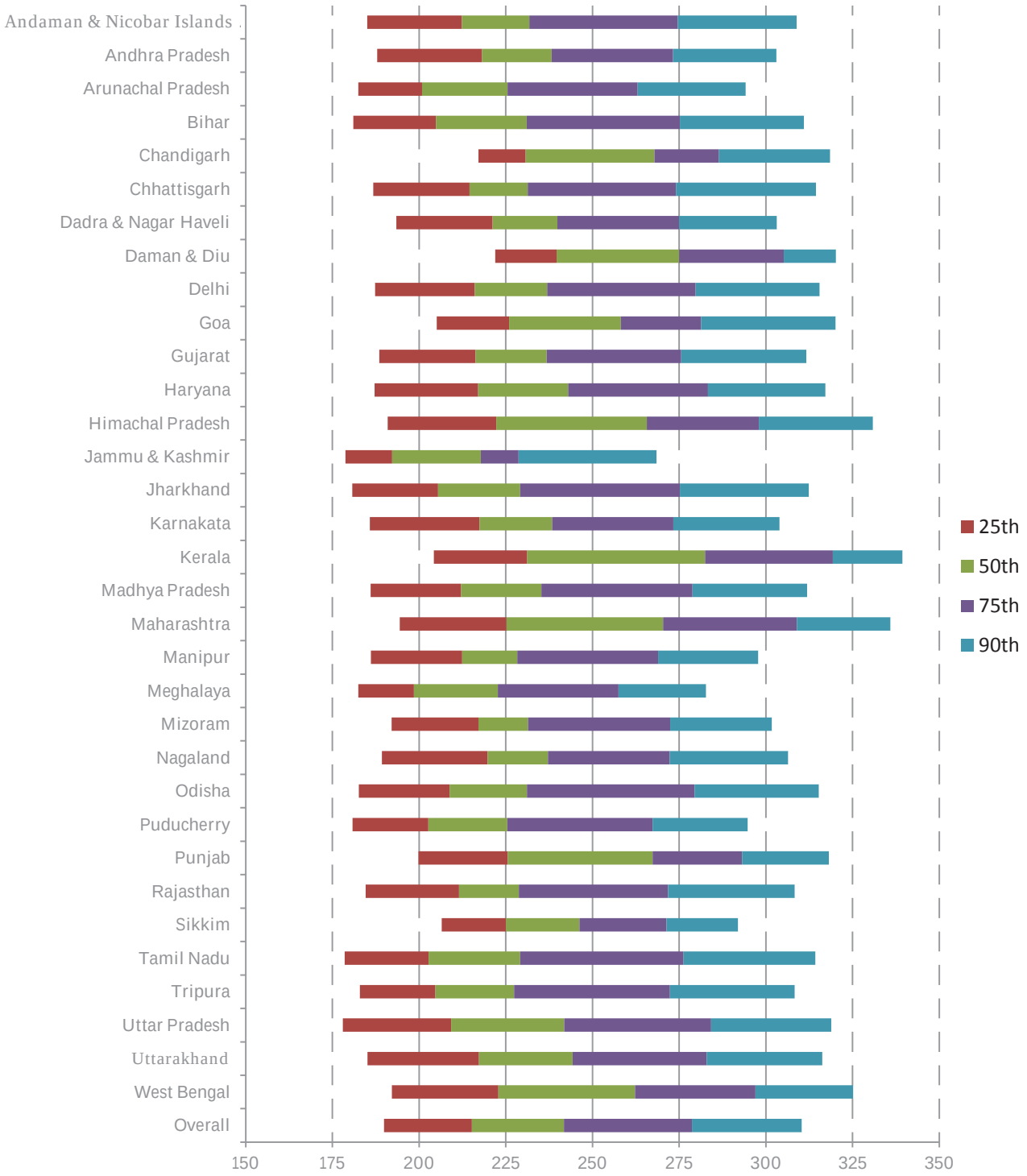
The range between the 25th and 75th percentiles (the inter-quartile range) represents the performance of the middle 50% of students. Hence, this is a good indicator of the state's degree of homogeneity in terms of the Reading Comprehension achievement of its students.

Table 4.2 | Percentile scores in Reading for States and Union Territories

State or Union Territory	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	Range 75-25	Range 90-10
A & N Islands	185	212	232	275	309	62	124
Andhra Pradesh	188	218	238	273	303	55	115
Arunachal Pradesh	182	201	225	263	294	62	112
Bihar	181	205	231	275	311	70	130
Chandigarh	217	231	268	287	319	56	101
Chhattisgarh	187	215	231	274	314	60	128
Dadra & Nagar Haveli	193	221	240	275	303	54	110
Daman & Diu	222	240	275	305	320	65	98
Delhi	187	216	237	280	316	64	128
Goa	205	226	258	281	320	55	115
Gujarat	189	216	237	276	312	59	123
Haryana	187	217	243	283	317	66	130
Himachal Pradesh	191	222	266	298	331	76	140
Jammu & Kashmir	179	192	218	229	268	36	90
Jharkhand	181	205	229	275	312	70	132
Karnataka	186	217	238	273	304	56	118
Kerala	204	231	282	319	339	88	135
Madhya Pradesh	186	212	235	279	312	67	126
Maharashtra	194	225	270	309	336	84	141
Manipur	186	212	228	269	298	56	112
Meghalaya	183	199	223	258	283	59	100
Mizoram	192	217	231	272	302	55	110
Nagaland	189	220	237	272	306	52	117
Odisha	183	209	231	279	315	71	133
Puducherry	181	203	225	267	295	65	114
Punjab	200	226	267	293	318	68	118
Rajasthan	185	212	229	272	308	60	124
Sikkim	207	225	246	271	292	46	85
Tamil Nadu	179	203	229	276	314	73	136
Tripura	183	205	227	272	308	68	125
Uttar Pradesh	178	209	242	284	319	75	141
Uttarakhand	185	217	244	283	316	66	131
West Bengal	192	223	262	297	325	74	133
Overall Distribution	**190**	**215**	**242**	**279**	**310**	**63**	**120**

Note: Ranges may not agree due to rounding.

Figure 4.1 | Percentile scores in Reading Comprehension for States and Union Territories



The inter-quartile range (i.e. the range between the 75th and 25th percentiles) is highly variable between states/UTs. For example, Jammu & Kashmir has an inter-quartile range of just 36 while Kerala has a corresponding value of 88. These values suggest that the Class VIII population in Jammu & Kashmir is far more homogeneous than that of Kerala. In most states, the range of performance for the middle group was between 55 and 75 scale-score points. Performance at the 10th and 90th percentiles respectively show extremes in low and high achievement. The range between these two points, which includes 90 percent of the population, is highly variable ranging from 90 (Jammu & Kashmir) to 141 (Uttar Pradesh).

The percentiles provide additional information when comparing Reading Comprehension performance amongst states. For example, when the states are arranged in order of average score, the differences between adjacent states tend to be small. However, the range of scores may not be similar. For example, there is no significant difference between the median score of Bihar, Chhattisgarh, Mizoram and Odisha (231). However, the range of scores between the 25th and 75th percentiles are very different: Bihar (70), Chhattisgarh (60), Mizoram (55) and Odisha (71). This indicates that while the average achievement is very similar in the states, Odisha has a more heterogeneous group of Class VIII students than Mizoram.

Further, the 50th percentile scores of the students of Kerala (282) are far better than 75th percentile scores of Andaman & Nicobar Islands (275), Andhra Pradesh (273), Arunachal Pradesh (263), Bihar (275), Chhattisgarh (274), Dadra & Nagar Haveli (275), Delhi (280), Goa (281), Gujarat (276), Jammu & Kashmir (229), Jharkhand (275), Karnataka (273), Madhya Pradesh (279), Manipur (269), Meghalaya (258), Mizoram (272), Nagaland (272), Odisha (279), Rajasthan (272), Sikkim (271) Tamil Nadu (276) and Tripura (272).

4.3 How did Various Groups Perform in Reading Comprehension?

The table below compares the average performance of different groups based on gender, school location and social category.

4.3.1 Are there any Gender-Related Differences in Reading Comprehension?

Table 4.3 compares the average Reading Comprehension scores achieved by boys and girls and shows that, the overall performance by girls was significantly better than boys. This trend may be observed in states/UTs like Chandigarh, Daman & Diu, Delhi, Goa, Kerala, Puducherry, Punjab and Tripura. However, only in Bihar, boys performed significantly better than the girls. In the remaining states / UTs there was no significant difference in performance of boys and girls.

Table 4.3 | Average Reading Comprehension Scores by Gender for States and UTs

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
A & N Islands	240 (4)	247 (3.6)	●
Andhra Pradesh	242 (1.6)	246 (1.8)	●
Arunachal Pradesh	234 (2.6)	233 (2.6)	●
Bihar	247 (2.4)	237 (2.7)	↓
Chandigarh	261 (2)	268 (1.9)	↑
Chhattisgarh	247 (3.3)	243 (2.9)	●
Dadra & Nagar Haveli	247 (3.4)	248 (4.8)	●
Daman & Diu	266 (4.3)	278 (2.2)	↑
Delhi	241 (2.6)	255 (2.3)	↑
Goa	253 (2.2)	263 (2.5)	↑
Gujarat	244 (2.5)	250 (2.5)	●
Haryana	247 (3.7)	252 (2)	●
Himachal Pradesh	260 (10.2)	257 (5.5)	●
Jammu & Kashmir	217 (2.8)	217 (2)	●
Jharkhand	246 (3.7)	238 (2.2)	●
Karnataka	242 (1.7)	247 (1.8)	●
Kerala	263 (2.2)	288 (1.8)	↑
Madhya Pradesh	246 (2.3)	246 (2.1)	●
Maharashtra	264 (6.1)	270 (2.6)	●
Manipur	239 (2.9)	239 (2.6)	●
Meghalaya	229 (3.3)	229 (3.3)	●
Mizoram	243 (5.2)	245 (3.6)	●

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
Nagaland	247 (4.5)	244 (4.2)	●
Odisha	246 (2.5)	245 (2.5)	●
Puducherry	227 (2)	238 (2.6)	↑
Punjab	254 (2)	265 (2.6)	↑
Rajasthan	240 (2.5)	242 (2.7)	●
Sikkim	249 (1.9)	247 (1.9)	●
Tamil Nadu	237 (2)	246 (2)	↑
Tripura	238 (2.6)	241 (2.6)	●
Uttar Pradesh	246 (2.9)	248 (4)	●
Uttarakhand	251 (2.3)	249 (2.2)	●
West Bengal	261 (2)	256 (2.6)	●
Overall	**246 (0.6)**	**249 (0.5)**	↑

● No significant difference between the average performance of girls and boys.
↑ Girls' average performance is significantly greater than that of boys.
↓ Boys' average performance is significantly greater than that of girls.

4.3.2 Are there any Differences in Reading Comprehension Achievement Related to School Location?

Table 4.4 below compares the average Reading Comprehension scores achieved by students in rural and urban schools. Analysis results depict that the overall students in urban schools did better than rural cohorts besides Delhi, where the rural students' average performance was significantly better than students of urban schools. In the remaining states/UTs either the urban students did better than rural students or there is no difference in performance of urban and rural students.

Table 4.4 | Average Reading Comprehension Scores by Location for States and UTs

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
A & N Islands	244 (4)	243 (5)	●
Andhra Pradesh	244 (1.5)	243 (2.6)	●
Arunachal Pradesh	231 (2.6)	243 (6.5)	●
Bihar	241 (2.2)	252 (4.6)	↓
Chandigarh	270 (5.2)	262 (1.9)	●
Chhattisgarh	246 (2.7)	239 (4.9)	●
Dadra & Nagar Haveli	246 (3.7)	262 (11.5)	●
Daman & Diu	272 (3.1)	278 (11.9)	●
Delhi	262 (5.3)	246 (1.9)	↑
Goa	253 (2.4)	267 (3.9)	↓
Gujarat	239 (2)	263 (3)	↓
Haryana	250 (2.6)	253 (4.8)	●
Himachal Pradesh	259 (8.3)	252 (5.1)	●
Jammu & Kashmir	217 (2.2)	213 (3)	●
Jharkhand	240 (2.6)	253 (5)	↓
Karnataka	246 (1.7)	241 (2.8)	●
Kerala	278 (1.8)	275 (5.1)	●
Madhya Pradesh	245 (2.4)	252 (4.4)	●
Maharashtra	259 (4.4)	276 (4.5)	↓
Manipur	238 (3.3)	240 (2.8)	●
Meghalaya	226 (4.3)	235 (3.9)	●

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
Mizoram	244 (4.3)	244 (4.9)	●
Nagaland	247 (4.8)	239 (7.5)	●
Odisha	244 (2.2)	252 (6.9)	●
Puducherry	230 (2.5)	236 (2.8)	●
Punjab	262 (1.8)	253 (4.1)	●
Rajasthan	239 (2.3)	255 (5.1)	↓
Sikkim	248 (1.7)	243 (5.2)	●
Tamil Nadu	238 (2)	247 (3)	↓
Tripura	235 (2.4)	259 (5.4)	↓
Uttar Pradesh	247 (2.8)	250 (17)	●
Uttarakhand	248 (1.7)	264 (4.2)	↓
West Bengal	255 (2)	275 (4.4)	↓
Overall	**247(0.6)**	**252(1)**	↓

● No significant difference between the average performance of rural and urban students.
↑ Rural students' average performance is significantly higher than that of urban students.
↓ Rural students' average performance is significantly lower than that of urban students.

4.3.3 Are there any Differences in Reading Comprehension Achievement Related to Social Category?

Table 4.5 below compares the average Reading Comprehension scores achieved by students in different social categories and shows that significant difference was detected in the average achievement levels of students in the SC, ST and OBC categories. Students classified as being in the OBC category group significantly outperformed those in the SC and ST group, while there was no significant difference between SC and ST category students. On an average, students in the General category achieved significantly higher scores than those in other categories.

Table 4.5 | Average Reading Comprehension Scores for Groups by Social Category

Category	Average (SE)	SC	ST	OBC	General
SC	244(1.1)	–	●	↓	↓
ST	243(1.4)	●	–	↓	↓
OBC	249(1.2)	↑	↑	–	↓
General	254(0.8)	↑	↑	↑	–

● The average scores of the two categories being compared are not significantly different.
↑ The average score of the category given in the first column is significantly higher than that of the category with which it is being compared.
↓ The average score of the category given in the first column is significantly lower than that of the category with which it is being compared.

4.4 Conclusion

The average achievement of students in Reading Comprehension varies greatly across the States and UTs of India. There is a highly significant difference between performance in high scoring States/UTs such as Kerala (277), Daman &Diu (273) and Maharashtra (267), and low scoring States such as Jammu & Kashmir (217), Meghalaya (229) and Arunachal Pradesh (234).

Besides this, states also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges; that present relatively homogeneous cohorts in some States/UTs and far more diverse performances amongst the others.

Overall significant differences were detected in the average achievement of girls and boys. Similarly, significant difference was observed between the achievement level of rural and urban students although exceptions were found in a small number of States/UTs.

Also, the survey did find that students from the General Category outperformed their peers in the SC, ST and OBC categories by a statistically significant margin.

Chapter 8 provides more information about what Class VIII students at various levels of achievement know and can do in the domain of Reading Comprehension.

- In Reading Comprehension average score of 33 states/ UTs was 247 with SE of 0.5.
- Kerala students scored highest average score (277) but Jammu & Kashmir Students scored lowest average score (217) in Reading Comprehension.
- The interquartile range (i.e., the range between 75th and 25th percentile) is highly variable across the states. It was highest in case of Kerala (88) and lowest in Jammu & Kashmir (36).
- The 50th percentile score of Kerala (282) was far better than 75th percentile scores of 21 out of 33 states/ UTs.
- Overall, girls performed significantly better than boys.
- Performance of urban students is significantly higher than rural students.
- General category students outperformed than students of other social groups.

CHAPTER - 5

Students' Achievement in Mathematics

This chapter summarises the student's achievement in Mathematics under the National Achievement Survey (NAS). The overall achievement for each of the participating states and union territories is reported here, along with the other information on differences in achievement by gender, school location and social category of students.

5.1 How did the States and Union Territories Perform in Mathematics?

Table 5.1 shows the distribution of achievement of students for the 33 participating States and UTs. States are listed in alphabetical order in each of the tables given below.

The tables show the average achievement score of the state on a scale from 0 to 500 with an SD of 50. The 'standard error' is given for each average score, to indicate the degree of imprecision arising from the sampling process. Finally, these tables also indicate whether average achievement score of the state is significantly different from the overall average achievement score of all 33 States/UTs participating in the survey or not.

Table 5.1 | Average Achievement Scores in Mathematics for States and Union Territories

State or Union Territory	Average Score	Standard Error	Significant Difference
A & N Islands	247	4.1	●
Andhra Pradesh	232	1.6	↓
Arunachal Pradesh	232	1.9	↓
Bihar	261	3.2	↑
Chandigarh	241	1.9	↓
Chhattisgarh	238	2.5	↓
Dadra & Nagar Haveli	258	5.0	↑
Daman & Diu	260	6.6	↑
Delhi	228	1.3	↓
Goa	239	1.6	↓
Gujarat	231	2.0	↓
Haryana	246	3.4	●
Himachal Pradesh	248	10.4	●
Haryana	246	3.4	●
Himachal Pradesh	248	10.4	●
Jammu & Kashmir	256	4.5	↑
Jharkhand	260	3.9	↑

State or Union Territory	Average Score	Standard Error	Significant Difference
Karnataka	243	2.0	●
Kerala	236	0.9	↓
Madhya Pradesh	267	3.3	↑
Maharashtra	242	2.6	●
Manipur	260	3.4	↑
Meghalaya	227	2.8	↓
Mizoram	249	2.6	●
Nagaland	238	4.5	●
Odisha	243	2.5	●
Puducherry	227	1.7	↓
Punjab	251	3.0	●
Rajasthan	247	3.2	●
Sikkim	231	1.6	↓
Tamil Nadu	229	1.8	↓
Tripura	264	3.5	↑
Uttar Pradesh	278	3.5	↑
Uttarakhand	239	2.0	↓
West Bengal	250	2.3	●
Overall	**245**	**0.6**	

● The average achievement score of the state is not significantly different to that of the overall achievement score.

↑ The average achievement score of the state is significantly above that of the overall achievement score.

↓ The average achievement score of the state is significantly below that of the overall achievement score.

Table 5.1 indicates that the average achievement score for 33 States and UTs was 245 (with a standard error of 0.6). Further, the results reveal substantial differences in Mathematics achievement between the highest performing state (278 for UP) and the lowest performing state (227 for Meghalaya and Puducherry). Also, while nine states/UTs showed average achievement scores significantly above that of the group; thirteen states/UTs depicted average achievement scores significantly below that of the overall average and eleven states/UTs presented average achievement scores that were not significantly different from that of the overall.

The participant group included ten states/UTs in which the language of assessment was Hindi and a wide range of performance was seen amongst them. At a time when, Uttar Pradesh displayed the highest average level of achievement (278), Uttarakhand showed the lowest level (239). The performance levels of the other states in the Hindi group as well fell between these extremes.

5.2 Percentile Scores in Mathematics for States and Union Territories

Table 5.2 given below, illustrates the range of achievement in mathematics within and across states with scores achieved by students at key percentiles. For example, the score at the 25th percentile is the score which 75% of students achieve or surpass: the score at the 90th percentile is the score that only 10% of students achieve or surpass.

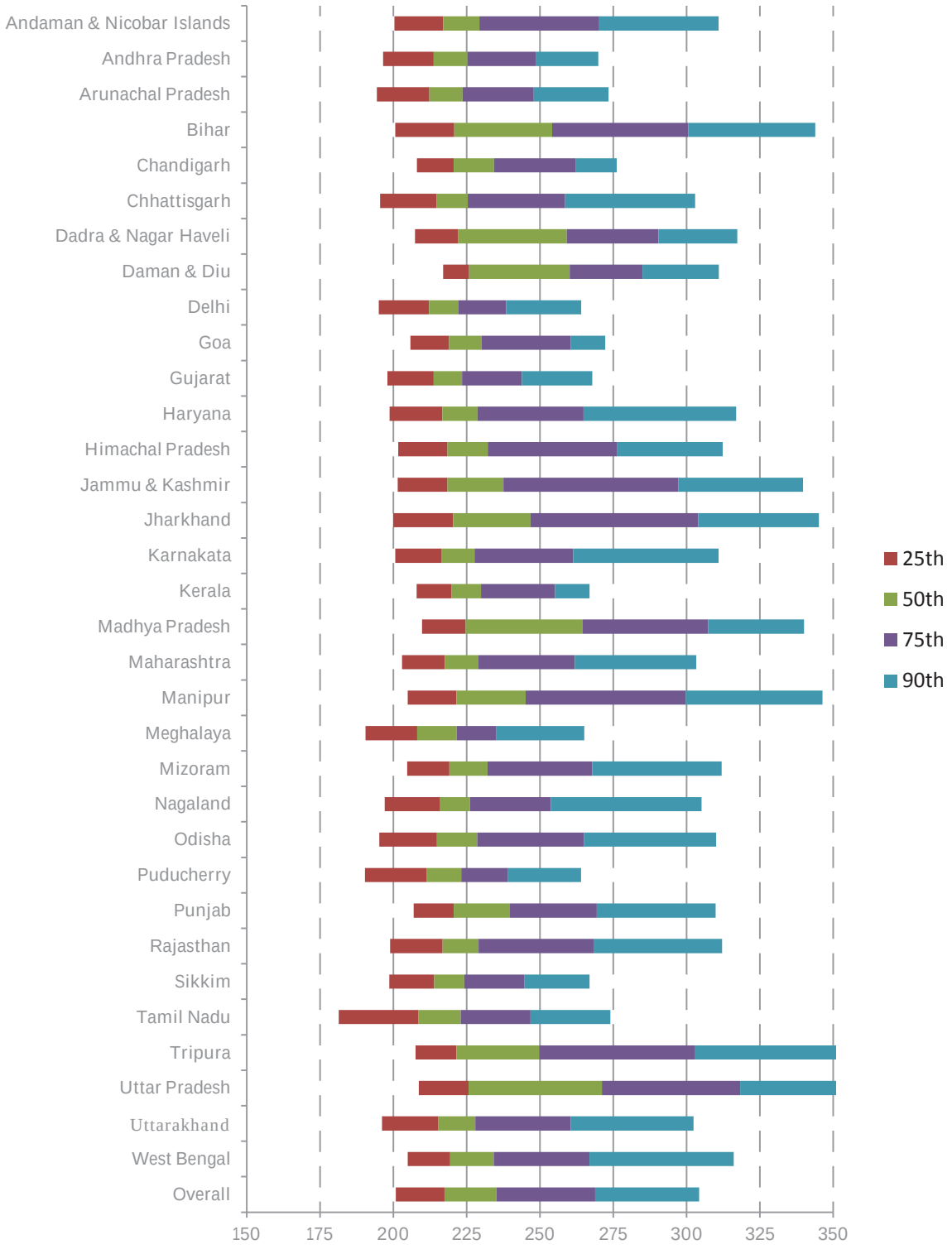
The range between the 75th and 25th percentiles (the inter-quartile range) represents the performance range of the middle 50% of students. Hence, this is a good indicator of degree of homogeneity in the state in terms of achievement in Mathematics of students in the state.

Table 5.2 | Percentile Scores in Mathematics for States and Union Territories

State or Union Territory	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	Range 75-25	Range 90-10
A & N Islands	200	217	229	270	311	53	111
Andhra Pradesh	196	214	225	249	270	35	73
Arunachal Pradesh	194	212	224	248	273	36	79
Bihar	201	221	254	301	344	80	143
Chandigarh	208	221	234	262	276	42	68
Chhattisgarh	196	215	225	259	303	44	107
Dadra & Nagar Haveli	207	222	259	290	317	68	110
Daman&Diu	217	226	260	285	311	59	94
Delhi	195	212	222	238	264	26	69
Goa	206	219	230	260	272	41	66
Gujarat	198	214	223	244	268	30	70
Haryana	199	217	229	265	317	48	118
Himachal Pradesh	202	218	232	276	312	58	111
Jammu & Kashmir	201	218	238	297	340	79	138
Jharkhand	200	220	247	304	345	84	145
Karnataka	201	216	228	261	311	45	110
Kerala	208	220	230	255	267	35	59
Madhya Pradesh	210	225	265	307	340	83	130
Maharashtra	203	218	229	262	303	44	100
Manipur	205	221	245	300	346	78	141
Meghalaya	191	208	222	235	265	27	75
Mizoram	205	219	232	268	312	49	107
Nagaland	197	216	226	254	305	38	108
Odisha	195	215	229	265	310	50	115
Puducherry	190	211	223	239	264	28	74
Punjab	207	221	240	269	310	49	103
Rajasthan	199	217	229	268	312	51	113
Sikkim	199	214	224	245	267	31	68
Tamil Nadu	181	209	223	247	274	38	93
Tripura	208	222	250	303	353	81	145
Uttar Pradesh	209	226	271	318	359	93	150
Uttarakhand	196	215	228	261	302	45	106
West Bengal	205	219	234	267	316	48	111
Overall	**201**	**217**	**235**	**269**	**304**	**51**	**103**

Note : Ranges may not agree due to rounding.

Figure 5.1 | Percentile scores in Mathematics for States and Union Territories



The inter-quartile range (i.e. the range between the 75th and 25th percentiles) is highly variable between states/UTs. For example, Delhi has an inter-quartile range of just 26 while Uttar Pradesh has a corresponding value of 93. These values suggest that the Class VIII population in Delhi is far more homogeneous than that of Uttar Pradesh. In almost 15 states, the range of performance for the middle group was between 40 and 60 scale-score points. Further, the performance at the 10th and 90th percentiles respectively show extremes in low and high achievement. The range between these two points, which includes 90 percent of the population, is highly variable ranging from 59 (Kerala) to 150 (Uttar Pradesh).

The percentiles provide additional information while comparing performance in Mathematics amongst states. For example, when the states are arranged in order of average scores, the differences between adjacent states tend to be small. However, the range of scores may not be similar. For example, there is no significant difference between the median score of the A & N Islands, Haryana, Maharashtra, Odisha and Rajasthan (229). However, the range of scores between the 25th and 75th percentiles are very different: A & N Islands (53), Haryana (48), Maharashtra (44), Odisha (50) and Rajasthan (51). This indicates that while the average achievement is very similar in the states, A & N Islands have a more heterogeneous group of Class VIII students than Maharashtra.

Further, the 50th percentile scores of the students of Uttar Pradesh (271) are slightly better than 75th percentile scores of Andaman & Nicobar Islands (270), Andhra Pradesh (249), Arunachal Pradesh (248), Chandigarh (262), Chhattisgarh (259), Haryana (265), Delhi (238), Goa (260), Gujarat (244), Kerala (255), Karnataka (261), Maharashtra (262), Meghalaya (235), Mizoram (268), Nagaland (254), Odisha (265), Rajasthan (268), Sikkim (245), Tamil Nadu (247), Puducherry (239), Punjab (269), Uttarakhand (261) and West Bengal (267).

5.3 How did Various Groups Perform in Mathematics?

The table below compares the average performances of different groups in Mathematics based on gender, school location and social category.

5.3.1 Are there any Gender-Related Differences in Mathematics?

Table 5.3 compares the average Mathematics scores achieved by boys and girls and shows that, there was no significant difference in performance of boys and girls in all the states, except in the state of Kerala where girls performed significantly better than boys.

Table 5.3 | Average Mathematics Scores by Gender for States and UTs

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
A & N Islands	247 (4.9)	247 (4.2)	●
Andhra Pradesh	234 (1.8)	231 (2)	●
Arunachal Pradesh	232 (2.4)	233 (1.9)	●
Bihar	263 (3.5)	259 (3.5)	●
Chandigarh	242 (1.9)	240 (2.2)	●
Chhattisgarh	237 (2.2)	239 (3.8)	●
Dadra & Nagar Haveli	256 (4.7)	260 (5.8)	●
Daman & Diu	258 (8)	262 (6.2)	●
Delhi	228 (2.2)	227 (1.4)	●
Goa	238 (1.5)	240 (2)	●
Gujarat	232 (2.3)	230 (1.9)	●
Haryana	248 (4.7)	244 (3.1)	●
Himachal Pradesh	254 (13.2)	242 (7.2)	●
Jammu & Kashmir	254 (4.5)	259 (4.9)	●
Jharkhand	266 (5.1)	255 (3.7)	●
Karnataka	242 (2.5)	244 (2.1)	●
Kerala	234 (1.1)	238 (1.1)	↑
Madhya Pradesh	269 (4.3)	266 (3.3)	●
Maharashtra	243 (3.3)	241 (2.7)	●
Manipur	260 (3.8)	261 (4.2)	●
Meghalaya	227 (3.2)	227 (2.9)	●

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
Mizoram	245 (2.9)	252 (3.2)	●
Nagaland	237 (4.4)	238 (5)	●
Odisha	246 (2.4)	240 (3.4)	●
Puducherry	225 (1.6)	228 (2.4)	●
Punjab	251 (3.1)	251 (3.4)	●
Rajasthan	246 (3.9)	248 (3.6)	●
Sikkim	234 (1.9)	229 (1.6)	●
Tamil Nadu	227 (2)	232 (2.3)	●
Tripura	261 (3.7)	267 (4)	●
Uttar Pradesh	278 (3.6)	279 (4.2)	●
Uttarakhand	240 (2.1)	238 (2.5)	●
West Bengal	252 (2.9)	248 (2.5)	●
Overall	**246 (0.7)**	**245 (0.6)**	●

● No significant difference between the average performance of girls and boys.

↑ Girls' average performance is significantly greater than that of boys.

5.3.2 Are there any Differences in Mathematics Achievement Related to School Location?

Table 5.4 below compares the average Mathematics scores achieved by students in rural and urban schools. Analysis results depict that the overall students in rural schools did better than urban cohorts. Justifying this point, observations reveal that in the states/UTs of A & N Islands, Chhattisgarh, Delhi, Haryana, Jharkhand, Karnataka, Rajasthan and Sikkim, the rural students' average performance was significantly better than students of urban schools. However, in case of Gujarat urban schools did better than rural cohorts, while in the remaining states/UTs no significant difference in performance in Mathematics of urban or rural students was seen.

Table 5.4 | Average Mathematics Scores by Location for States and UTs

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
A & N Islands	250 (5)	231 (3.4)	↑
Andhra Pradesh	233 (1.7)	231 (4.3)	●
Arunachal Pradesh	233 (2.3)	231 (2.9)	●
Bihar	260 (3.4)	269 (8.5)	●
Chandigarh	240 (3.4)	241 (2.1)	●
Chhattisgarh	241 (3)	222 (2.8)	↑
Dadra & Nagar Haveli	258 (5.4)	255 (15.6)	●
Daman & Diu	262 (7.9)	251 (26.6)	●
Delhi	239 (5.7)	226 (1.3)	↑
Goa	236 (1.7)	244 (3.4)	●
Gujarat	229 (2.6)	236 (1.7)	↓
Haryana	248 (3.8)	230 (4.1)	↑
Himachal Pradesh	250 (11)	227 (4.3)	●
Jammu & Kashmir	256 (4.7)	254 (12.8)	●
Jharkhand	264 (4.4)	235 (4.1)	↑
Karnataka	247 (3.1)	235 (2.9)	↑
Kerala	236 (1)	238 (2.4)	●
Madhya Pradesh	268 (3.1)	267 (9.8)	●
Maharashtra	241 (3.7)	243 (3.5)	●

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
Manipur	262 (4.4)	258 (5.2)	●
Meghalaya	226 (4.1)	228 (3.7)	●
Mizoram	248 (3.2)	251 (6.4)	●
Nagaland	239 (4.7)	234 (11.5)	●
Odisha	242 (2.9)	246 (5.7)	●
Puducherry	224 (2)	229 (2.6)	●
Punjab	251 (3.7)	250 (5.2)	●
Rajasthan	248 (3.3)	230 (5.2)	↑
Sikkim	232 (1.7)	225 (2.8)	↑
Tamil Nadu	230 (2.3)	228 (2.9)	●
Tripura	266 (4.2)	255 (6.9)	●
Uttar Pradesh	279 (3.4)	275 (14.9)	●
Uttarakhand	240 (2.1)	234 (5.1)	●
West Bengal	250 (2.7)	252 (4.8)	●
Overall	**246(0.7)**	**241(1.4)**	↑

● No significant difference between the average performance of rural and urban students.
↑ Rural students' average performance is significantly higher than that of urban students.
↓ Rural students' average performance is significantly lower than that of urban students.

5.3.3 Are there any Differences in Mathematics Achievement Related to Social Category?

Table 5.5 below compares the average Mathematics scores achieved by students in different social categories and shows that, no significant difference was observed in the average achievement levels of students in the SC and ST categories. Students classified as being in the OBC category and general category groups significantly outperformed those in the SC group.

Table 5.5 | Average Mathematics Scores for Groups by Social Category

Category	Average (SE)	SC	ST	OBC	General
SC	243(1.0)	-	●	↓	↓
ST	245(1.8)	●	-	●	●
OBC	246(1.3)	↑	●	-	●
General	246(1.0)	↑	●	●	-

● The average scores of the two categories being compared are not significantly different.
↑ The average score of the category given in the first column is significantly higher than that of the category with which it is being compared.
↓ The average score of the category given in the first column is significantly lower than that of the category with which it is being compared.

5.4 Conclusion

The average achievement of students in Mathematics varies greatly across the States and UTs of India. There is significant difference between performance in high scoring States/UTs such as Uttar Pradesh (278), Madhya Pradesh (267) and Tripura (264), and low scoring States such as Puducherry (227), Meghalaya (227) and Delhi (228).

Besides this, states also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges. Some States/UTs have relatively homogeneous cohorts whilst others have far more diverse performance.

No significant difference was observed in the average achievement of girls and boys. Similarly, no significant difference was observed between the achievement level of rural and urban students in as many as 24 States/UTs, although exceptions were found in a small number of States/UTs.

Also, the survey did find that students from the General Category and OBC categories outperformed as compared to SC category students by a statistically significant margin.

Chapter 9 provides more information about what Class VIII students at various levels of achievement know and can do in the domain of Mathematics.

- In Mathematics average score of 33 states/ UTs was 245 with SE of 0.6.
- Uttar Pradesh students scored highest average score (278), whereas Meghalaya and Puducherry students scored lowest average score (227) in Mathematics.
- The interquartile range (i.e., the range between 75th and 25th percentile) is highly variable across the states. It was highest in case of Uttar Pradesh (93) and lowest in Delhi (26).
- The 50th percentile score of Uttar Pradesh (278) was far better than 75th percentile scores of 23 out of 33 states/UTs.
- There is no significant difference in the performance of boys and girls as well as students from rural schools than urban schools in general. However, students of General and OBC category outperformed than that of SC category students.

CHAPTER - 6

Students' Achievement in Science

This chapter summarises the achievement of students in Science under the National Achievement Survey (NAS). The overall achievement in science domain for each of the participating states and union territories is reported here, along with the information on differences in achievement by student gender , school location and social category.

6.1 How did the States and Union Territories Perform in Science?

Table 6.1 shows the distribution of students' achievement in science for the 33 participating States and UTs. In each of the tables given below, states are listed in the alphabetical order.

The tables list each state's average achievement score on a scale from 0 to 500 with a SD of 50. The 'standard error' is given for each average score, to indicate the degree of imprecision arising from the sampling process. Finally, these tables also indicate whether a state's average score is significantly different from the overall average of 33 States/ UTs or not.

Table 6.1 | Average Science Scores for States and Union Territories

State or Union Territory	Average Score	Standard Error	Significant Difference
A & N Islands	262	4.9	↑
Andhra Pradesh	237	1.8	↓
Arunachal Pradesh	241	2.4	↓
Bihar	241	3.1	↓
Chandigarh	249	2.3	●
Chhattisgarh	244	2.7	↓
Dadra & Nagar Haveli	277	5.4	↑
Daman & Diu	282	9.6	↑
Delhi	237	1.8	↓
Goa	265	2.2	↑
Gujarat	247	2.1	↓
Haryana	250	3.2	●
Himachal Pradesh	251	4.3	●
Jammu & Kashmir	256	4.4	●
Jharkhand	250	3.2	●
Karnataka	241	2.0	↓

State or Union Territory	Average Score	Standard Error	Significant Difference
Kerala	261	1.4	↑
Madhya Pradesh	258	3.2	●
Maharashtra	249	3.0	●
Manipur	261	3.2	↑
Meghalaya	232	2.6	↓
Mizoram	253	2.6	●
Nagaland	244	4.9	●
Odisha	256	2.4	●
Puducherry	230	1.9	↓
Punjab	250	1.9	●
Rajasthan	248	4.1	●
Sikkim	261	1.9	↑
Tamil Nadu	237	1.8	↓
Tripura	265	3.3	↑
Uttar Pradesh	259	3.6	↑
Uttarakhand	241	2.0	↓
West Bengal	257	2.0	↑
Overall	**251**	**0.6**	

● The state's average score is not significantly different to that of the overall.
↑ The state's average score is significantly above that of the overall.
↓ The state's average score is significantly below that of the overall.

Table 6.1 indicates that the average score for 33 States and UTs was 251 (with a standard error of 0.6). Further, the results reveal substantial differences in Science achievement between the highest performing States/UTs (282 for Daman & Diu) and the lowest performing States/UTs (230 for Puducherry). Also, while ten States/UTs showed average scores significantly above that of the group, eleven states/UTs depicted average scores significantly below that of the overall average and twelve states/UTs presented average scores that were not significantly different from that of the overall.

The participant group was inclusive of ten states/UTs in which the language of assessment was Hindi and a wide range of performance was seen amongst them. Particularly, when Uttar Pradesh had the highest average level of achievement (259), Delhi showed the lowest (237) level. Furthermore, the performance levels of the other states in the Hindi group as well fell between these extremes: Bihar (241); Chhattisgarh (244); Himachal Pradesh (251); Madhya Pradesh (258); Rajasthan (248); Haryana (250); Jharkhand (250); and, Uttarakhand (241).

6.2 Percentile Scores in Science for States and Union Territories

The following table and figure illustrate the range of achievement within and across the states by listing the scores achieved by students at key percentiles. For example, the score at the 25th percentile is the score which 75% of students achieve or surpass, while the score at the 90th percentile is the score that 10% of students achieve or surpass.

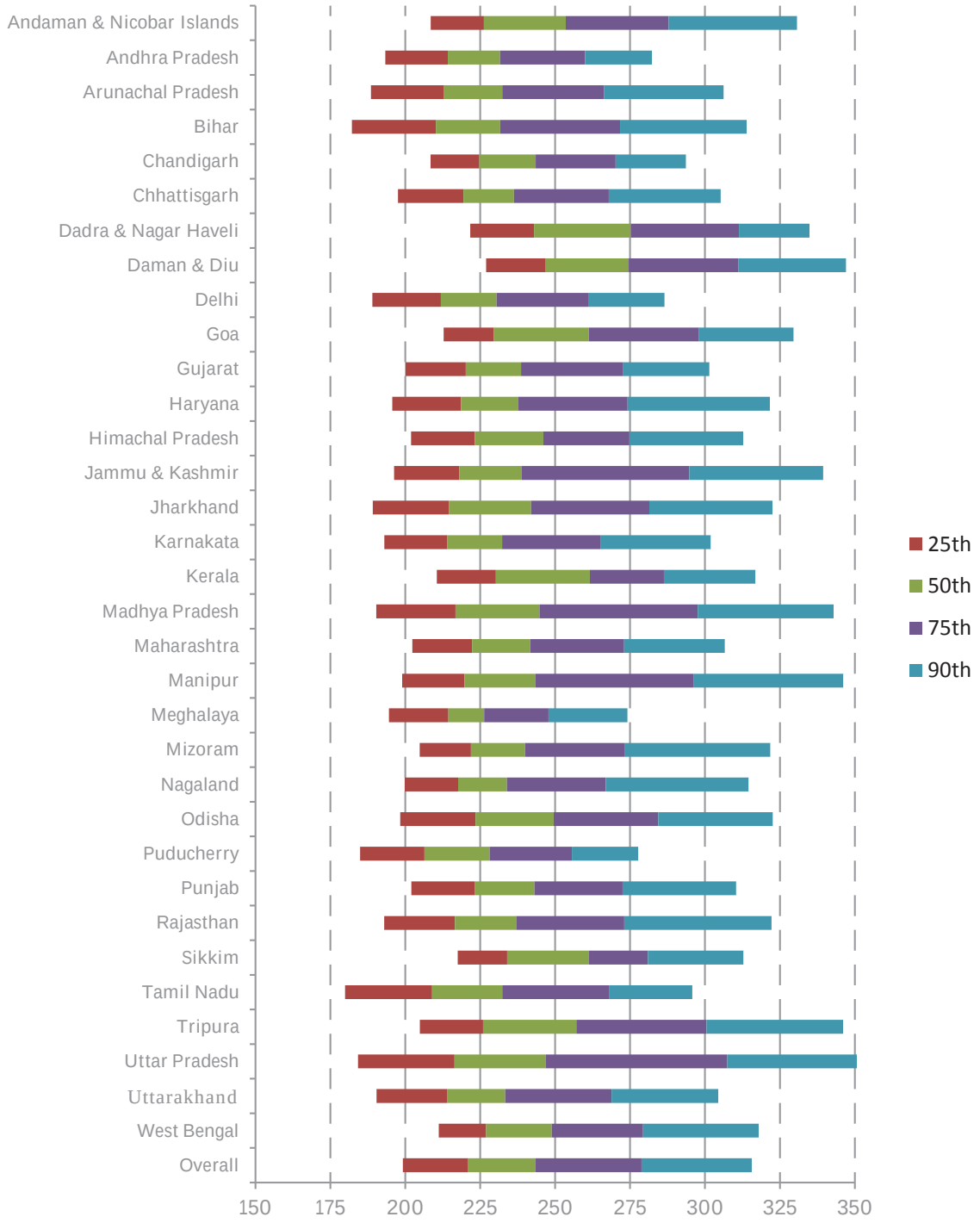
The range between the 25th and 75th percentiles (the inter-quartile range) represents the performance of the middle 50% of students. Hence, this is a good indicator of reflecting the degree of homogeneity in achievement of students across the States/UTs.

Table 6.2 | Percentile Scores in Science for States and Union Territories

State/ Union Territory	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	Range 75-25	Range 9 0-10
A & N Islands	208	226	254	288	331	62	122
Andhra Pradesh	193	214	232	260	282	46	89
Arunachal Pradesh	189	213	232	266	306	54	118
Bihar	182	210	232	272	314	61	132
Chandigarh	208	225	243	270	294	45	85
Chhattisgarh	198	219	236	268	305	49	108
Dadra & Nagar Haveli	222	243	275	311	335	68	113
Daman & Diu	227	247	275	311	347	64	120
Delhi	189	212	230	261	287	49	98
Goa	213	230	261	298	330	68	117
Gujarat	200	220	239	273	301	53	101
Haryana	196	219	238	274	322	56	126
Himachal Pradesh	202	223	246	275	313	52	111
Jammu & Kashmir	196	218	239	295	339	77	143
Jharkhand	189	215	242	281	323	67	133
Karnataka	193	214	232	265	302	51	109
Kerala	211	230	262	286	317	56	106
Madhya Pradesh	190	217	245	298	343	81	153
Maharashtra	202	222	242	273	307	51	104
Manipur	199	220	243	296	346	76	147
Meghalaya	195	214	226	248	274	33	80
Mizoram	205	222	240	273	322	51	117
Nagaland	200	218	234	267	315	49	115
Odisha	198	223	250	284	323	61	124
Puducherry	185	206	228	256	278	49	93
Punjab	202	223	243	272	310	49	108
Rajasthan	193	217	237	273	322	56	129
Sikkim	218	234	261	281	313	47	95
Tamil Nadu	180	209	232	268	296	59	116
Tripura	205	226	257	301	346	75	141
Uttar Pradesh	184	216	247	307	352	91	168
Uttarakhand	190	214	233	269	304	55	114
West Bengal	211	227	249	279	318	52	107
Overall Distribution	**199**	**221**	**243**	**279**	**316**	**58**	**116**

Note: Ranges may not agree due to rounding.

Figure 6.1 | Percentile Scores in Science for States and Union Territories



It is obvious from figure 6.1 that the inter-quartile range (i.e. the range between the 75th and 25th percentiles) between States/UTs is highly variable. For example, Meghalaya has an inter-quartile range of just 33 while Uttar Pradesh has a corresponding value of 91. These values suggest that the Class VIII population in Meghalaya is far more homogeneous in science achievement than in Uttar Pradesh. In most states, the range of performance for the middle group was between 49 and 68 scale-score points. Further, the performance at the 10th and 90th percentiles respectively show extremes in low and high achievement. The range between these two points, which includes 90 percent of the population, is highly varied ranging from 80 (Meghalaya) to 168 (Uttar Pradesh).

The percentiles provide additional information when comparing Science performance amongst states. For example, when the states are arranged in order of average score, the differences between adjacent states tend to be small. However, the range of scores may not be similar. For example, there is no significant difference among the median

score of Andhra Pradesh, Arunachal Pradesh, Bihar, Karnataka, and Tamil Nadu (232). However, the range of scores between the 25th and 75th percentiles are very different: Andhra Pradesh (46), Arunachal Pradesh (54), Bihar (61), Karnataka (51) and Tamil Nadu (59). This indicates that while the average achievement is very similar in the states, Bihar has a more heterogeneous group of Class VIII students than the state of Andhra Pradesh.

Further, the 50th percentile scores of Dadra & Nagar Haveli and Daman & Diu (275) students are far better than the 75th percentile scores of Andhra Pradesh (260), Arunachal Pradesh (266), Bihar (272), Chandigarh (270), Chhattisgarh (268), Delhi (261), Gujarat (273), Haryana (274), Karnataka (265), Maharashtra (273), Meghalaya (248), Mizoram (273), Nagaland (267), Puducherry (256), Punjab (272), Rajasthan (273), Tamil Nadu (268) and Uttarakhand (269).

6.3 How did Various Groups Perform in Science?

The table below compares the average performances of different groups in Science based on gender, school location, and social category.

6.3.1 Are there any Gender-Related Differences in Science?

Table 6.3 compares the average Science scores achieved by boys and girls and shows that, overall, boys and girls performed more or less same in science with no significant difference in achievement scores between both the groups. However, it is observed that girls performed significantly better than boys in Kerala and boys performed significantly better than girls in West Bengal. In the remaining States / UTs there was no significant difference in performance of boys and girls.

Table 6.3 | Average Science Scores by Gender for States and UTs

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
A & N Islands	260 (5.4)	264 (5.1)	●
Andhra Pradesh	236 (1.9)	238 (2.4)	●
Arunachal Pradesh	244 (3.1)	239 (2.5)	●
Bihar	243 (3.3)	240 (3.6)	●
Chandigarh	249 (2.6)	249 (2.1)	●
Chhattisgarh	243 (3.1)	246 (3.6)	●
Dadra & Nagar Haveli	278 (6)	275 (5.9)	●
Daman & Diu	283 (9.3)	281 (10.4)	●
Delhi	235 (2.4)	239 (2.5)	●
Goa	262 (2.4)	269 (2.6)	●
Gujarat	248 (2.2)	246 (3.3)	●
Haryana	250 (4.1)	250 (3.3)	●
Himachal Pradesh	254 (6.1)	247 (2.6)	●
Jammu & Kashmir	252 (5.1)	260 (4.6)	●
Jharkhand	253 (4.5)	248 (3.2)	●
Karnataka	242 (2.3)	240 (2.3)	●
Kerala	257 (1.9)	263 (1.5)	↑
Madhya Pradesh	258 (4.3)	257 (3.4)	●
Maharashtra	253 (4.1)	245 (2.4)	●
Manipur	260 (3.4)	261 (4.2)	●
Meghalaya	231 (4.2)	233 (2.4)	●
Mizoram	253 (2.8)	252 (3.4)	●
Nagaland	246 (5.3)	243 (5.7)	●
Odisha	260 (3.1)	252 (2.8)	●

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
Puducherry	227 (2.2)	233 (2.4)	●
Punjab	250 (2.2)	251 (2.3)	●
Rajasthan	248 (4.1)	248 (4.7)	●
Sikkim	262 (1.7)	261 (2.4)	●
Tamil Nadu	236 (2.1)	239 (2.2)	●
Tripura	268 (3.6)	263 (3.6)	●
Uttar Pradesh	258 (4.1)	259 (4.2)	●
Uttarakhand	243 (2.4)	239 (2.3)	●
West Bengal	262 (2.6)	252 (2.2)	↓
Overall	**252(0.7)**	**251(0.7)**	●

● No significant difference between the average performance of girls and boys.
↑ Girls' average performance is significantly greater than that of boys.
↓ Boys' average performance is significantly greater than that of girls.

6.3.2 Are there any Differences in Science Achievement Related to School Location?

Table 6.4 below compares the average Science scores achieved by students in rural and urban schools and the results depict that, the overall students in rural schools did better than urban cohorts. Urban school students' average performance in Goa, Gujarat, Puducherry and West Bengal was significantly better than students of rural schools, whereas in the remaining states/UTs either the rural students did better than urban students or there was no difference in performance of rural or urban students.

Table 6.4 | Average Science Scores by Location for States and UTs

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
A & N Islands	265 (5.8)	245 (3.9)	↑
Andhra Pradesh	237 (2)	237 (3.4)	●
Arunachal Pradesh	241 (3)	243 (6.1)	●
Bihar	241 (3.3)	244 (5.6)	●
Chandigarh	252 (5)	248 (2.5)	●
Chhattisgarh	246 (3.1)	235 (3.1)	↑
Dadra & Nagar Haveli	278 (6)	269 (12.3)	●
Daman & Diu	287 (10)	258 (2.6)	↑
Delhi	248 (4.7)	236 (1.9)	↑
Goa	261 (2.4)	275 (4.3)	↓
Gujarat	243 (2.4)	255 (2.6)	↓
Haryana	253 (3.7)	235 (2.7)	↑
Himachal Pradesh	252 (4.4)	234 (7.9)	↑
Jammu & Kashmir	256 (4.6)	250 (8.2)	●
Jharkhand	252 (3.6)	238 (4.3)	↑
Karnataka	246 (2.7)	232 (2.7)	↑
Kerala	261 (1.6)	258 (3.3)	●
Madhya Pradesh	259 (3.5)	252 (9)	●
Maharashtra	247 (3.2)	252 (4.7)	●
Manipur	259 (4.2)	264 (5.2)	●
Meghalaya	229 (3.8)	238 (2.7)	●

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
Mizoram	252 (3.1)	254 (5.5)	●
Nagaland	248 (5.4)	232 (9.7)	●
Odisha	254 (2.4)	264 (7.8)	●
Puducherry	226 (2.6)	234 (2.4)	↓
Punjab	251 (2.1)	249 (5.3)	●
Rajasthan	248 (4.3)	246 (6.2)	●
Sikkim	262 (1.9)	259 (8.4)	●
Tamil Nadu	236 (2.3)	239 (2.9)	●
Tripura	262 (3.9)	278 (7.2)	●
Uttar Pradesh	259 (3.6)	254 (15.4)	●
Uttarakhand	242 (2.2)	238 (4.6)	●
West Bengal	255 (2.4)	263 (3.2)	↓
Overall	**252 (0.7)**	**249 (1.1)**	↑

● No significant difference between the average performance of rural and urban students.
↑ Rural students' average performance is significantly higher than that of urban students.
↓ Rural students' average performance is significantly lower than that of urban students.

6.3.3 Are there any Differences in Science Achievement Related to Social Category?

Table 6.5 below compares the average Science scores achieved by students in different social categories and shows that, there was no significant difference in the average achievement of students of SC and ST, OBC and general and SC and OBC categories. Students classified as being in the OBC category group significantly outperformed those in the ST group, while on an average, students in the General category achieved significantly higher scores than those in other categories.

Table 6.5 | Average Science Scores for Groups by Social Category

Category	Average (SE)	SC	ST	OBC	General
SC	250(1.3)	-	●	↓	●
ST	248(1.3)	●	-	↓	↓
OBC	252(1.6)	●	↑	-	●
General	254(0.9)	↑	↑	●	-

● The average scores of the two categories being compared are not significantly different.
↑ The average score of the category given in the first column is significantly higher than that of the category with which it is being compared.
↓ The average score of the category given in the first column is significantly lower than that of the category with which it is being compared.

6.4 Conclusion

The average achievement of students in Science varies greatly across the States and UTs of India. There is a highly significant difference between performance in high scoring States/UTs such as Daman &Diu (282) and Dadra & Nagar Haveli (277), and low scoring States/UTs such as Puducherry (230), Meghalaya (232), Andhra Pradesh (237), Delhi (237) and Tamil Nadu (237).

Besides this, states also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges; that present relatively homogeneous cohorts in some States/UTs and far more diverse performance amongst the others.

Overall no significant difference was observed in the average achievement of girls and boys. But, significant difference was detected between the achievement level of rural and urban students, although exceptions were found in a few States/UTs.

Also, the survey did find that students from the General Category outperformed their peers in the SC, ST and OBC categories by a statistically significant margin.

The chapter 10 provides more information about what Class VIII students at various levels of achievement know and can do in the domain of Science.

- In Science average score of 33 states/ UTs was 251 with SE of 0.6.
- Daman & Diu students scored highest average score (282) whilst Puducherry Students scored lowest average score (230) in Science.
- The interquartile range (i.e., the range between 75th and 25th percentile) highly varied across the States/ UTs. It was highest in case of Uttar Pradesh (91) and lowest in Meghalaya (33).
- The 50th percentile score of Dadra & Nagar Haveli and Daman & Diu (275) was far better than 75th percentile scores of 19 out of 33 states/UTs.
- Overall, no significant difference was found on the basis of gender in Science.
- Performance of rural students is significantly higher than urban students in Science.
- On average, students of general category secured significantly higher scores than those of other categories.

CHAPTER - 7

Students' Achievement in Social Science

This chapter summarises the achievement of students in Social Science under the National Achievement Survey (NAS). The overall achievement in the Social Science domain is reported for each of the participating states and union territories. In addition, information about differences in achievement by student gender, school location and social category is also provided.

7.1 How did the States and Union Territories Perform in Social Science?

Table 7.1 shows the distribution of the students' achievement for the 33 participating States and UTs. In each of the tables given below, states are listed in alphabetical order.

The table lists each of the state's average achievement score on a scale from 0 to 500 with a SD of 50. For each score, the 'standard error' is given to indicate the degree of imprecision arising from the sampling process. Finally, the tables also indicate whether a state's average score is significantly different from the overall average of 33 States/ UTs or not.

Table 7.1 | Average Social Science Scores for States and Union Territories

State or Union Territory	Average Score	Standard Error	Significant Difference
A & N Islands	251	4.2	●
Andhra Pradesh	232	1.3	↓
Arunachal Pradesh	239	2.6	↓
Bihar	250	3.9	●
Chandigarh	249	1.8	●
Chhattisgarh	247	1.9	●
Dadra & Nagar Haveli	263	7.4	↑
Daman & Diu	278	11.0	↑
Delhi	237	1.7	↓
Goa	254	2.0	↑
Gujarat	239	1.8	↓
Haryana	248	3.1	●
Himachal Pradesh	247	4.3	●
Jammu & Kashmir	239	4.1	↓
Jharkhand	255	4.2	●
Karnataka	248	2.0	●

State or Union Territory	Average Score	Standard Error	Significant Difference
Kerala	257	1.3	↑
Madhya Pradesh	265	3.1	↑
Maharashtra	249	2.9	●
Manipur	242	3.0	●
Meghalaya	226	3.1	↓
Mizoram	238	2.5	↓
Nagaland	242	4.5	●
Odisha	234	2.1	↓
Puducherry	222	2.0	↓
Punjab	257	2.0	↑
Rajasthan	255	3.9	↑
Sikkim	250	2.1	●
Tamil Nadu	228	1.6	↓
Tripura	258	3.1	↑
Uttar Pradesh	267	3.2	↑
Uttarakhand	243	2.0	↓
West Bengal	248	2.1	●
Overall	**247**	**0.6**	

● The state's average score is not significantly different to that of the overall.
↑ The state's average score is significantly above that of the overall.
↓ The state's average score is significantly below that of the overall.

Table 7.1 indicates that the average score for 33 States and UTs was 247 (with a standard error of 0.6). Further, the results reveal substantial differences in Social Science achievement between the highest performing States/UTs (278 for Daman & Diu followed by Uttar Pradesh 267) and the lowest performing States/UTs (222 for Puducherry followed by Meghalaya 226). Also, while nine states/UTs showed average scores significantly above that of the group; eleven states/UTs depicted average scores significantly below that of the overall average and thirteen states/UTs presented average scores that were not significantly different from that of the overall.

7.2 Percentile Scores in Social Science for States and Union Territories

The following table and figure illustrate the range of achievement within and across the states. The table lists the scores achieved by students at key percentiles. For example, the score at the 25th percentile is the score which 75% of students achieve or surpass, whereas the score at the 90th percentile is the score that 10% of students achieve or surpass.

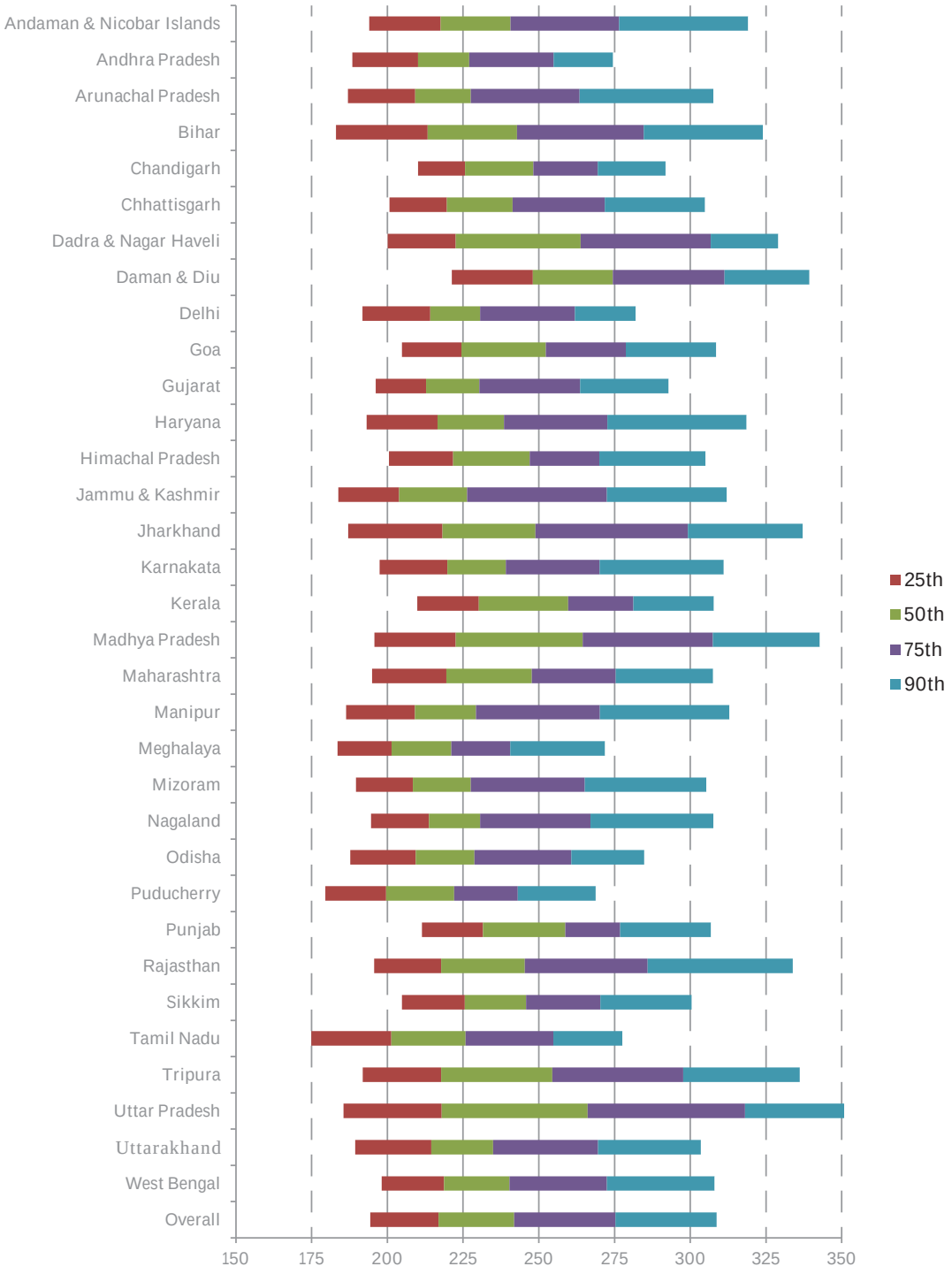
The range between the 25th and 75th percentiles (the inter-quartile range) represents the performance of the middle 50% of students. Hence, this is a good indicator of the state's degree of homogeneity in terms of the Social Science achievement of its students.

Table 7.2 | Percentile Scores in Social Science for States and Union Territories

State or Union Territory	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	Range 75-25	Range 90-10
A & N Islands	194	218	241	276	319	59	125
Andhra Pradesh	188	210	227	255	275	45	86
Arunachal Pradesh	187	209	228	263	308	54	121
Bihar	183	213	243	285	324	71	141
Chandigarh	210	226	248	269	292	44	82
Chhattisgarh	201	220	241	272	305	52	104
Dadra & Nagar Haveli	200	223	264	307	329	84	129
Daman & Diu	221	248	274	311	339	63	118
Delhi	192	214	231	262	282	48	90
Goa	205	224	252	279	309	54	104
Gujarat	196	213	230	264	293	51	97
Haryana	193	217	239	273	319	56	125
Himachal Pradesh	201	222	247	270	305	48	105
Jammu & Kashmir	184	204	226	272	312	69	128
Jharkhand	187	218	249	299	337	81	150
Karnataka	197	220	239	270	311	50	114
Kerala	210	230	260	281	308	51	98
Madhya Pradesh	196	223	265	307	343	85	147
Maharashtra	195	220	248	275	308	56	113
Manipur	186	209	229	270	313	61	127
Meghalaya	184	201	221	241	272	39	88
Mizoram	190	208	228	265	305	57	116
Nagaland	195	214	231	267	308	53	113
Odisha	188	209	229	261	285	51	97
Puducherry	180	200	222	243	269	44	89
Punjab	211	232	259	277	307	45	95
Rajasthan	196	218	245	286	334	68	138
Sikkim	205	226	246	270	300	45	96
Tamil Nadu	175	201	226	255	278	53	103
Tripura	192	218	254	298	336	80	144
Uttar Pradesh	185	218	266	318	355	100	170
Uttarakhand	189	215	235	270	304	55	114
West Bengal	198	219	240	272	308	54	110
Overall Distribution	**194**	**217**	**242**	**275**	**309**	**58**	**114**

Note: Ranges may not agree due to rounding.

Figure 7.1 | Percentile Scores in Social Science for States and Union Territories



The inter-quartile range (i.e. the range between the 75th and 25th percentiles) between states/UTs is highly variable. For example, Meghalaya has an inter-quartile range of just 39 while Uttar Pradesh has a corresponding value of 100. These values suggest that the Class VIII population in Meghalaya is far more homogeneous than that of Uttar Pradesh. In most states, the range of performance for the middle group is between 48 and 69 scale-score points. Further, the performance at the 10th and 90th percentiles respectively show extremes in low and high achievement. The range between these two points, which includes 90 percent of the population, is highly variable ranging from 82 (Chandigarh) to 170 (Uttar Pradesh).

The percentiles provide additional information when comparing Social Science performance amongst states. For example, when the states are arranged in order of average score, the differences between adjacent states tend to be small. However, the range of scores may not be similar. For example, there is no significant difference between

the median score of Haryana and Karnataka (239). However, the range of scores between the 25th and 75th percentiles for both the states is very different: Haryana (125) and Karnataka (114). This indicates that while average achievement is very similar in the states, Haryanahas a more heterogeneous group of Class VIII students than the state of Karnataka.

Further, the 50th percentile score of Uttar Pradesh (266) students is far better than the 75th percentile scores of Andhra Pradesh (255), Arunachal Pradesh (263), Delhi (262), Gujarat (264), Meghalaya (241), Mizoram (265), Odisha (261), Puducherry (243) and Tamil Nadu (255).

7.3 How did Various Groups Perform in Social Science?

The tables given below compare the average performances of the different groups based on gender, school location and social category.

7.3.1 Are there any Gender-Related Differences in Social Science?

Table 7.3 compares the average Social Science scores achieved by the boys and girls. It shows that, overall, there is no significant difference in average achievement of boys and girls. Further, a similar trend may be observed in all states/UTs barring Goa, Delhi, Kerala and Puducherry where girls performed significantly better than the boys.

Table 7.3 | Average Social Science Scores by Gender for States and UTs

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
A & N Islands	249 (4.5)	253 (4.9)	●
Andhra Pradesh	234 (2.1)	231 (1.6)	●
Arunachal Pradesh	238 (3.2)	239 (2.8)	●
Bihar	250 (5)	250 (3.6)	●
Chandigarh	248 (2.1)	250 (1.7)	●
Chhattisgarh	247 (1.8)	247 (3.1)	●
Dadra & Nagar Haveli	264 (7.7)	263 (8.1)	●
Daman & Diu	278 (12)	278 (11.4)	●
Delhi	232 (2.5)	242 (2)	↑
Goa	249 (2)	258 (2.4)	↑
Gujarat	237 (2.3)	241 (3)	●
Haryana	248 (3.9)	249 (3)	●
Himachal Pradesh	251 (6.4)	244 (2.4)	●
Jammu & Kashmir	236 (4.3)	243 (4.5)	●
Jharkhand	257 (4.9)	254 (4.3)	●
Karnataka	247 (2.2)	248 (2.4)	●
Kerala	250 (1.7)	263 (1.4)	↑
Madhya Pradesh	267 (3.8)	263 (3.2)	●
Maharashtra	250 (3.8)	249 (2.6)	●
Manipur	243 (3.5)	241 (3.3)	●
Meghalaya	222 (3.7)	228 (3)	●
Mizoram	238 (2.6)	239 (3.3)	●
Nagaland	244 (4.5)	241 (5.4)	●
Odisha	237 (3)	232 (2.1)	●
Puducherry	218 (1.9)	226 (3)	↑
Punjab	256 (2)	258 (2.5)	●
Rajasthan	253 (3.6)	257 (4.8)	●

State or Union Territory	Boys' Average (SE)	Girls' Average (SE)	Significant Difference
Sikkim	251 (2.6)	249 (2.2)	●
Tamil Nadu	225 (1.8)	230 (2.1)	●
Tripura	258 (3.2)	259 (3.7)	●
Uttar Pradesh	273 (4.8)	264 (3.5)	●
Uttarakhand	244 (2.6)	242 (2.4)	●
West Bengal	251 (2.6)	246 (2.4)	●
Overall	**247(0.7)**	**248(0.7)**	●

● No significant difference between the average performance of girls and boys.

↑ Girls' average performance is significantly greater than that of boys.

7.3.2 Are there any Differences in Social Science Achievement Related to School Location?

Table 7.4 below compares the average Social Science scores achieved by students in rural and urban schools. It shows that, overall students in urban schools and rural schools performed similarly without any significant difference in their performance. Only in Gujarat and Puducherry, urban students' average performance was significantly better than students of rural schools. While in Andaman & Nicobar Islands, Chandigarh, Chhattisgarh, Delhi, Haryana, Jharkhand, Karnataka, Madhya Pradesh and Sikkim, rural students outperformed urban students. However, in the remaining States/ UTs, no difference in performance of urban or rural students was found.

Table 7.4 | Average Social Science Scores by Location for States and UTs

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
A & N Islands	253 (4.9)	238 (4.2)	↑
Andhra Pradesh	233 (1.7)	231 (2.8)	●
Arunachal Pradesh	237 (3.1)	244 (5.4)	●
Bihar	249 (4.2)	263 (6.3)	●
Chandigarh	257 (3.7)	247 (1.8)	↑
Chhattisgarh	249 (2.3)	237 (4.6)	↑
Dadra & Nagar Haveli	265 (8.2)	254 (17.3)	●
Daman & Diu	279 (12.2)	275 (26.2)	●
Delhi	251 (5.8)	236 (1.7)	↑
Goa	251 (2.5)	259 (3.3)	●
Gujarat	235 (2.3)	247 (2.7)	↓
Haryana	251 (3.5)	234 (3.6)	↑
Himachal Pradesh	248 (4.5)	236 (4.8)	●
Jammu & Kashmir	239 (4.3)	246 (11)	●
Jharkhand	257 (4.7)	244 (4.4)	↑
Karnataka	251 (2.8)	241 (2.9)	↑
Kerala	258 (1.5)	257 (2.7)	●
Madhya Pradesh	268 (3.5)	251 (6.2)	↑
Maharashtra	247 (3.8)	252 (3.9)	●
Manipur	242 (3.9)	241 (4.3)	●
Meghalaya	223 (4.5)	230 (4.2)	●
Mizoram	239 (3.2)	236 (5.1)	●
Nagaland	244 (5)	239 (9.8)	●
Odisha	233 (2.2)	241 (4.7)	●

State or Union Territory	Rural Average (SE)	Urban Average (SE)	Significant Difference
Puducherry	218 (2.4)	227 (3)	↓
Punjab	258 (2.3)	253 (4.2)	●
Rajasthan	256 (4.1)	250 (7.3)	●
Sikkim	250 (2.2)	241 (3.5)	↑
Tamil Nadu	227 (2.2)	228 (2.4)	●
Tripura	256 (3.5)	267 (7.2)	●
Uttar Pradesh	269 (3.6)	257 (11.1)	●
Uttarakhand	242 (2.2)	248 (5.7)	●
West Bengal	248 (2.5)	248 (2.9)	●
Overall	**248 (0.7)**	**245 (1.3)**	●

● No significant difference between the average performance of rural and urban students.
↑ Rural students' average performance is significantly higher than that of urban students.
↓ Rural students' average performance is significantly lower than that of urban students.

7.3.3 Are there any Differences in Social Science Achievement Related to Social Category?

Table 7.5 below compares the average Social Science scores achieved by students in different social categories. It shows that no significant difference was detected in the average achievement levels of students in the SC and ST categories. Students classified as being in the OBC group significantly outperformed those in the SC and ST group, while on an average, students in the General category achieved significantly higher scores than those in SC and ST categories. No significant difference was seen between students from General and OBC groups.

Table 7.5 | Average Social Science Scores for Groups by Social Category

Category	Average (SE)	SC	ST	OBC	General
SC	245(1.1)	-	●	↓	↓
ST	244(1.1)	●	-	↓	↓
OBC	251(1.1)	↑	↑	-	●
General	251(1.1)	↑	↑	●	-

● The average scores of the two categories being compared are not significantly different.
↑ The average score of the category given in the first column is significantly higher than that of the category with which it is being compared.
↓ The average score of the category given in the first column is significantly lower than that of the category with which it is being compared.

7.4 Conclusion

The average achievement of students in Social Science varies greatly across the States and UTs of India. There is a highly significant difference between performance in high scoring States/UTs such as Daman& Diu (278), Uttar Pradesh (267), Madhya Pradesh (265) and Dadra and Nagar Haveli (263), and low scoring States such as Tamil Nadu (228), Meghalaya (226) Andhra Pradesh (232) and Puducherry (222).

Besides this, states also vary greatly in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges; that present relatively homogeneous cohorts in some states/UTs and far more diverse performance amongst the others.

Overall, no significant differences were detected in the average achievement of girls and boys. Similarly, no significant difference was detected between the achievement level of rural and urban students, although exceptions were found in a small number of States/UTs.

Also, the survey found that students from the General Category outperformed their peers in the SC and ST categories by a statistically significant margin.

Chapter 11 provides more information about what Class VIII students at various levels of achievement know and can do in the domain of Social Science.

- In Social Science average score of 33 states/ UTs was 247 with SE of 0.6.
- Uttar Pradesh (267) was the highest and Meghalaya (226) was the lowest performing state in Social Science.
- The interquartile range (i.e., the range between 75th and 25th percentile) is highly variable across the states. It was highest in case of Uttar Pradesh (100) and lowest in Meghalaya (39).
- The 50th percentile score of Kerala (266) was far better than 75th percentile scores of 9 out of 33 states/ UTs.
- Overall, no significant differences were found on the basis of gender and location of the schools.
- General category students performed significantly better than SC and ST category students.

CHAPTER - 8

Language:

What Students Know and Can Do?

8.1 Overview of the Reading Comprehension Tests

The reading comprehension tests administered to class VIII students consisted of two test booklets, individually containing five reading passages with six multiple-choice items on each passage. The passages were chosen to represent a range of text types including informational passages, tables, public notices, stories etc. Three reading passages were common in both test forms and served as 'anchors', so that both the test booklets could be linked together and hence, all items could be placed on a common scale. In addition to this, each test form contained an extra of two unique passages, thus adding up to a total of five passages and thirty items in each of the reading comprehension tests used in the survey.

The items were designed to test a range of relevant *cognitive processes* or 'reading skills',classified as abilities to: 'locate information', 'grasp ideas and interpret' and 'infer and evaluate' as defined below:

COGNITIVE PROCESSES FOR READING COMPREHENSION

Locate information: In items testing this process, students need to find and extract a specific piece of information explicitly stated in the text. 'Locating' requires students to focus on a specific element of the given piece.

Grasp ideas and interpret: In items testing this process, students need to demonstrate that they have understood an idea being conveyed in the text and have interpreted it correctly. For example, students may need to identify the text's main idea and/or the sequence of events and/or relationships between ideas, events, or characters across the text. In addition, students may need to draw simple conclusions based on their interpretation of the text.

Infer and evaluate: In items testing this process, students need to demonstrate understanding beyond the information and/or ideas stated explicitly in the text. They are asked to read between the lines, for example, make inferences about the qualities or actions of characters. They may be asked to identify the text's underlying theme and/or evaluate its title by examining the text from more than one perspective.

8.2 Item Mapping

After testing the students, their responses to the various tasks were analysed using Item Response Theory. Using the anchor items, the two test forms were then aligned, thereby placing all items on a single reading comprehension scale comprising scores from 0 to 500. On this scale, the mean score was set at 250 with a standard deviation of 50. Calibrating the items according to their levels of difficulty, the items were placed on an 'item map' with the more difficult items at the top and the easiest ones at the bottom. Such item maps provide us with a picture of what students at different levels of ability know and can do.

The item map for reading comprehension is given in table 8.1. The scale score in the first column shows the level of difficulty for each item. This score also represents the score on the ability scale necessary for a student to have 50:50 chance of success on the item. The map also includes a brief description of what students were required to do in order to answer the items correctly, i.e. each item is classified according to the *cognitive process* being evaluated.

A student's scale score gives an indication of the possibility of success on an item, if the item difficulty is known. The higher the scale score, the more likely the student is to be able to answer; the higher the item difficulty, the less likely the student is to be able to answer correctly. Thus, the item with a difficulty of 345 was difficult for this population except for the high ability students, while the item with the difficulty of 240 is likely to be relatively easy on average.

The map shows that Class VIII students demonstrated a wide range of ability in the domain of Reading Comprehension.

Students at the lower end of the scale i.e. those with scale scores in the range of, say, 218 to 250, demonstrated two cognitive processes having clear context and involving non-complex tasks. For example, they were able to use information from a table to locate the industries and the occurrence of a phenomenon, recognize a particular text type and also make simple inferences about the causes of an act described in the text.

Students performing in the intermediate range of the scale (say, 250 to 300) could do more in addition to that described above. They determined the causes, frequency, and sequence of events described in a variety of texts. Furthermore, they also identified the cause and effect relationships, made complex inferences about the qualities of characters from their actions and identified the effect of a given activity on the characters within a text.

Moreover, students performing at the higher end of the scale i.e. those with scale scores above, say, 300 could do even more in addition to that described above. They identified the main theme of a given passage and evaluated the title. They also identified the relationship between a pronoun and the relevant object/person even when this was not immediately obvious. Furthermore, the following table 8.1 of item map suggests that students at this level as well identified the relationships between events, ideas and phenomena and recognized the likely thoughts of characters in the text.

Table 8.1 | Item Map in Reading Comprehension

Scale Score	Mental Processes	Level of Difficulty	Question Description
446	Reasoning	Difficult	Use the information in the text to make inference
362	Reasoning	Difficult	Use information in the text to make complex inference about one's qualities of characters
350			
345	Applying	Average	Retrieve information from the given text
342	Reasoning	Difficult	Use information in the text to make inference
326	Applying	Average	Grasp ideas from the text and interpret
324	Applying	Average	Grasp ideas from the text and interpret
316	Applying	Average	Grasp ideas from the given text and interpret
310	Applying	Average	Make complex inference about one's qualities of character

Scale Score	Mental Processes	Level of Difficulty	Question Description
300			
298	Applying	Average	Bring ideas together from different places in the text and interpret
296	Applying	Average	Use information in the text to interpret the meaning of a statement
295	Reasoning	Difficult	Retrieve information from the given text
293	Applying	Average	Grasp ideas from the text and interpret
285	Applying	Average	Identifies relationships between an expression and charaters
284	Applying	Average	Locate / retrieve information from the given text
283	Applying	Average	Grasp ideas from the text and interpret
280	Applying	Average	Critically evaluate to make complex inference about the quality of one's characters
280	Applying	Average	Grasp relevant ideas from the text
274	Applying	Average	Work out the ideas from the information given in the text
271	Applying	Average	Use information in the text to determine the sequence of events
268	Applying	Average	Use information in the text to make complex inference
263	Applying	Average	Use information in the text to make inference
262	Applying	Average	Critically make complex inference about the cause of one's behaviour
259	Applying	Average	Interpret the meaning of the given term
258	Knowing	Easy	Work out the ideas from the information given in the text
256	Applying	Average	Retrieve information from the text
256	Applying	Average	Retrieve information from the text
256	Applying	Average	Make complex inference about one's feelings
255	Applying	Average	Critically evaluate to make complex inference about the cause of one's behaviour
252	Knowing	Easy	Grasp ideas from the text and interpret
250			
249	Applying	Average	Workout the idea from the information given in the text
247	Applying	Average	Retrieve information from the text
244	Applying	Average	Grasp ideas from the text and interpret
242	Applying	Average	Grasp ideas from the text and interpret
240	Knowing	Easy	Locate/ retrieve complex information from the text
237	Knowing	Easy	Use information in the text to make inference
234	Knowing	Easy	Grasp and interpret the meaning from the text
233	Knowing	Easy	Locate/ retrieve information from the given text
229	Knowing	Easy	Locate/ retrieve information from the text
229	Knowing	Easy	Locate/retrieve information from the text
223	Knowing	Average	Locate/ retrieve information from the text
222	Knowing	Easy	Locate/ retrieve information from the text
218	Knowing	Easy	Locate/ retrieve complex information from the given text

8.3 Sample Item and Reading Passage

Listed below are the passage and the items that were used in one of the Reading Comprehension Tests. Statistics showing how students responded to these items are given and these can also be located on the item map.

Read the following advertisement and answer the questions that follow.

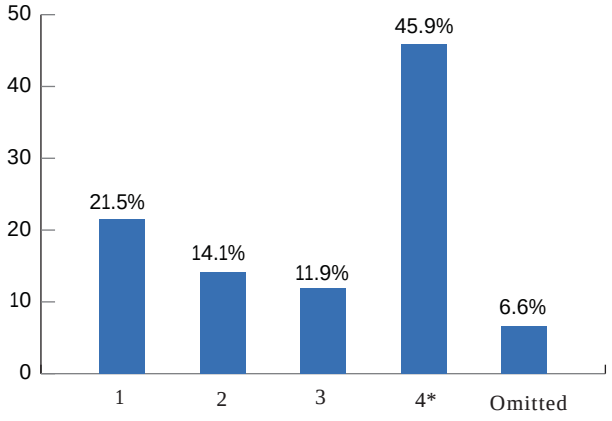
Sample Item: Grasp Ideas/interpret **Scale score**: 263

Item 45. The advertisement is about the importance of

1. Nutritious Food
2. Peas and Dal
3. Reasonably Priced Food
4. Yellow Peas Dal

This item required students to read the advertisement, comprehend the details and interpret the importance. The scaled score of this item was 263 i.e. close to the average score of 250.46% students in the sample were able to select the correct answer (4), whereas the chart shows how the remaining 54% responded.

Figure 8.1 (Item 45) | Percentage of Students in each Response Category



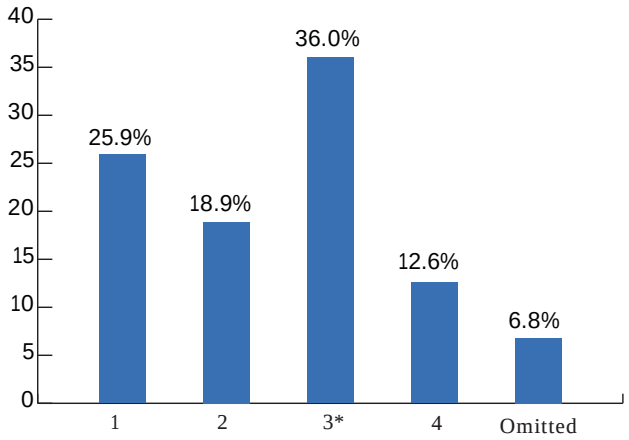
Sample Item: Locate information **Scale score**: 295

Item 47. The study about yellow peas dal was conducted by

1. Kendriya Bhandar
2. Ministry of Consumer Affairs, Food and Public Distribution
3. Central Food Technology Research Institute
4. Mother Dairy

This item required students to locate the information given in the text to know that the Central Food Technology Research Institute conducted the study regarding importance of yellow peas dal. The scale score of this item was 295, i.e. significantly above the average scale score of 250. Only 36% students in the sample were able to select the correct answer (3), while the chart shows how the remaining 64% responded.

Figure 8.2 (Item 47) | Percentage of Students in each Response Category



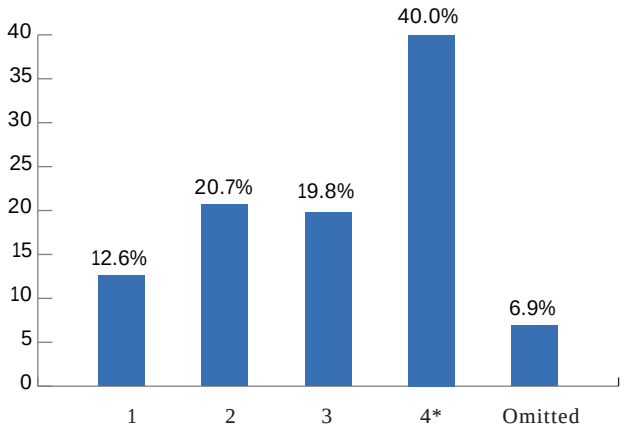
Sample Item: Grasp ideas/interpret **Scale score**: 274

Item 48. The yellow peas dal is **NOT** available at

1. Kendriya Bhandar
2. NAFED
3. Mother Dairy
4. Krishi Bhawan

This item required students to grasp ideas and interpret the text to make an inference about the availability of yellow peas dal. The scale score of this item was 274, i.e. nearly half sigma above that of the average scale score (250) on the scale. While only 40% students in the sample were able to select the correct answer (4), the chart shows how the remaining 60% responded.

Figure 8.3 (Item 48) | Percentage of Students in each Response Category



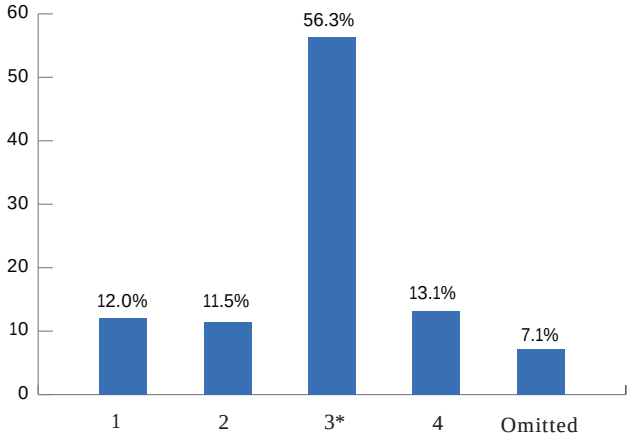
Sample Item: Grasp ideas/interpret **Scale score**: 237

Item 50. Yellow peas dal should be consumed because it is

1. Easily Available
2. Advocated by the Government
3. Healthy And Nutritious
4. Yellow In Colour

This item required students to locate a specific piece of information given explicitly in the text and make inference. The scale score of this item was 237 i.e. below the average score of 250. 56% students in the sample were able to select the correct answer (3). The chart shows how the remaining 44% responded.

Figure 8.4 (Item 50) | Percentage of Students in each Response Category



Performance on the sample items reproduced here (i.e. items 46-50) varied across the country. Table 8.2 below shows the proportion of students in each state or union territory responding correctly to each item. The States/UTs are arranged in alphabetical order.

Table 8.2 | Performance on the Sample Items in States/UTs

State	Item 45 (%)	Item 47 (%)	Item 48 (%)	Item 50 (%)
All sample	**46**	**36**	**40**	**56**
Andhra Pradesh	42	39	20	54
Arunachal Pradesh	41	33	35	43
Bihar	38	30	36	55
Chhattisgarh	46	30	43	61
Delhi	47	26	36	58
Goa	45	32	46	52
Gujarat	49	42	41	56
Haryana	50	29	43	61
Himachal Pradesh	50	25	39	57
Jammu & Kashmir	37	24	28	32
Jharkhand	38	31	40	53
Karnataka	33	51	42	63
Kerala	58	57	49	73
Madhya Pradesh	42	34	41	51
Maharashtra	44	37	51	68
Manipur	42	35	34	45
Meghalaya	40	36	39	46
Mizoram	48	35	42	50
Nagaland	43	34	34	44
Odisha	48	40	42	61
Punjab	57	34	47	71
Rajasthan	36	26	32	50
Sikkim	47	36	42	50
Tamil Nadu	53	40	34	46
Tripura	45	39	42	63
Uttar Pradesh	37	32	36	52
Uttarakhand	46	29	39	58
West Bengal	58	44	45	71
A & N Islands	44	26	32	41
Chandigarh	55	31	54	62
Puducherry	46	40	32	45
Dadra & Nagar Haveli	44	51	42	62
Daman & Diu	63	55	54	82

8.4 What Majority of Students Can Do in Reading Comprehension?

It has already been mentioned earlier in this chapter, what the students performing at different levels of scaled scores of reading comprehension items can do.

Locating Information

Given below is the table, showing the performance of students of Class VIII on the cognitive process of locating information.

Table 8.3 | Performance of Class VIII students on the Cognitive Process of Locating Information

Item No.	Scale Value	% Correct
21	229	60.1
23	284	37.5
25	233	58.3
27	223	63.3
29	240	54.5
30	229	60.4
31	222	65.6
32	218	67.4
47	295	36.0
49	345	27.8
61	247	50.5
63	256	46.8
71	256	45.9
		Average=54.4

Overall, 54% students were able to respond correctly to items based on the ability to 'locate information', i.e.; simple retrieval of information from the given text. Besides, majority of items were characterized as lowest cognitive processes and ranged between the scale score of 218 to 250.

- About 60% students could find out that the bark of neem tree is rough and scaly (Item 21).
- Nearly two-third students could retrieve information from the given text, i.e.; in India Jowar is grown in Punjab and Rajasthan (Item 32).
- About two-third students could identify that sports goods are mainly manufactured in Punjab (Item 31).
- Less than one-third students could read the given advertisement carefully and retrieve information about who had issued the advertisement 'Yellow Peas Dal' (Item 49).
- Nearly one-third students could locate the information given in advertisement related to the name of the organization who conduct the study about Yellow Peas Dal (Item 47).

Grasp Ideas/Interpret

Given below is the table showing the performance of Class VIII students on the cognitive process **of Grasping Ideas/ interpreting.**

8.4 | Performance of Class VIII Students on the Cognitive Process of Grasp Ideas/interpret

Item No.	Scale Value	% Correct
22	259	45.8
24	234	57.7
28	249	49.9
33	244	52.2
35	280	38.3
37	285	39.5
39	446	23.5
40	293	36.6
41	326	32.3
42	324	33.0
43	296	34.1
44	271	41.8
45	263	45.9
46	258	46.5
48	274	40.0
50	237	56.3
62	298	38.8
64	242	52.6
67	316	32.2
69	252	47.4
70	283	37.2
		Average =43

Overall, the students' ability to Grasp Idea/ Interpret was slightly lower on items tested as compared to the cognitive ability to locate/retrieve information. Some were as under:

- More than half (58%) of the students could interpret the use of 'dried leaves of neem' in daily life (Item 24).
- Slightly higher than half (56%) of the students could grasp the idea of consumption of yellow peas dal being healthy and nutritious for human, from the given (Item 50) advertisement.
- Less than one-fourth of the students could understand the name given to a monkey in the story (Item 39).
- About one-third of students were in position to reason out a particular action (Item 42).

Infer/Evaluate

Given below is the table showing the performance of Class VIII students on the cognitive process of **inferring/ evaluating.**

8.5 | Performance of Class VIII students on the Cognitive Process of Infer/Evaluate

Data clearly shows that NOT even half of the students could respond correctly to a single item within this cognitive process. The variation of responses related to Inferring/Evaluating any given text was 26% to 46%. The following were the outcomes:

Item No.	Scale Value	% Correct
26	342	31.5
34	262	44.5
36	255	47.2
38	362	26.1
65	280	38.7
66	268	45.1
68	256	45.5
72	310	37.3
		Average =38.8

- About 46% students could infer why Baba Amte felt proud (Item 68).
- Only 26% students could infer what qualities of Himmat Singh helped him to capture the thief (Item 38), from the given story.

Overall, it can be confirmed from the above presentation and discussion that 'Locating information' was found easiest whereas the abilities to 'Infer and Evaluate' were found to be the most difficult. The difficulty of items testing the ability to 'Grasp ideas/ Interpret' fell between the above stated competencies.

CHAPTER - 9

Mathematics:
What Students Know and Can Do?

9.1 Overview of the Mathematics tests

The mathematics achievement tests administered to the Class VIII students, consisted of two test booklets; each containing 60 multiple-choice items with four-options. Thirty items were common across both test forms and served as 'anchors' so that both the test booklets could be linked together and hence, all items could be placed on a common scale. In total, the Mathematics assessment instrument comprised of ninety unique items*

The items in each text booklet were chosen to cover a number of domains from the Mathematics curriculum, namely the number system, algebra, ratio proportion, mensuration, geometry and data handling. In addition to the content domains listed above, items were constructed to test a range of cognitive processes or skills in a variety of contexts. These were classified as Knowing 'Skill 1', Applying 'Skill 2' and Reasoning 'Skill 3', as described below:

SKILLS CLASSIFICATION FOR TEST CONSTRUCTION IN MATHEMATICS

Knowing (Skill 1): In items testing this process, students are expected to answer using simple knowledge (recall/or recognition) of terms and/or concepts familiar to their lessons. This skill also includes the application of basic operations in straightforward tasks.

Applying (Skill 2): In items testing this process, students are expected to solve non-complex problems set in familiar situations by way of simple application of the operations/concepts learned in Class VIII.

Reasoning (Skill 3): In items testing this process, students are expected to use mathematics concepts, principles, facts, etc. learned in class, in a new or less familiar situation. In particular, students are expected to apply their mathematical abilities to solve real-world problems.

9.2 Item mapping

After testing the students, their responses to the various mathematics items were analysed using Item Response Theory. Using the anchor items, the two test forms were then aligned thereby placing all items on a single mathematics achievement scale comprising scores from 0 to 500. On this scale, the mean score was set at 250 with a standard deviation of 50. Calibrating the items according to their levels of difficulty, the items were placed on an 'item map' with the more demanding items at the top and the easiest items at the bottom. Such item maps give us a picture of what students at different levels of ability know and can do.

* In Mathematics, out of ninety items, one item was not satisfying IRT parameters, as the difficulty of the item was beyond the scale used for reporting. Therefore, this item was not considered for reporting purposes.

The map for selected items from the mathematics test is given in Table 9.1. The scale score in the first column shows the level of difficulty for each item. Perhaps more importantly, this score also represents the minimum score on the ability scale necessary for a student to have an equal chance of success on the item. The map (Table 9.1) also includes a brief description of what students needed to know in order to answer the items correctly.

Table 9.1 | Item Map for selected Items from the Class VIII NAS in Mathematics

Scale Score	Mental Processes	Level of Difficulty	Question Description
413	Applying	Difficult	Know the relationship between simple interest and compound interest
407	Reasoning	Difficult	Able to calculate compound interest
400			
395	Reasoning	Average	Able to use laws of exponents
393	Reasoning	Average	Know the property of parallelogram
374	Reasoning	Easy	Know the angle sum property of parallelogram
357	Knowing	Difficult	Able to find a rational number between two rational numbers
354	Applying	Difficult	Able to solve linear equation in one variable in contextual problem involving multiplication and division
350			
342	Applying	Difficult	Able to find simple interest
339	Applying	Average	Know the property of rhombus
332	Applying	Average	Able to find rational number between two rational numbers
331	Applying	Average	Know the algebraic identity
329	Applying	Average	Able to calculate volume of a cube
325	Applying	Easy	Able to use percentage in word problem
319	Knowing	Difficult	Able to solve linear equation with use of laws of exponents with integer powers
317	Knowing	Difficult	Able to infer number of digits in square root of a five digit number
314	Applying	Average	Able to use laws of exponents with integer powers
313	Applying	Average	Able to use laws of exponents with integerl powers
308	Reasoning	Easy	Able to solve linear equation in one variable
300			
297	Applying	Easy	Know the angle relationship
290	Applying	Average	Able to solve linear equation in one variable for word problem
288	Knowing	Average	Able to use laws of exponents with integers
277	Knowing	Difficult	Able to use the basic property of squaring
268	Knowing	Average	Able to understand concept of cube
267	Applying	Easy	Able to find cube root of a four digit number
266	Knowing	Easy	Able to understand concept of rational number
264	Knowing	Easy	Able to find square root by factor method
250			
226	Knowing	Easy	Able to find numeral co-efficient of monomial

Items ranged in difficulty from those being the easiest with a scale score of 226 (final numeral co-efficient of monomial) to those having a high difficulty level with a scale score of 453 (calculate surface shape made by cutting sheets). Using the item map and similar information for all the other test items, descriptions of what students know and can do at different levels of ability we redeveloped. Such evidence based descriptions from the survey are given below. In addition to this, exemplar items are listed to help subject teachers understand the statements.

Students performing at the lower end of the ability scale, i.e. those with scale scores in the range of, say, 226 to 230, can:

- find out numeral co-efficient of monomial

Students performing in the intermediate range of the scale, i.e. those with scale scores in the range of, say, 230 to 275, can do more in addition to that described above. They can:

- use laws of exponents with integers;
- use basic property of squaring;
- understand concept of rational number;
- understand concept of cube;
- find out number co-efficient of monomial,
- find out cube root of rational number.

Students performing at higher end of the scale, i.e. those with scale scores above, say, 275, can do still more in addition to the mathematical tasks described above. They can:

- use the basic property of squaring;
- solve linear equation in one variable for word problem;
- calculate difference of two fractional numbers;
- draw conclusion from data table;
- use algebraic identity;
- calculate square root of a decimal number;
- use laws of exponents with integral powers,
- find out relations between simple interest and compound interest and much more.

9.3 Sample Items

The sample items given below are intended to exemplify student achievement in selected mathematical domains at three distinct levels within the ability range. For each item, the proportion of students choosing the correct answer (marked *) and each of the incorrect options are given. A table at the end of this section shows the proportion of students selecting the correct answer within each participating States/UTs.

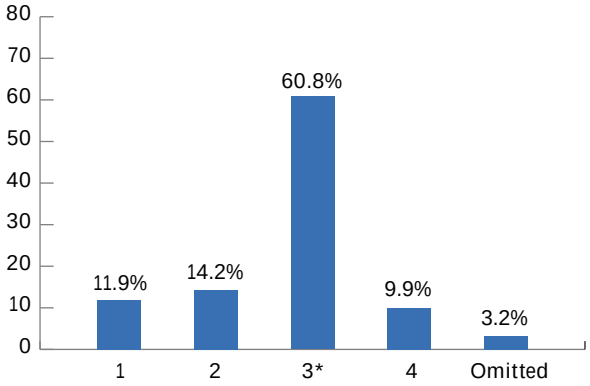
Sample Item: Knowing **Scale score:** 220

Item 16. The one's digit of the square root of 2025 is:

1. 1
2. 4
3. 5
4. 6

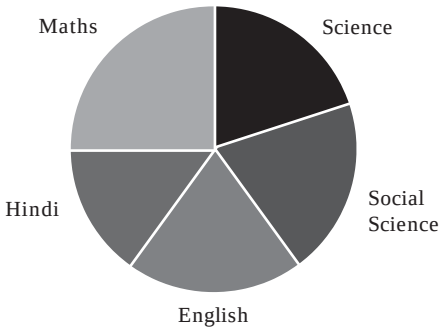
This item required students to find out one's digit of the square root. The scale value of the item is 220; which is below the average difficulty of all items used in the survey. About 69% students identified the correct answer as (3). The bar graph shows the distribution of remaining 31% responses.

Figure 9.1 (Item 16) | Percentage of Students in each Response Category



Sample Item: Knowing **Scale score:** 244

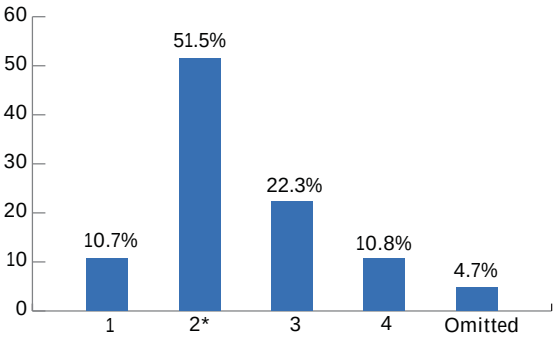
Item 44. The following pie chart represents marks in percent scored by a student in five subjects. In which subject the student gets minimum marks?



1. English
2. Hindi
3. Math
4. Science

This item required students to compare the proportion in the given pie diagram. The scale value of this item is 244; which is near the average difficulty of all items used in the survey. In this item, 51.5% of student's chose the correct answer as (2).

Figure 9.2 (Item 44) | Percentage of Students in each Response Category



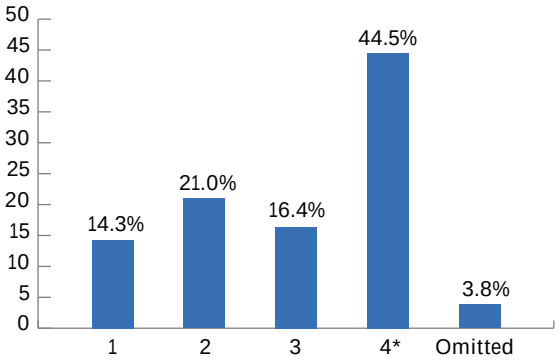
Sample Item: Knowing **Scale score**: 262

Item 62. The cube of an even number is:

1. a negative number
2. a prime number
3. an odd number
4. an even number

This item required students to show knowledge of computing the cube of an even number. The scale score of the item is 262, significantly above the average difficulty of all items used in the survey A total of about 45% students selected the correct option as (4).

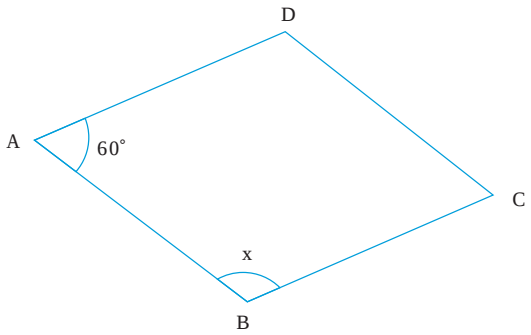
Figure 9.3 (Item 62) | Percentage of Students in each Response Category



Sample Item: Applying **Scale score:** 297

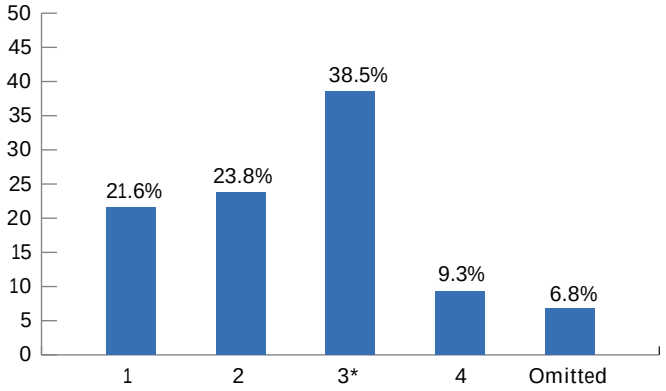
Item 82. In the figure, ABCD is a rhombus. What is the value of x?

1. 60^0
2. 90^0
3. 1200
4. 150^0



This item required students to find the answer by using simple adjacent angle property of a rhombus. The scale value of the item is 297; which is significantly above average difficulty value of all the items used in the survey. A total of 38.5% students identified the correct answer as (3), whereas about 24% and 22% students chose incorrect options (2) and (1) respectively. The graph shows the distribution of remaining 16% responses.

Figure 9.4 (Item 82) | Percentage of Students in each Response Category



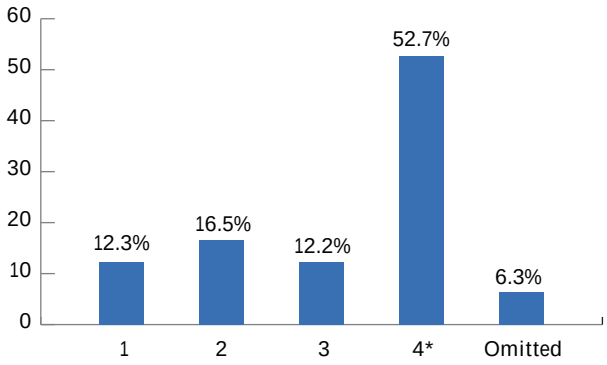
Sample Item: Applying **Scale score:** 239

Item 51. Three exterior angles of a quadrilateral are 700, 800 and 1000. The fourth exterior angle is:

1. 70
2. 80°
3. 100°
4. 110°

This item required students to find the fourth exterior angle of quadrilateral when the values of three exterior angles are given. The scale value of the item is 239; which is below the average difficulty of all items used in the survey. While a total of 53% students identified the correct answer as (4), about 47% students selected the other incorrect options.

Figure 9.5 (Item 51) | Percentage of Students in each Response Category



Item 23. The smallest perfect square number which is divisible by 6, 9, 15 is:

1. 999
2. 900
3. 810
4. 100

This item required students to find out the smallest perfect square number which is divisible by the given numbers. The difficulty level of the item is significantly above the average difficulty of all items used in the survey with the exact value of 326. A total of only 27% students could identify the correct answer as (2).

Figure 9.6 (Item 23) | Percentage of Students in each Response Category

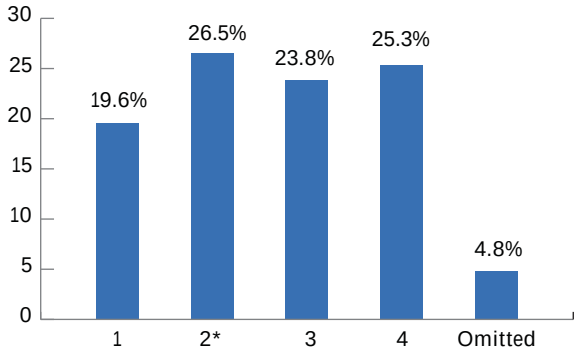


Table 9.2 below shows the proportion of students responding correctly to the sample items given above.

Table 9.2 | The Proportion of Students Selecting the Correct Option for each of the above Given Six Sample Items by States/UTs

State	Item 16 (%)	Item 23 (%)	Item 44 (%)	Item 51 (%)	Item 62 (%)	Item 82 (%)
All sample	61	27	52	53	45	39
Andhra Pradesh	56	26	46	49	37	32
Arunachal Pradesh	50	27	40	45	40	39
Bihar	57	37	51	51	49	37
Chhattisgarh	63	18	44	59	46	39
Delhi	56	20	44	52	33	35
Goa	62	30	56	50	39	38
Gujarat	54	21	47	44	31	35
Haryana	64	27	47	54	40	37
Himachal Pradesh	64	23	49	59	40	43
Jammu & Kashmir	52	29	44	45	55	37
Jharkhand	67	30	54	58	50	42
Karnataka	69	22	65	60	51	41
Kerala	52	21	68	58	35	36
Madhya Pradesh	73	38	56	58	55	40
Maharashtra	66	28	51	54	46	35
Manipur	55	38	40	42	54	44
Meghalaya	55	25	31	43	27	42
Mizoram	54	30	43	46	44	45
Nagaland	54	25	44	47	42	37
Odisha	62	37	42	54	48	36
Punjab	72	21	62	66	59	37
Rajasthan	61	26	44	57	45	39
Sikkim	58	26	50	52	34	40
Tamil Nadu	51	16	57	47	52	-
Tripura	70	38	57	51	50	42
Uttar Pradesh	71	45	58	53	62	45
Uttarakhand	64	27	48	52	44	37
West Bengal	63	33	49	51	38	41
A &N Islands	57	20	48	47	38	34
Chandigarh	69	23	63	67	43	41
Puducherry	47	19	49	40	43	35
Dadra & Nagar Haveli	70	19	64	59	51	43
Daman & Diu	76	23	78	64	46	48

Due to translation effects item 82 in Tamil Nadu was deleted.

9.4 What Majority of Students can do in Mathematics?

Earlier in this chapter, it has already been mentioned what the students performing at different levels of scale scores of the Mathematics items can do. Further to this, are the tables given below, showing the performance of students of Class VIII on various content domain in Mathematics.

9.3 | Performance of Class VIII Students in Number System

Item No.	Scale Value	% Correct
1	266	45.9
2	258	45.7
3	267	44.2
4	288	31.1
5	268	40.9
6	332	30.0
7	313	41.2
8	300	31.0
9	290	28.3
10	357	20.9
11	313	28.7
12	280	36.3
13	354	21.5
14	334	23.0
16	220	60.8
17	268	41.2
18	287	33.3
19	333	31.1
20	297	35.2
21	298	28.2
22	317	23.8
23	326	26.5
24	317	27.3
25	277	40.8
26	379	21.9
27	309	26.8
61	264	43.1
62	262	44.5
63	335	26.5
64	287	36.3
65	283	39.9
66	278	36.6
67	314	24.2
68	306	31.4
69	395	16.7
70	319	28.6
71	360	22.5
72	315	28.3
73	381	26.8
74	333	22.0
		Average =32.6

The concept of 'number system' was represented by 40 items in the survey with an average difficulty of 32.6%. The range of difficulty for the items varied from 16.7% (item no. 69 with scale value 395) to 60.8% (item no. 16 with scale value 220).

- About 60% students could find out one's digit of square root of a four digit number.
- In number system, nearly 46% students knew the concept of rational number and could calculate difference of two fractional numbers.
- Nearly 44% students found out the cube root of a four digit number.
- Of the surveyed students, 83% students were not able to use laws of exponents.
- About 78% students were not able to solve one variable linear equation in contextual problem involving multiplication and division of rational numbers.
- Approximately 78% students were able to understand the concept of perfect square.

9.4 | Performance of Class VIII Students in Algebra

The concept of 'Algebra' was represented by 13 items in the survey with an average difficulty of the items being 33%. With a range from 21.6% (item no. 48 with scale value 335) to 58% (item no. 75 with scale value 226), majority of the items in this concept varied in their difficulty between 27% to 40%.

Item No.	Scale Value	% Correct
15	264	43.4
28	275	40.4
29	308	32.4
30	307	28.7
31	306	29.7
32	290	32.1
46	281	39.6
47	324	22.2
48	335	21.6
75	226	58.0
77	308	27.0
78	331	28.1
79	376	28.1
		Average=33

- Approximately 58% students were able to find numeral co-efficient of monomial.
- Nearly 43% students were able to find number co-efficient of monomial.
- Nearly 78% students were not able to solve linear equation in one variable.
- About 78% students could not find the value of algebraic expression at any integer.

9.5 | Performance of Class VIII Students in Ratio and Proportion

The concept of 'Ratio & Proportion' was represented by five items in this survey, having an average difficulty level of 25%. The difficulty of these items vary from 20.7% (item no. 50 with scale value 363) to 31.0% (item no. 49 with scale value 316). The range of the difficulty of these items is 20% to 30%.

Item No.	Scale Value	% Correct
33	407	26.5
49	316	31.0
50	363	20.7
80	342	23.5
81	413	22.3
		Average=25

- Only the simple items could be responded by 31% students.
- Performance of students on items covering 'Ratio and Proportion' was low, i.e.; 21% to 27%.

9.6 | Performance of Class VIII Students in Mensuration

The concept of 'Mensuration' was represented by 13 items in this survey, having an average difficulty of 27.6%. The difficulty of items varied from 16.3% (item no. 38 with scale value 394) to 39.3% (item no. 37 with scale value 272), with the majority of items being in the difficulty range of 20%-33%.

Item No.	Scale Value	% Correct
37	272	39.3
38	394	16.3
39	375	24.5
40	321	30.8
41	314	29
42	453	21.8
55	325	33.4
56	329	29.5
57	360	25.7
58	380	17.7
86	287	36.5
87	314	33.7
89	352	25.3
		Average=27.6

- Nearly 39% students knew the relationship between litre and millilitre.
- About 84% students were not able to calculate area of circular path.
- About 82% students were not able to calculate volume of a cylinder.

9.7 | Performance of Class VIII Students in Geometry

'Geometry' was represented by eleven items in this survey with an average difficulty of 33.8%. The level of difficulty related to the items varied from 23% (item no. 85 with scale value 394) to 52.7% (item no. 51 with scale value 239), while majority of these items remained within the difficulty range of 30% to 40%.

Item No.	Scale Value	% Correct
34	271	42.2
35	299	31.3
36	298	29.8
51	239	52.7
52	374	30.4
53	339	27.2
54	393	31.3
82	297	38.5
83	298	30.5
84	354	33.6
85	394	23.0
		Average=33.8

- Nearly 42% students understood property of rhombus.
- About half of the students were able to calculate exterior angle of a quadrilateral by use of angle sum property.
- Nearly 77% students did not know the relationship between internal and external property of polygon.

9.8 | Performance of Class VIII students in Data Handling

The concept of 'Data Handling' was represented by seven items in this survey, adding up to an average difficulty level of 41%. The difficulty of these items varied from 34% (item no. 59 with scale value 304) to 52% (item no. 44 with scale value 244).

Item No.	Scale Value	% Correct
43	278	41.5
44	244	51.5
45	288	38.7
59	304	33.9
60	297	35.2
76	325	35.3
90	272	41.2
		Average =41

Nearly half of the students could draw conclusion from the given bar graph.

- Nearly 42% students could draw conclusion from the data table.
- Approximately two-third of students couldn't solve word problem of direct variation.

On the basis of the above discussion, it may be concluded that the items based on 'Data Handling' were easy as compared to those of 'Algebra' and 'Number System', whereas items based on 'Mensuration' and 'Ratio and Proportion' were found to be the most difficult for the students surveyed at Class VIII level.

CHAPTER - 10

Science:
What Students Know and Can Do?

10.1 Overview of the Science Tests

The Science tests given to the Class VIII students consisted of two test booklets, each containing sixty multiple-choice items. The items were chosen keeping in view the whole range of the content. Thirty out of the sixty items were common across both the test forms and served as 'anchors', so that both the test booklets could be linked together and all items could be placed on a common scale. In addition to this, the test forms contained an extra of thirty unique items, thus adding up to a total of ninety items* in each of the Science tests used in the survey.

The items were designed to test a range of relevant *cognitive processes* or 'skills', classified as knowing, applying and reasoning as defined below:

COGNITIVE PROCESSES FOR SCIENCE

Knowing(Skill 1): In items testing this process, the students are expected to recall or recognize terms, facts, symbols, units and basic scientific/ social concepts. They identify the phenomenon involved in certain processes/ investigations.

Applying (Skill 2): The items in this cognitive domain are designed to involve the application of knowledge and understanding in straight forward situations and require the students to compare, contrast, classify and interpret information in light of a concept. The students are also expected to use and apply their understanding of concepts and principles for situations familiar to them.

Reasoning (Skill 3): In items testing reasoning, the students need to demonstrate their ability to solve problems, draw conclusions and make decisions. For this,the students are required to analyze a problem (perhaps in a new situation), identify relationships, determine underlying principles, devise and explain strategies for problem solving.

10.2 Item Mapping

After testing the students, their responses to the various tasks were analysed using Item Response Theory. Using the anchor items, the two test forms were then aligned, thereby placing all items on a single scale comprising scores from 0 to 500. On this scale, the mean score was set at 250 with a standard deviation of 50. Calibrating the items according to their levels of difficulty, the items were placed on an 'item map' with the more demanding items at the

* In Science, out of ninety items, nine items were not satisfying IRT parameters, this may be due to translation problem or content of the items were not taught up to that level or the difficulty of the items was beyond the scale, used for reporting. Therefore, these items were not considered for reporting purposes.

top and the easiest items at the bottom. Such item maps provide us with a picture of what students at different levels of ability know and can do.

The item map for Science is given in Table 10.1. The scale score in the first column shows the level of difficulty for each item. Perhaps more importantly, this score also represents the minimum score on the ability scale necessary for a student to have an even chance of success on the item. The map also includes a brief description of what students needed to know in order to answer the items correctly, i.e. each item is classified according to the cognitive process being evaluated.

Table 10.1 | Item Map for Selected Items from the Class VIII NAS in Science

Scale Score	Mental Processes	Level of Difficulty	Question Description
400	Applying	Average	Identify the properties of reflection
397	Applying	Difficult	Apply Knowledge that vacuole occupying maximum space in a plant cell
379	Reasoning	Average	Apply reasoning to solve the problem
378	Reasoning	Easy	Interprets the properties of pressure
365	Reasoning	Difficult	Understand the phenomena of lunar eclipse
357	Reasoning	Average	Integrate the concept of differences in temperature with various zones of a candle flame
337	Applying	Difficult	Relate pressure in different situation (positions)
332	Applying	Difficult	Uses of observation to draw conclusion
331	Applying	Difficult	Relates information about different stages of development in human being
321	Applying	Difficult	Knows the concept of decomposition and applies it
317	Knowing	Difficult	Know the properties of metal and non-metal
316	Applying	Average	Understand the role of rhizobium present in root nodules of pea plants
316	Applying	Average	Applying the concept of electroplating
312	Reasoning	Average	Apply the knowledge of crops rotation needed to maintain the soil fertility
309	Knowing	Difficult	Know the term related to reproduction
305	Knowing	Difficult	Recognizes various celestial bodies
304	Reasoning	Easy	Know the phenomena of reflection
300	Knowing	Difficult	Reason out and identify extinct species of birds
299	Applying	Difficult	Relate physical property of petroleum to its uses
291	Applying	Average	Know the objectives of Project Tiger
280	Applying	Average	Identify suitable conditions for endangered animals
274	Applying	Average	Identify the role of lubricant
273	Applying	Easy	Identify the process of reproduction
252	Knowing	Easy	Apply the law of floating
248	Knowing	Easy	Know the specific characteristics of different fuels
244	Knowing	Average	Know about exhaustible natural resource
226	Knowing	Easy	Compare the characteristics of various planets
223	Knowing	Easy	Know about the history of discovery of a cell

The map shows that Class VIII students demonstrated a wide range of ability in the domain of Science.

Students at the lower end of the scale i.e. those with scale scores less than 225, demonstrated few cognitive processes – provided that the context was clear and the tasks non-complex. For example, they were able to recall the history of a cell discovered by the biologists, analyze situations and identify remedies for increasing the crop yield etc. Further, there were very few items towards the lower end of the scale, which indicated a high level of test difficulty, may be due to the intention at the elementary school stage to test students on more challenging tasks.

Students performing in the intermediate range of the scale (say, 225 to 275) could do more in addition to that described above. They analyzed the issues, interpreted information, established relationships, related information and found out solutions to different situations. Furthermore, they could also reason out the floating of damaged and hollow seeds, integrate properties with their uses, find the consequences of deforestation etc.

Students performing at the higher end of the scale i.e. those with scale scores above, 275 could do even more in addition to that described above. They knew and could explain ways in which unwanted plants harm the crops, crop rotation effects crop yield, reason out the survival of animals in different conditions, integrate the property of fibers with their uses, identify the sequence of events taking place during reproduction etc. They could also establish the relationship between force and pressure in different conditions.

10.3 Sample Items

Listed below are some of the items that were used in the Science tests. Arranged in an increasing order of difficulty, statistics show how students responded to the items and these can also be located on the item map.

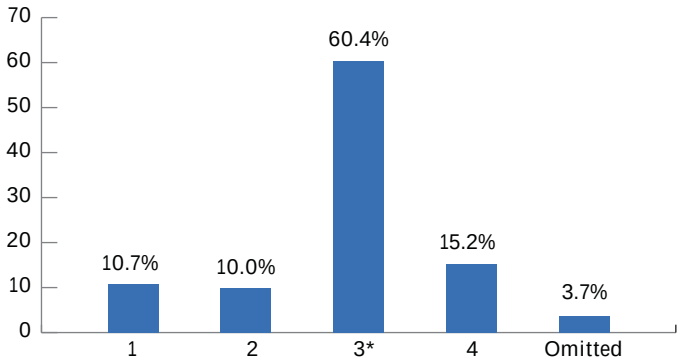
Sample Item: Knowing **Scale score:** 226

Item 26. Which of the following is the biggest planet in our solar system?

1. Neptune
2. Saturn
3. Jupiter
4. Earth

This item required students to recall the size of planets, from the smallest to the biggest. The scale score of this item was 226, i.e. below the average level of difficulty of items in the survey. About 60% of the students in the sample were able to select the correct answer (3). The chart shows how the remaining 40% responded.

Figure 10.1 (Item 26) | Percentage of students in each response category



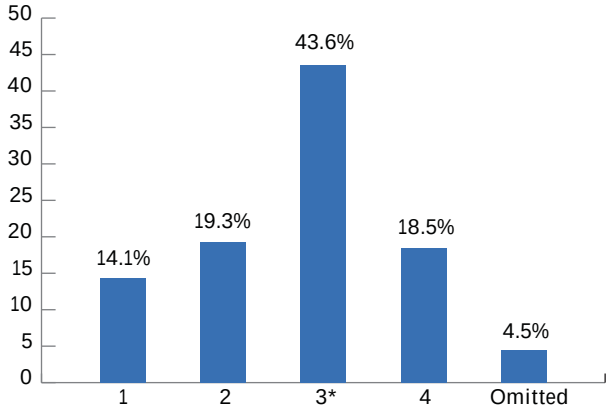
Sample Item: Knowing **Scale score:** 271

Item 12. Chlorination is the process to purify water. It is done to

1. Remove harmful gases.
2. Separate suspended impurities.
3. Kill harmful germs.
4. Change the colour of water.

The item required students to recall the process of Chlorination which is carried out to kill the harmful germs present in the water. The scale score of this item was 271,which is very close to the average level of item difficulty in the survey.44% of the students in the sample were able to select the correct answer (3). The chart shows how the remaining 56% responded.

Figure 10.2 (Item 12) | Percentage of Students in each Response Category



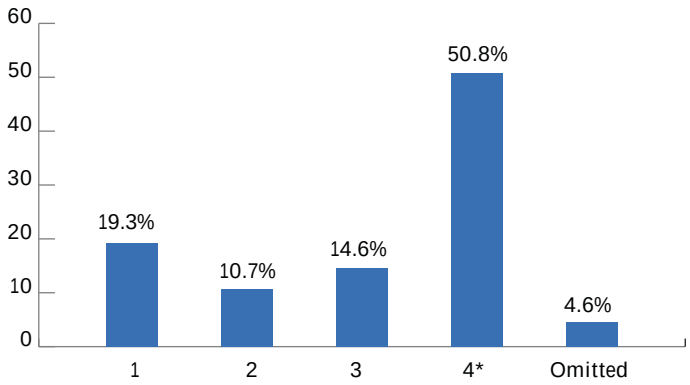
Sample Item: Applying **Scale score:** 247

Item 13. Oxygen exists in nature in the form of a gas. It is essential for our life because it

1. Enhances the growth of plants
2. Is used as an antiseptic
3. Is used for purifying water
4. Is used during respiration

This item required students to relate the use of oxygen with the process of respiration. The scale score of this item was 247 i.e. nearlythe average level of difficulty of items in the survey. About 51% of the students in the sample were able to select the correct answer (4). The chart shows how the remaining 49% responded.

Figure 10.3 (Item 13) | Percentage of Students in each Response Category



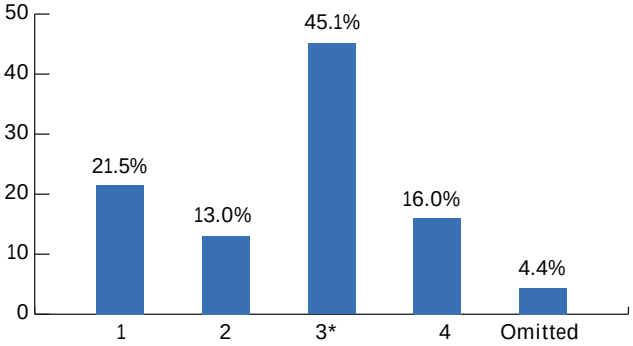
Sample Item: Applying — Scale score: 264

Item 75. There is a fiber which melts on heating and sticks to the body. Clothes of such a fiber should NOT be worn while burning crackers. Identify that fiber.

1. Silk
2. Cotton
3. Nylon
4. Wool

This item required students to integrate the properties of fibers with their uses. The scale score of this item was 264, i.e. close to the average level of difficulty of items in the survey. 45% of the students in the sample were able to select the correct answer (3). The chart shows how the remaining 55% responded.

Figure 10.4 (Item 75) | Percentage of Students in each Response Category



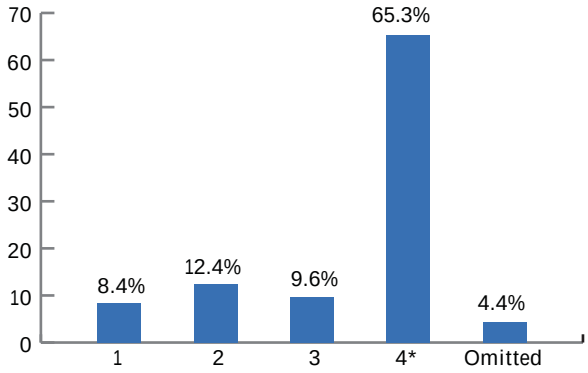
Sample Item: Reasoning — Scale score: 209

Item 25. A farmer was continuously cultivating same type of crop on the same piece of land and he found that yield of the crop has reduced. In order to increase the yield he should add

1. Weedicides and Sand
2. Pesticides and Weedicides
3. Sand and Pesticides
4. Manures and Fertilizers

This item required students to find out the reason for decrease in crop yield and also suggest ways of improvement. The scale score of this item was 209, i.e., below the average level of difficulty of items in the survey. 65% of the students in the sample were able to select the correct answer (4). The chart shows how the remaining 35% responded.

Figure 10.5 (Item 25) | Percentage of Students in each Response Category



Sample Item: Reasoning — Scale score: 323

Item 4. Given below is a list of doctor's advice to a person.

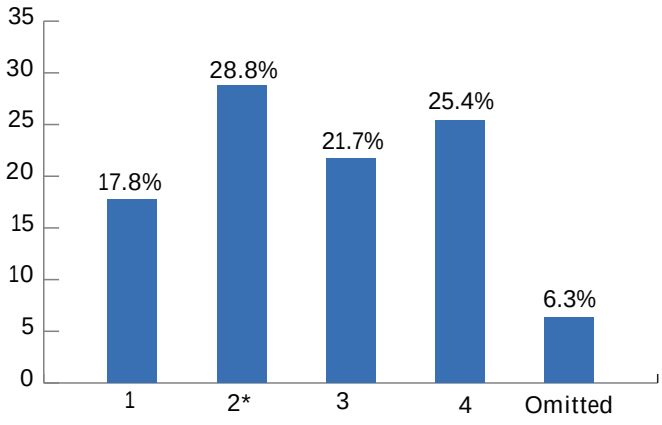
- Get your blood glucose checked regularly
- Control your diet
- Exercise regularly
- Take your medicines without fail

The person to whom this advice is given is likely to be a

1. Growing Child Having Respiratory Problem
2. Person Suffering From Diabetes
3. Pregnant Woman of 35 Years Age
4. Hockey Player Injured in a Match

This item necessitated the students to find out the disease on the basis of the advice given to a patient by a doctor. The scale score of this item was 323, i.e., above the average level of difficulty of items in the survey. Approximately 29% of the students in the sample were able to select the correct answer (2). The chart shows how the remaining 71% responded.

Figure 10.6 (Item 4) | Percentage of Students in each Response Category



Performance on the sample items reproduced here for items 4, 12, 13, 25, 26 and 75 varied across the country. Table 10.2 below shows the proportion of students in each state or union territory responding correctly to each item.

Table 10.2. | Performance on the Sample Items in States/UTs

State	Item 4 (%)	Item 12 (%)	Item 13 (%)	Item 25 (%)	Item 26 (%)	Item 75 (%)
All sample	29	44	51	65	60	45
Andhra Pradesh	25	50	42	59	70	37
Arunachal Pradesh	29	39	37	60	60	40
Bihar	26	33	45	65	55	44
Chhattisgarh	22	41	55	73	69	40
Delhi	20	38	37	68	46	42
Goa	35	59	52	65	69	55
Gujarat	23	38	63	59	59	49
Haryana	24	43	45	72	56	49
Himachal Pradesh	20	39	38	75	59	45
Jammu & Kashmir	40	48	43	54	53	38
Jharkhand	28	38	44	75	58	55
Karnataka	-	44	55	68	41	35
Kerala	51	40	64	63	68	28
Madhya Pradesh	35	38	50	70	67	50
Maharashtra	23	53	70	74	51	61
Manipur	47	49	48	54	68	46
Meghalaya	33	45	40	47	56	43
Mizoram	36	43	41	51	70	44
Nagaland	41	40	36	48	70	53
Odisha	27	43	58	76	53	60
Punjab	15	53	74	70	48	41
Rajasthan	23	35	42	67	58	46
Sikkim	32	55	49	67	80	53
Tamil Nadu	23	34	46	53	56	33
Tripura	33	59	62	68	71	51
Uttar Pradesh	37	43	54	69	55	54
Uttarakhand	22	35	46	72	48	37
West Bengal	27	53	68	75	62	45
A & N Islands	36	43	41	66	71	51
Chandigarh	27	43	36	68	71	45
Puducherry	25	36	41	47	61	35
Dadra & Nagar Haveli	38	50	68	70	81	65
Daman & Diu	30	54	83	72	91	68

Due to translation effects item 4 in Karnataka was deleted.

10.4 What Majority of Students Can Do in Science?

It has already been mentioned earlier, that the objective of this chapter is to highlight what the students can perform at different levels of content domain on Science items. The items in Science were developed on the following content areas:

Biology

i) Crop production
ii) Micro-Organism
iii) Cell structure and function
iv) Reproduction
v) Biodiversity (conservation of plants & Animals)

Physics

i) Force and pressure
ii) Electric Current and Circuit
iii) Light
iv) Star and the solar system

Chemistry

i) Synthetic fibres and plastic
ii) Metals and Non-metals
iii) Coal and Petroleum
iv) Pollution of Air and water

The tables given below show the performance of students of Class VIII on different content domains.

Table 10.3 | Performance of Class VIII Students on the Content Area of Crop Production

Item No.	Scale Value	% Correct
1	310	28.3
2	339	25.9
18	297	35
21	312	29.9
24	321	27.4
25	209	65.3
46	242	52.5
62	252	48.8
64	316	33.1
		Average =38.8

In the content area of 'Crop Production' only 26% of the students attempted item no. 2 correctly, by recalling the weedicide used for controlling unwanted plants in the field. The average performance of the students on this content area was about 39%, whereas the range of percentage correct responses was between 26 to 65%.

- About 65% of the students could reason out the effects of crop rotation and its impact on crop production.
- Nearly 26% of the students could identify the weedicide used for controlling unwanted plants in the field.
- About 49% of the students could explain why damaged and hollow seeds float on water.

10.4 | Performance of Class VIII Students on the Content Area of Micro-Organism

Item No.	Scale Value	% Correct
3	294	37.7
4	323	28.8
16	290	35.4
19	317	30.7
20	308	36.6
		Average =34

Items based on the domain of 'Micro-organism' were quite difficult, as only 29% to 38% students answered these items correctly.

- About 29% of the students identified the disease of diabetes on the basis of its symptoms.
- Nearly one-third of the students could recall Micro-organism Rhizobium, which is friendly to human beings.
- 38% of the students could recall the appropriate stage/time of vaccination.

10.5 | Performance of Class VIII Students on the Content Area of Cell Structure and Function

Item No.	Scale Value	% Correct
5	397	22.0
22	297	32.3
47	344	25.5
61	223	57.3
76	353	28.6
79	355	29.0
		Average =32.4

Based on the content domain of 'Cell structure and functions', item 5 was found to be the most difficult as only 22% students could respond correctly, while item 61 were considered easiest as 57% responded correctly to it. Overall, one-third of the students could respond correctly to items of the area of 'Cell structure and functions'.

- Only 22% of the students could reason out that vacuole occupies the maximum space in the centre of the plant cell.
- About 57% of the students could recall the name of the scientist who coined the term 'Cell'.

10.6 | Performance of Class VIII Students on the Content Area of Reproduction

Item No.	Scale Value	% Correct
17	273	42.5
23	309	34.3
49	350	31.5
78	372	29.6
81	331	31.8
		Average =35.2

All the 5 items related to the content of 'Reproduction' were responded to correctly by 30-43% of the students. While item no. 17 was considered to be the easiest, item no. 78 was thought off to be difficult by the respondents. The average score on the content area of 'Reproduction' came up to a value of 35.

- About 32% of the students could identify single cell organisms and the stage of reproduction at which body part of a developing baby can be identified.
- Nearly 43% of the students could identify the process of binary fission in Amoeba depicted in a diagram.

10.7 | Performance of Class VIII Students on the Content Area of Biodiversity (Conservation of Plants & Animals)

The response variation on items related to 'Biodiversity' was 6, i.e.; the students responded correctly ranging from 35-41%. On an average about 38% of the students could respond correctly to items based on 'Biodiversity'.

Item No.	Scale Value	% Correct
48	280	40.0
50	285	37.4
63	297	38.0
65	300	36.3
77	269	41.1
80	291	35.0
		Average =38

- 35% of the students were aware about the objective of Project Tiger launched by the Government in the country.
- About 41% of the students could reason out the consequences of loss of forests.

10.8 | Performance of Class VIII Students on the Content Area of Force and Pressure

Item No.	Scale Value	% Correct
29	288	37.6
31	274	41.4
32	379	26.4
66	347	27.8
67	337	31.1
86	378	31.2
		Average =30.9

The students responded to the items based on 'Force and Pressure' correctly with a variation of 15, i.e.; between the range of 26-41%.While item no. 31 was considered to be the easiest, item no. 32 in comparison, was considered difficult by the students. The average performance on the content area was 30.91%.

- About 31% of the students were able to find out the condition at which pressure exerted on the surface of earth is the least and the liquid pressure experienced by an object on its top surface is the lowest.
- About 41% of the students knew why movable parts of a sewing machine are oiled.

10.9 | Performance of Class VIII Students on the Content Area of Electric Current and Circuit

Item No.	Scale Value	% Correct
6	308	38.2
7	430	24.8
27	250	49.6
30	274	42.2
69	316	32.9
82	348	26.9
		Average =37.4

On an average, 37% of the students responded correctly on items based on the content domain of 'Electric Current and Circuit'. Students considered item 27 easy and item 7 difficult.

- Nearly 25% of the students could identify the condition in which no chemical effect takes place when connected to a battery in a circuit.
- About 50% of the students could reason out the consequences of electric appliances being handled with wet hands.
- About 38% of the students knew the number of electrodes present in a dry cell.

10.10 | Performance of Class VIII Students on the Content Area of Light

Item No.	Scale Value	% Correct
8	308	37.3
28	304	36.3
33	359	27.6
34	385	26.1
51	323	29.3
52	327	30.3
55	383	31.4
83	267	42.7
84	335	29.8
85	400	28.3
		Average =30.8

On an average, about 31% of the students responded correctly on items of content domain 'Light'. As per response pattern, item 83 was considered easy and item 33 comparatively difficult by the respondents.

- About 43% of the students knew about the measuring unit of very long distances.
- Nearly 30% of the students could establish relationship between the change in angle of incidence and angle of reflection.
- Only 28% of the students could compute the number of images formed when an object is kept between the two plane mirrors.

10.11 | Performance of Class VIII Students on the Content Area of Star and the Solar System

Item No.	Scale Value	% Correct
11	305	35.1
26	226	60.4
35	365	26.5
68	306	33.5
		Average =40.4

In content domain 'Star and the Solar System', the average performance of the students was 40%. However, about 60% students considered item no. 26 to be easiest and item no. 35 to be difficult.

- More than 60% of the students could recall the biggest planet of solar system.
- About 27% of the students could identify the positions of sun, moon and earth during lunar eclipse.

10.12 | Performance of Class VIII students on the Content Area of Synthetic Fibers and Plastics

Item No.	Scale Value	% Correct
14	423	26.2
15	444	24.9
39	267	42.8
41	259	46.5
56	354	32.1
73	238	53.5
75	264	45.1
		Average =40.1

Average performance of the students in the domain of 'Synthetic Fibers and Plastics' was 40% and about 54% of the students could identify the fibers which are most skin friendly to human beings, thereby considering item no. 73 easy. Further, item no. 15 was considered by the students as difficult, because only 25% could respond to it correctly.

- Nearly 54% of the students knew that cotton is the best suited fibre to skin.
- About 47% of the students were able to identify fibres which can melt after heating.
- Only 25% of the students could relate the properties of material with their uses.

10.13 | Performance of Class VIII Students on the Content Area of Metal and Non-metals

In content domain 'Metal and non-metals', the average performance of students was 38%. About 51% students responded to item 13 correctly, which was related to existence of oxygen in nature and its essentiality in life. They found the item easiest in comparison to others.

Item No.	Scale Value	% Correct
13	247	50.8
37	268	43.7
40	302	37.6
42	295	37.3
43	317	35.8
58	332	34.1
72	296	37.6
		Average =38.3

- More than 50% of the students could reason out why oxygen is essential for human life.
- About 38% of the students could name the metal being used in the process of galvanization of iron to protect it from rusting and could explain malleability of metals.
- Nearly 44% of the students could differentiate between metals and non-metals on the basis of their properties.

10.14 | Performance of Class VIII Students on the Content Area of Coal and Petroleum

Item No.	Scale Value	% Correct
36	248	50.4
38	322	29.6
44	299	32.0
57	357	26.8
59	395	29.6
74	244	51.9
89	362	32.2
		Average =35.4

Average performance of students on content domain of 'Coal and Petroleum' was 35%; wherein more than 50% students could identify the least polluting and exhaustible fuels found in nature.

- About 52% of the students could recall exhaustible natural resources.
- More than 50% of the students were able to identify the fuel, which is least polluting to nature.
- Nearly 30% of the students could identify the fuel which has the lowest ignition temperature.
- Only 32% of the students could explain why petroleum is known as 'black gold'.

10.15 | Performance of Class VIII Students on the Content Area of Pollution of Air and Water

Item No.	Scale Value	% Correct
12	271	43.6
45	306	34.2
60	331	31.1
		Average=32.4

The average score of students in the content domain of 'Pollution of Air and Water' was 32.4%. Further, item no. 12 was considered easiest in comparison to others.

- About 44% of the students could reason out the process of chlorination of water.
- Nearly 34% of the students could reason out the survival of aquatic life in hot water.
- About 31% of the students could recall the gases produced during decay of organic matter under water.

Overall, it can be said that content related to 'Star and the Solar System' and 'Synthetic Fibers and Plastics' was found to be easy and content related to 'Light' and 'Force and Pressure' was difficult for Class VIII surveyed students.

CHAPTER - 11

Social Science:
What Students Know and Can Do?

11.1 Overview of the Social Science Tests

The Social Science tests administered to Class VIII students consisted of two test booklets, each containing sixty multiple-choice items. The items were chosen keeping in view the whole range of the content. Thirty out of the sixty items were common across both test forms and served as 'anchors', so that the different test booklets could be linked together and, hence, all items could be placed on a common scale. In addition to this, the test forms contained an extra of thirty unique items, thus amounting to a total of ninety items* in each of the Social Science tests used in the survey.

The items were designed to test a range of relevant *cognitive processes* or 'skills', classified as knowing, applying and reasoning as defined below:

COGNITIVE PROCESSES FOR SOCIAL SCIENCE

Knowing (Skill 1): In items testing this process, students are expected to recall or recognize terms, facts, and basic social concepts, besides selecting appropriate statements and ideas for knowing events or phenomenon.

Applying (Skill 2): The items in this cognitive domain are designed to involve the application of knowledge and understanding in straight forward situations and require students to compare, contrast, classify and interpret information in light of a concept or situation. Apart from this, students are also expected to use and apply their understanding of theory, rules, laws and social phenomenon in situations known to them.

Reasoning (Skill 3): In items testing reasoning, students need to demonstrate their ability to solve problems, draw conclusions and make decisions. For this, students are required to analyze problems (generally in new situations), identify social relationships and legal implications, determine underlying principles and explain strategies for problem solving.

11.2 Item Mapping

After testing the students, their responses to the various tasks were analysed with the Item Response Theory. Using the anchor items, the two test forms were then aligned, thereby placing all items on a single scale comprising scores from 0 to 500. On this scale, the mean score was set at 250 with a standard deviation of 50. Calibrating the items according to their levels of difficulty, the items were placed on an 'item map' with the more difficult items at the top

* In Social Science, out of ninety items, twenty items were not satisfying IRT parameters, this may be due to translation problem or content of the items were not taught up to that level or the difficulty of the items was beyond the scale, used for reporting. Therefore, these items were not considered for reporting purposes.

and the easiest items at the bottom. Such item maps facilitate us with a picture of what students at different levels of ability know and can do.

The item map for Social Science is given below. The scale score in the first column shows the level of difficulty for each item. Perhaps more importantly, this score also represents the minimum score on the ability scale necessary for a student to have an even chance of success on the item. The map also includes a brief description of what students were required to do in order to answer the items correctly, i.e. each item is classified according to the *cognitive process* being evaluated.

Table 11.1 | Item map for Selected Items from the Class VIII NAS in Social Science

Scale Score	Mental Processes	Level of Difficulty	Question Description
408	Reasoning	Difficult	The relation between land and law and the right of ownership under law
400			
397	Applying	Difficult	Policy of Congress towards Muslims
394	Reasoning	Average	Understand the kind of industries
389	Reasoning	Average	The physical features with the type of energy developed
385	Reasoning	Average	The promotion and development of Western education before independence
365	Applying	Difficult	Type of irrigation and relates to the different region
353	Reasoning	Easy	Relation between farming types and their features
350			
345	Reasoning	Easy	Constitutional act and its area of function
344	Knowing	Difficult	Social reformers in modern India
331	Applying	Difficult	President's discretionary powers
306	Applying	Difficult	Judicial tools devised by courts
304	Applying	Average	Factor responsible for the growth of Indian indigo plantation
303	Applying	Average	Apex agency in making a law for a country
300			
299	Applying	Average	Development and its impact.
297	Knowing	Difficult	Extent of spread of the revolt of 1857
294	Applying	Average	The two textile industrial sites of the world
288	Applying	Average	How the British establish control over Bengal
281	Reasoning	Easy	New invention with the replacements of paper
268	Applying	Average	Concept of secularism
266	Applying	Easy	Judicial hierarchy
264	Knowing	Average	Parts of the Parliament
263	Knowing	Average	Various rivers of India
262	Knowing	Easy	The treatment meted out to Indians by British officials
260	Knowing	Easy	Features of economic activity with agriculture
257	Applying	Easy	The concept of development.
255	Applying	Easy	Reasons of spread of European trading companies in India
251	Knowing	Average	The forms of industries
250			
217	Knowing	Easy	Constitutional provisions for welfare of human beings

The map shows that Class VIII students demonstrated a wide range of ability in the domain of Social Science.

The overall Social Science test was found difficult; with only 5-6 items scoring below the average score of 250 on the scale used (0-500). The scores were in the range of 212-474, leaving little scope for lower ability students to perform on the Social Science test.

Students at the lower end of the scale i.e. those with scale scores in the range of, say, 212 to 250 demonstrated all three cognitive processes that had a clear context and involved non-complex tasks. For example, they were aware of the constitutional provisions for welfare of human beings, knew the various methods of irrigation, comprehended the industrial activities with understanding and understood the importance of healthy and skilled human.

Students performing in the intermediate range of the scale (say, 250 to 300) could do more in addition to that described above. They could interpret and relate information, establish relationships and find out solutions in different situations. Besides this, they also located places on the map, reasoned out the tenure of the Lok Sabha, identified cause and effect relationships and made inferences in various situations.

Students performing at the higher end of the scale i.e. those with scale scores above, 300 could do much more in addition to that described above. They knew and could explain the social reformers of modern India; who worked for upliftment of untouchables and improvement of women's status in the Indian Political system.

11.3 Sample Items

Listed below are some of the items that were used in the tests of Social Studies. Arranged in an increasing order of difficulty, statistics show how students responded to these items and these items can also be located in the given item map.

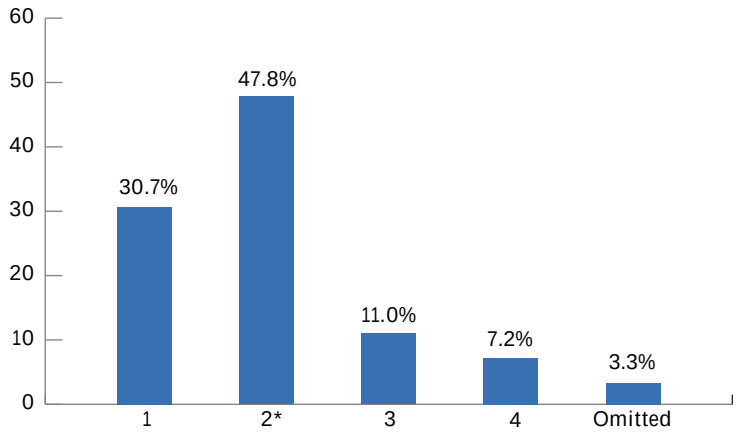
Sample Item: Knowing — Scale score: 225

Item 19. What attracted European trading companies to India?

1. Gold and Silver
2. Cotton, Silk and Spice
3. Flora and Fauna
4. Horses and Cattle

This item required students to know the basic reason of European traders coming to India. The scale score of this item was 255 i.e. nearly the average level of difficulty of items used in the survey. About 48% of students in the sample were able to select the correct answer (2). The chart shows how the remaining 52% responded.

Figure 11.1 (Item 19) | Percentage of Students in each Response Category



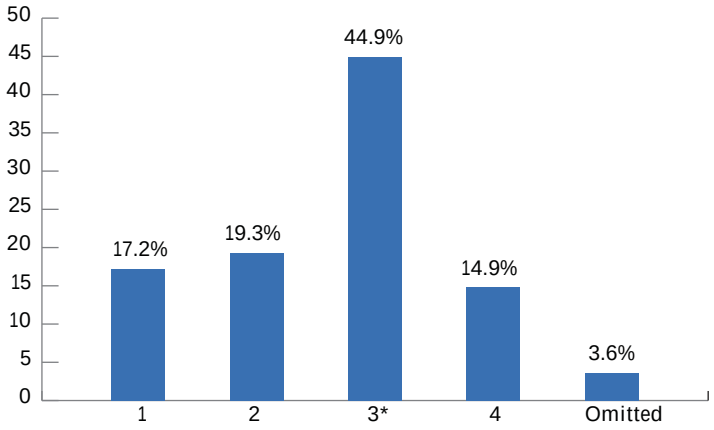
Sample Item: Knowing Scale score: 263

Item 28. Which Indian river flows through Pakistan also?

1. Ganga
2. Narmada
3. Satluj
4. Yamuna

This item required students to know the rivers originating from India and flowing through the neighboring countries. The scale score of this item was 263, which is slightly above the average level of difficulty of items in the survey. 45% of students in the sample were able to select the correct answer (3). The chart shows how the remaining 55% responded.

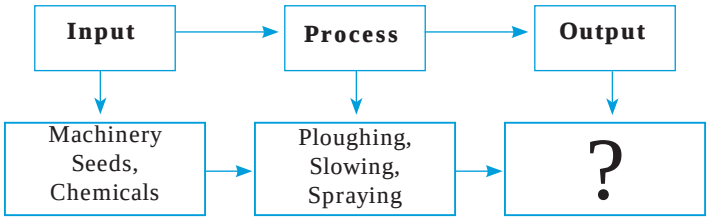
Figure 11.2 (Item 28) | Percentage of Students in each Response Category



Sample item: Applying Scale score : 212

Item 34. The diagram represents a process.

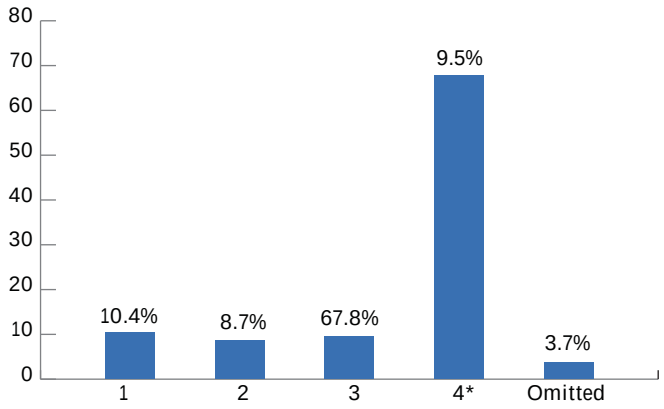
Choose the correct option for the blank box?



1. Animals
2. Birds
3. Fishes
4. Crops

This item required students to understand the industrial process and relationship between different stages. The scale score of this item was 212, i.e. far below the average score of difficulty of items in the survey. About 68% students in the sample selected the correct answer (4). The chart shows how the remaining 32% students responded.

Figure 11.3 (Item 34) | Percentage of Students in each Response Category



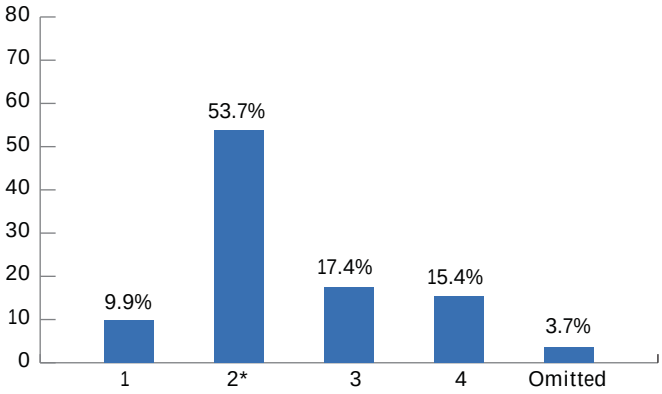
Sample Item: Applying — Scale score: 240

Item 27. We must educate and provide technical skills to the human resource because

1. We have ample amount of money.
2. They can help in developing our country.
3. Literate people look smart.
4. People of other nations are also educated.

This item required students to understand and apply the need of the human resource with in relation to various job profiles. The scaled score of this item was 240 i.e. below the average level of difficulty of items in the Social Science test. Nearly 54% students in the sample were able to select the correct answer (2). The chart shows how the remaining 46% responded.

Figure 11.4 (Item 27) | Percentage of Students in each Response Category

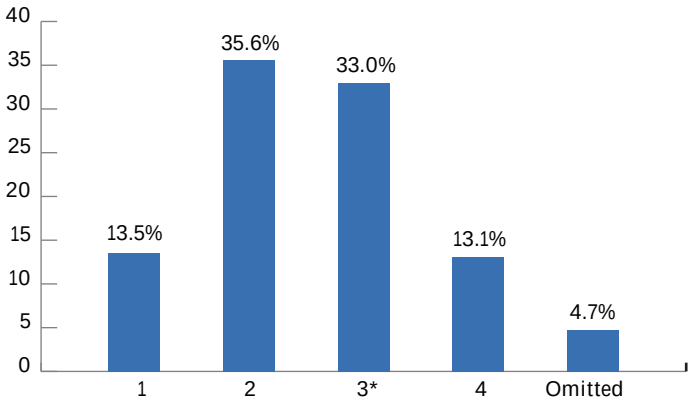


Item 47. A powerful caste decided to teach Rathnam a lesson. They set his hut on fire. He escaped and filed a case in a local police station. Which of the following acts rescues him?

1. Sedition Act 1870
2. Civil Rights Act 1964
3. Prevention of Atrocities Act 1989
4. Minimum Wages Act 1948

This item required students to reason out the act which is applicable in case of destruction of property of the deprived and loss of lives. The scale score of this item was 330, which is significantly above the average score and hence proved to be reasonably difficult. Only 33% of the students in the sample were able to select the correct answer (3). The chart shows how the remaining 67% responded.

Figure 11.5 (Item 47) | Percentage of Students in each Response Category



Performance on the sample items reproduced here for items 19, 27, 28, 34 and 47 varied across the country. Table 11.2 below shows the percentage of students in each state or union territory responding correctly to the items. The States/UTs are arranged in alphabetical order.

Table 11.2. | Performance on the Sample Items in States/UTs

State	Item 19 (%)	Item 27 (%)	Item 28 (%)	Item 34 (%)	Item 47 (%)
All sample	**48**	**54**	**45**	**68**	**33**
Andhra Pradesh	43	28	37	63	-
Arunachal Pradesh	56	50	43	58	25
Bihar	47	61	49	66	39
Chhattisgarh	38	56	58	69	40
Delhi	47	54	51	73	37
Goa	59	59	46	71	23
Gujarat	51	59	57	68	33
Haryana	47	54	47	71	41
Himachal Pradesh	55	53	28	63	31
Jammu & Kashmir	41	47	40	53	25
Jharkhand	49	61	47	72	40
Karnataka	57	50	48	72	40
Kerala	72	38	36	77	-
Madhya Pradesh	46	59	62	71	39
Maharashtra	55	59	60	69	41
Manipur	45	48	46	53	28
Meghalaya	36	49	30	54	23
Mizoram	38	44.8	24	53	26
Nagaland	41	56	27	57	24
Odisha	29	57	41	64	27
Punjab	40	67	32	81	35
Rajasthan	40	52	48	67	30
Sikkim	64	54	42	72	24
Tamil Nadu	41	44	30	66	36
Tripura	46	64	39	67	22
Uttar Pradesh	52	63	63	69	43
Uttarakhand	32	55	56	65	38
West Bengal	45	63	36	73	26
A & N Islands	53	56	51	69	30
Chandigarh	59	58	51	79	30
Puducherry	37	41	32	57	31
Dadra & Nagar Haveli	56	62	63	72	40
Daman & Diu	64	78	73	85	45

Due to translation effects item 47 in Andhra Pradesh and Kerala was deleted.

11.4 What Majority of Students Can Do in Social Science?

It has already been mentioned earlier, that the objective of this chapter is to highlight what the students performing at different levels of content domain on Social Science items can do. The items in Social Science were developed on the following content areas:

History

i) Education and British Rule
ii) Women and reform
iii) The Nationalist Movement
iv) The Revolt of 1857-58
v) The Establishment of company Power
vi) Colonialism and tribal Societies
vii) Craft and Industries
viii) Rural life and Society
ix) Challenging the Caste system
x) India After Independence

Geography

i) Agriculture Preservation
ii) Natural and Man made Resources
iii) Industries
iv) Human Resources

Civics

i) The Constitution
ii) The Judiciary
iii) Parliamentary Government
iv) Social justice and Marginalized
v) Economic Presence of government

The tables given below show the performance of Class VIII students on different content areas.

Table 11.3 | Performance of Class VIII students on the content area of Education and British Rule

In the content area of 'Education and British Rule', only four items were used for analysis of students' performance and overall, less than one-third of the sample could respond to the items correctly.

Item No.	Scale Value	% Correct
1	351	37.4
18	385	32.9
31	255	46.7
68	466	27.5
		Average=32.2

- Only 47% of the students could understand the concept of development.
- About 37% of the students could recognise who advocated British Education in India.
- Only one third of the survey students could understand the promotion and development of western education before independence.
- Nearly, 72% of the students could not understand the various philosophies of education in practise.

Table 11.4 | Performance of Class VIII Students on the Content Area of Women and Reform

Item No.	Scale Value	% Correct
3	295	40.8
5	283	42.0
		Average= 41.4

In the content area of 'Women and Reform' from History, only two items were retained for analysis finally. Both the items were responded correctly by about 41% and 42% students respectively. While item no. 3 was based on 'Politics initiated by British after 1857 revolt', item no. 5 was based on 'Clash of ideologies during reform movement'. Both these items were considered to be of average difficulty by subject experts.

Table 11.5 | Performance of Class VIII Students on the Content Area of the Nationalist Movement

Item No.	Scale Value	% Correct
15	397	34.3
22	286	39.7
25	268	43.4
41	281	37.8
65	392	30.7
90	262	45.2
		Average =36

In the content area of 'The Nationalist Movement', from the 'History' only 34% to 45% students could answer most of the items correctly. However, 69% of the students surveyed were not aware of the freedom struggle of India (Item 65).

- Only 43% of the students understood the concept of secularism.
- About 45% of the students knew about the treatment meted out to Indians by British Officials (General Dyer) during the infamous episode of Jallianwala Bagh massacre.
- Nearly 69% of the students were not aware of why the Swadeshi Movement was started during the freedom struggle of India.

Table 11.6 | Performance of Class VIII Students on the Content Area of the Revolt of 1857-58

Item No.	Scale Value	% Correct
10	456	27.7
17	317	31.7
63	297	41.3
		Average =33.2

- About 41% of the students could identify the extent of spread of the 1857 revolt on the given map.
- About 68-72% of the survey students could not identify the various rulers, who participated in the revolt and didn't know the impact of the 1857 revolt.

Table 11.7 | Performance of Class VIII students on the content area of the Establishment of Company Power

Out of the four items tested on the content area of 'establishment of company power', the students performed better on item no. 19 and 62, as compared to the remaining two items. On the basis of their performance on different items, it can be stated that:

Item No.	Scale Value	% Correct
16	275	39.9
19	255	47.8
20	352	29.6
62	288	44
		Average =34.7

- About 48% of the students were able to explain the reasons for the spread of European Trading Companies in India.
- Nearly 44% of the students could explain how the British established control over Bengal.
- Nearly 40% of the students could identify the mercantile trading companies, which wanted to establish trade with India.
- About 70% students didn't know what was the revenue policy of British Government related to cultivated land.

Table 11.8 | Performance of Class VIII Students on the Content Area of Rural Life and Society

Item No.	Scale Value	% Correct
24	304	37.2
		Average =37.2

Only one item was considered for analysis here, so it is not fair to make judgment about what the students could or couldn't do in the content area of the 'Rural Life and society'.

Table 11.9 | Performance of Class VIII Students on the Content Area of Challenging the Caste System

Item No.	Scale Value	% Correct
21	344	29.8
23	332	32.2
		Average =31.1

There were two items in the content area of 'Challenging the Caste System. The performance on both the items was not satisfactory, as only a mere fraction of less than 33% students could respond to these correctly.

11.10 | Performance of Class VIII Students on the Content Area of India after Independence

Item No.	Scale Value	% Correct
56	376	28.5
		Average =28.5

Only one item was considered for analysis here, so it is not fair to make judgment about what students could or couldn't do in the content area of 'India after Independence'.

11.11 | Performance of Class VIII Students on the Content Area of Agriculture

Item No.	Scale Value	% Correct
2	342	32.8
7	353	34.2
9	365	30.5
26	297	36.1
34	212	67.8
53	260	46.5
74	336	34.3
75	231	56.4
79	372	25.8
		Average =40

The student's performance on 9 items testing their abilities on the content area of 'Agriculture' shows, that the difficulty of items was directly related to the percentage of correct responses of the students. This meant higher the difficulty of the item, lesser the percentage of correct responses. Further, the percent of correct responses on these items ranged from 26% to 68%.

- About two-third of the students could identify the processes of cross production.
- About 56% of the students could identify the various forms of irrigation in the given picture.
- Nearly 47% of the students, knew about the feature of economic activities.
- Nearly one-fourth of the surveyed students couldn't relate the unknown situation with type of farming.
- About one-third (31% to 35%) of the students couldn't critically analyse the benefits of various types of irrigation and its uses in different regions of Jhum cultivation, population density etc.

Table 11.12 | Performance of Class VIII Students on the Content Area of Natural and Man made Resources

Item No.	Scale Value	% Correct
28	263	44.9
29	299	35.2
52	389	32.4
60	389	30.7
73	344	36.9
76	299	36.6
		Average =37.2

Performance of the students on items testing the content area of 'Natural and Man made Resources' was not good, as it only ranged from 32% to 45%.

- About 45% of the students knew the different rivers of India.
- About one-third of the students were familiar with soil formation.
- Nearly two-third of the students couldn't correlate the physical features with the type of energy produced by them.

Table 11.13 | Performance of Class VIII Students on the Content Area of Industries

The understanding of the students, in the content area of 'Industries', was tested through six items. The performance on these items varied from 26% to 49%. Moreover, out of the six items, the performance of students on three items was below 30%, i.e.; poor performance.

Item No.	Scale Value	% Correct
12	251	49.4
32	294	36.8
33	257	47.3
55	399	28.9
59	394	26.3
71	474	27.1
		Average =37.5

- Nearly half of the students, knew about agro based industries.
- About 47% of the surveyed students understood that both private and public sectors are participating in industrial production in our country.
- Approximately three-fourth of the surveyed students were aware of the types of industries' as well as various types of economic activities.

Table 11.14 | Performance of Class VIII Students on the Content Area of Human Resources

There was a large variation in the performance of the students on different items, ranging from 34% to 65%in the content area of 'Human Resource'.

Item No.	Scale Value	% Correct
27	240	53.7
30	213	65.0
72	341	33.5
		Average =42.7

- About two-third of the students could understand various industrial activities.
- About two-third of the students could not understand various forms of migration.

Table 11.15 | Performance of Class VIII Students on the Content Area of the Constitution

The performance of the students on items testing their understanding on content area of 'The Constitution' is not good, barring on item no. 35.

Item No.	Scale Value	% Correct
35	217	65.5
39	303	32.3
40	279	39.4
49	268	42.6
86	345	29.7
87	440	28.2
		Average =38.6

- About two-third of the students, knew the minimum age for men and women as per the Constitution of India.

Table 11.16 | Performance of Class VIII Students on the Content Area of the Judiciary

Item No.	Scale Value	% Correct
36	306	30
38	266	42.4
50	326	33.4
57	408	19
82	277	42.4
		Average =34.7

- Performance of the students on items testing the content area of 'The Judiciary' was not good, as it only ranged from 19% to 42%.
- About 42% of the students could identify judicial system and judicial hierarchy in India.
- About one-third of the students knew the judicial tools devised by courts.

Table 11.17 | Performance of Class VIII Students on the Content Area of Parliamentary Government

Item No.	Scale Value	% Correct
37	264	45.4
42	264	43.9
43	273	39.0
51	331	26.3
70	353	28.1
		Average =39

The data clearly indicates that the students' performance on items testing their understanding on the content area of 'Parliamentary Government' was not good.

- Only 45% of the students, knew that Supreme Court is not a part of Parliament in India.
- About 74% of the students couldn't understand that President Rule is imposed due to the breaking of Constitutional Machinery.
- Approximately 72% of the surveyed students didn't know the key constituents of the Indian Parliament.

Table 11.18 | Performance of Class VIII Students on the Content Area of Social Justice and Marginalized

Item No.	Scale Value	% Correct
44	303	32.4
45	359	25.7
47	330	33.0
83	347	24.7
88	300	36.9
		Average =28.7

The performance of the students on the content area of 'Social Justice and Marginalized' shows, that this content area was difficult for them; with the percentage of responses ranging from 25% to 37%.

There is a need of more understanding in this content area.

Table 11.19 | Performance of Class VIII students on the content area of Economic Presence of the Government

Item No.	Scale Value	% Correct
84	335	27.7
85	419	27.5
		Average =27.6

The overall performance was very poor on the content area of 'Economic Presence of the Government'.

- Majority of the students did not know about the Economic Presence of the Government, i.e.; Lapse in enforcement of Law e.g. Bhopal Gas Tragedy.

In overall, all the content areas covered under Social Science were found to be difficult for Class VIII students. The order of difficulty may be organized in decreasing order with 'Economic Presence of the Government', 'Social Justice and Marginalised', 'Challenging the Caste System', 'Resources', 'Education and British Rule',..... and 'Women and Reform'.

CHAPTER - 12

Association of Background Variables

The relationship between learning achievement of students and some variables related to student's home background and school were analyzed by using regression technique. International studies (OECD, 2001, 2004 and 2007) indicate that the student's related variables and learning achievement of students does not vary markedly across the subjects. Hence, the analysis presented is only for one of the four subjects, i.e.; Mathematics.

For analysis few key variables have been included because of their importance in attainment of educational success, i.e., socio-economic status, language spoken at home and location (urban/rural) of the school.

The following method of analysis is adopted:

- First the raw relation ('bivariate') between the background variable and the outcome in mathematics, is presented and then the relation is presented after allowing for these three 'key' variables altogether.
- One category, usually the largest, is designated as a 'base' category/group, and assigned a zero value, and all other categories/groups are defined in terms of their difference from the result of base category.
- Since key variables are a very important aspect of attainment, it often, though by no means unfailingly, happens that including such other, key variables in the regression means that the apparent univariate relationship is diluted.

If a relation between a variable and an outcome is not extinguished by making such allowances, it is reasonable to suggest that the variable is having an effect on the outcome.

The information in this chapter comes from the pupil and school questionnaires. It is important to keep in mind that the primary focus of this study was not to explain differences in attainment, but to compare the levels of attainment of entities in the national system.

12.1 Key Variables

12.1.1 Socio-economic Index

The first 'key' variable is socio-economic index. Literary and other resources available at home together form socio-economic index. It is a weighted combination of parental education, parental occupation, number of possessions, and number of books at home.

12.1.2 Language Spoken at Home

The second 'key' variable considered is the spoken language of instruction at home. It is to be expected that students familiar with the language of instruction in the classroom will be able to cope with teaching learning better and are likely to make more progress as compared to those who are not fully conversant with the language.

12.1.3 Location of the School

The third 'key' variable considered is location of the school, i.e., urban or rural area. It is generally observed that schools located in urban areas do better than their counter parts in rural areas as urban schools have better access to resources.

Since students are the basis for sampling, they have also been taken as the unit of analysis, regardless of the source of information from the questionnaires. That is, the results shown in the tables in this chapter are the percentages of students whose school principals reported on a particular activity or characteristic and who completed a test on the relevant subject, in this case mathematics. Typically, because of the matrix sampling scheme in which no student was tested in all the subjects, the results are based on half the number questionnaire responses received. When a principal or headmaster did not complete the assigned questionnaire, background data was not available for those students.

12.2 School Factors and Student Achievement

Previous National Achievement Surveys conducted by NCERT show that student performance is directly linked with the quality of education provided in the schools. Learning environment and school infrastructural facilities also contribute in all round development of the students. This section attempts to analyze the relationship of students' achievement with some school related variables.

12.2.1: Treatment Given to Variables Used in Analysis

School related variables were treated in the following manner:

Table 12.1 | School Related Variables and its Treatment for Regression Analysis

Variables	Categories of Variables	Treatment
School management	a) State Government/Department of Education, b) Government aided.	'GOVERNMENT ' as a base category
School type	a) Boys, b) Girls, c) Co-Ed.	'BOYS' as a base category
School inspection	a) Yes, b) No	'NO' as a base category
Working days in the academic year 2010-11	a) Less than 179 days, b) 180-220 days	'180-220 DAYS' as a base category
Working days per week	a) 5 days per week, b) 6 days per week	'5 DAYS' as a base category
Infrastructural facilities	a) Pucca, b) Not pucca	'NOT PUCCA' as a base category
Incentive schemes	a) Mid Day Meal, b) Free Uniform, c) Free Textbooks, d) Scholarship for attendance	Sum of 'yes' responses to the questions
Committees in schools	a) Yes, b) No	'NO' as a base category
School perception	a) Teacher's expectation, b) Parental support, c) Parental involvement, d) Students' desire to do well in school.	Responses were coded 'High as Yes' and 'Average and low as No'
Head teacher teaching class	a) Yes, b) No	'NO' as a base category
Behaviour problems	a) Arriving late at school, b) Absenteeism, c) Skipping class, d) Violating dress code,	Sum of' 'frequently and sometimes' responses to the questions

12.2.2 School Management Wise

Table 12.2 | Regression Results – School Management

School Management	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Government Aided	-8.69	2.02	*	-8.14	2.05	*

*Significant if P<.05

The sample comprised of around 72 percent government schools. Government schools were taken as a base category and the performance of students studying in government aided schools was lower by 8.69 scale score points than the students of government schools. Schools by management are significantly associated with performance of students. The data in table 12.2 shows that government schools are doing significantly better than aided schools. The similar kind of result is obtained when key variables are considered.

12.2.3 School Type

Table 12.3 | Regression Results – School Type

School Type	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Girls	6.46	4.63	NS	7.5	4.35	NS
Co-education	10.67	3.64	*	7.42	3.15	*

*Significant if P<.05, NS-Not Significant

Only boys' schools is taken as the base category, its score is taken as the zero point, and regressions for the other categories expressed as deviations from this. The results shows that type of schools and average performance of students studying in these schools are related. Thus, on average, students from co-education schools perform better by 10.67 score points than the students from boys' schools. Results indicate that only for girls' schools and coeducation schools did better than only boys' school. However, the difference was significant only in case of co-education schools. After including key variables in the above set of data the same kind of trend is observed.

12.2.4 School Inspection

Table 12.4 | Regression Results – School Inspection

School Inspection	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Yes	12.08	1.88	*	11.63	1.87	*

*Significant if P<.05

Inspection of the schools by authorities is an important administrative activity in the education system with a purpose to monitor and support the teaching learning activity.

Outcomes presented in Table 12.4 shows that the performance of students studying in the schools who had been inspected in the last academic year performed significantly better than those of students studying in the schools that were not inspected. Result after considering key variables also supported this finding. Output clearly indicates that school inspection has positive significant relationship with the performance of students of that school.

12.2.5 Working Days in the Academic Year 2010-11

Table 12.5 | Regression Results – Working Days in the School

Number of working days	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Less than 179 days/year	-8.11	3.22	*	-8.54	3.15	*

*Significant if P<.05

In India, most (94%) of the schools had 180-220 working days in the academic year 2010-11. Considering this as base category the regression analysis was carried out. Outcomes in the Table 12.5 clearly indicate that the performance of schools had less working days (less than 179 days in a year) has a significant negative association. Hence, it may be said that number of days may effect on performance of students. The similar kind of result was obtained after considering key variables.

12.2.6 Working Days Per Week

Table 12.6 | Regression Results – Working Days per week

Days per week	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
6 days	16.92	1.85	*	17.89	1.94	*

*Significant if P<.05

Of the surveyed schools, 82% schools had 6 working days per week. Data in table 12.6 shows that the achievement of students studying in schools with 6 working days in a week do significantly better in comparison to schools with 5 working days in a week. Hence, number of working days impacts the performance of students

The similar level of output is obtained after entering the key variables.

12.2.7 Infrastructural Facilities

Table 12.7 | Regression Results – Pucca Building

Facilities	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Pucca building	7.54	3.2	*	8.22	3.12	*

*Significant if P<.05

Under infrastructural facilities, the type of school building was considered. All surveyed schools were placed in two groups, i.e.; schools having pucca* buildings and schools without pucca buildings.

The data in Table 12.7depicts that type of building and achievement of students studying in these schools are significantly correlated. It may be stated that students those were studying in pucca buildings performed significantly better than those who were not studying in pucca buildings. The similar type of finding may also be observed after entering key variables.

* 'pucca' means concrete permanent building.

12.2.8 Incentive Schemes

Table 12.8 | Regression Results – Incentive Schemes

Incentives	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Mid day meal	7.65	3.45	*	7.37	3.45	*
Free uniform	7.51	1.94	*	7.27	2	*
Free textbooks	5.17	5.92	NS	5.61	5.83	NS
Scholarship for attendance	9.89	1.45	*	10.07	1.44	*

*Significant if P<.05, NS-Not Significant

Schools have various incentive schemes, such as mid-day meal, free uniform, free text books, scholarship for attendance etc. The main purpose of providing such incentive schemes is to retain students in the school, support and involve them in various curricular activities so that they are motivated to attend school regularly.

The outputs in table 12.8 show that mid-day meal scheme, free uniform distribution scheme and scholarship for attendance have significant positive relationship with the learning achievement of students. Similar kind of result was obtained after considering the key variables.

12.2.9 Committees in School

Table 12.9 | Regression Results – School Committees

School Committees	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
VEC/AEC/SMC	13.68	2.17	*	12.09	2.24	*

*Significant if P<.05

Output in Table 12.9 shows that achievement of students studying in those schools where VEC/AEC/SMC committee is formed have significant positive relationship. It means that students of schools where VEC/AEC/SMC committee was working performed significantly better than their counterparts where such committee did not exist. The same kind of result is obtained after entering key variables.

12.2.10 School Perception

Table 12.10 | Regression Results – School Perception

School Perception	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Teacher expectations for student achievement	4.07	1.86	*	4.14	1.8	*
Parental support for student achievement	2.36	2.63	NS	2.49	2.6	NS
Parental involvement in school activities	-4.14	2.45	NS	-4.16	2.45	NS
Students' desire to do well in school	9.79	1.86	*	9.69	1.83	*

*Significant if P<.05, NS-Not Significant

A range of variables related to perception of the head teachers about the school were asked. Significant positive relationship between was found between achievement of students in mathematics vis-à-vis high expectation. This relationship indicates that students in schools where teachers expect a high performance from their students performed better. Also the schools where students have a high desire to achieve high scores performed significantly better than those who have low or no desire to achieve higher scores in the examination. The similar type of finding is observed after entering key variables.

12.2.11 Head Teacher teaching class

Table 12.11 | Regression Results – Head Teacher Teaching Class

Teaching Class	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Yes	9.93	3.51	*	10.77	3.49	*

*Significant if P<.05

In the surveyed schools, about 92% head teachers were taking class (es) in their schools. The result in Table 12.11 shows that students studying in those schools, where head teachers were taking class (es) performed significantly better than those where head teachers were not taking class (es). It means that performance of students in Mathematics is related to the efforts made by the head teachers such as taking the class (es) themselves. The similar kind of result is also obtained after entering key variables.

12.2.12 Behaviour Problems

Table 12.12 | Regression Results – Behaviour Problem of Students

Behaviour Problem	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
	-9.82	2.77	*	-9.13	2.76	*

*Significant if P<.05

Information was collected from the head teachers on questions related to behaviour problem amongst students such as late arrival to school, absenteeism, skipping classes and violating dress code. The output in Table 12.12 shows that achievement of students who were studying in schools which reported late arrival to school, absenteeism, skipping classes and violating dress code was significantly lower than their counterparts studying in schools where said practices were not prevalent. This implies that achievement is negatively associated where students were having late arrival tendency, absenteeism, skipping classes and violating dress code. In other words, these schools were performing poor than those schools, where such type of problems were not persisting. Similar kind of result is also obtained after including key variables.

Summary of Findings

The school questionnaire information were collected on various variables related to school background, home school interaction, teaching learning process and school's social climate.

The results obtained through regression analysis on various variables related to schools were studied but presented only those have positive association with the learning achievement of students and may be considered in planning strategies.

The following variables appear to have a robust relationship or association with attainment of students in mathematics:

- Government schools (positive)
- Co-education schools (positive)
- School inspection (positive)
- More working days per week (positive)
- Pucca school buildings(positive)
- Incentive schemes such as mid day meal, free uniform and textbooks (positive)
- School committees(positive)
- Teacher expectations for students' achievement(positive)
- Students' desire to do well in school(positive)
- Head teacher taking class(es)(positive)
- Behaviour problem (negative)

12.3 Student Background and Achievement

Student learning never take place in isolation. It is influenced by various factors such as home background, school environment and socio cultural environment. This section seeks to understand the relationship between students' home background and achievement in Mathematics.

The same method of analysis is used to understand the influence of student background on achievement. First the relationship was considered on its own, and then after allowing for key variables. If a relation between a variable and an outcome is not extinguished by making such allowances, it is reasonable to suggest that the variable is associated with the outcome. As in the school regressions analyses, here also, one category, usually the largest, is designated as a 'base' category, and assigned a zero value, and all other categories were defined in terms of their difference from the base result.

12.3.1 Treatment Given to Variables Used in Analysis

The variables considered under the pupil background are as under:

Table 12.13 | Pupil Related Variables and its Treatment for Regression Variables

VARIABLES	CATEGORIES	TREATMENT
Category	a) Scheduled castes, b) scheduled tribes, c) OBCs, d) others	'OTHERS' as a base category
Physically challenged	a) Yes, b) No	'NO' as a base category
Distance to school	a) Upto 1 km, b) More than 1 km and upto 3 km, c) More than 3 km and upto 5 km, d) More than 5 km	'UPTO 1KM' as a base category
Attitude towards subject	a) Mathematics	'NONE' as a base category
Mathematics a difficult subject	a) Yes, b) No	'NO' as a base category
Learning of Mathematics	a) Solve problems in Mathematics, b) Work with other students in solving problems, c) Draw geometrical figures, d) Explain your answers	'AGREE' as a base category
Homework in Mathematics	a) Everyday, b) 3-4 times a week, c) 1-2 times a week, d) Never	'Everyday' as a base category
Homework checked at school	a) Everyday, b) 3-4 times a week, c) 1-2 times a week, d) Never	'Everyday' as a base category

VARIABLES	CATEGORIES	TREATMENT
Taking private tuition	a) Yes, b) No	'NO' as a base category
Learning related home activities	a) Watch television or videos, b) Read magazine/ newspapers, c) Read book, d) Play sports or games	'NO' as a base category

12.3.2 Category Wise

Table 12.14 | Regression Results– Category wise

Category	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
SC	-0.99	1.37	NS	-0.49	1.31	NS
ST	-7.94	1.79	*	-7.75	1.75	*
OBC	4.12	1.29	*	3.7	1.33	*

*Significant if P<.05, NS-Not Significant

Table 12.14 shows that there is a relationship between social category of the students and the achievement of students in Mathematics. The Schedule Tribe (ST) category students significantly under performed and Other Backward Caste (OBC) category students did significantly better as compared to students of 'Others' category in mathematics. However, in case of SC category no significant differences were observed. The same trend is observed with key variables.

12.3.3 Physically Challenged

Table 12.15 | Regression Results– Students Belonging to Physically Challenged

Physically Challenged	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Challenged	-12.42	1.48	*	-12.14	1.48	*

*Significant if P<.05

From table 12.15 it is clear that disability of students is negatively associated with their achievement in Mathematics. This means that pupils classified as physically challenged performed substantially lower than the rest of the students in Mathematics both without and with key variables.

It has an implication that physically challenged students should get more attention like special facilities, teaching methodology, etc. so as to improve their achievement and access to education.

12.3.4 Distance to School

An important aspect of school attendance is, evidently, the distance of school from the student's residence.

Table 12.16 | Regression Results– Distance to School

Distance	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
1 - 3 Km	-3.96	1.38	*	-4	1.35	*
3 -5 Km	-7.82	1.87	*	-7.62	1.81	*
5 +	-11.59	2.06	*	-10.8	1.94	*

*Significant if P<.05

Table 12.16 shows that the distance of school from residence of the students is significantly negatively associated with achievement of students in Mathematics. The similar kind of negative association of distance was observed after including key variables.

12.3.5 Attitude towards Subject

Having a positive attitude towards the subject yield a positive association with the performance of students.

Table 12.17 | Regression Results– Students Attitude towards Mathematics

Like Subject	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Mathematics	18.64	3.19	*	16.7	3.16	*

*Significant if P<.05

Positive attitude of students towards Mathematics has shown positive association with their achievement. The same kinds of results are also obtained after considering key variable.

12.3.6 Mathematics as Difficult Subject

Table 12.18 | Regression Results– Difficulty in Mathematics

Difficulty in Mathematics	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Yes	-10.28	1.14	*	-9.96	1.12	*

*Significant if P<.05

Table 12.18 shows that student's perception regarding difficulty of the subject has a significant relationship with achievement in that subject. The output clearly indicates that those students who reported that mathematics is difficult subject for them, performed significantly poorer than their counterparts, those who do not consider mathematics as a difficult subject for them. Similar kinds of results are also obtained after including key variables.

12.3.7 Learning of Mathematics

Table 12.19 | Regression Results– Mathematics Activities in Class

Activities in Class	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Solve problems	2.84	1.27	*	2.56	1.26	*
Solve problems in a group	7	1.26	*	6.82	1.25	*
Draw figures	3.7	1.28	*	3.17	1.27	*
Explain your answers	2.84	1.34	*	2.35	1.4	NS

*Significant if P<.05, NS-Not Significant

Results in table 12.19 clearly indicate that achievement of students in Mathematics has positive association with the mathematics activities undertaken by the teacher in the classroom. On the basis of outcomes it may be interpreted that those students who agreed that these activities were useful did significantly better in mathematics as compared

to those students who either opted, 'disagree' or 'neither agree or disagree'. The similar types of positive results are also obtained after including key variables, except in case of statement *'can explain how they got their answer'*.

Teachers may use these outcomes in improving the learning achievement of students in mathematics.

12.3.8 Getting Homework in Mathematics

Table 12.20 | Regression Results– Homework in Mathematics

Mathematics Homework	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
3-4 times per week	-2.79	2.13	NS	-2.9	2.15	NS
1-2 times per week	-8.16	1.76	*	-8.02	1.74	*
Never	-9.36	2.23	*	-9.17	2.27	*

*Significant if P<.05, NS-Not Significant

Data in Table 12.20 shows that students' achievement in Mathematics and frequency of homework given to them by teachers in Mathematics is associated. Students, who get home work 'every day' did significantly better than those students who get home work once or two times a week' or 'never' get home work in Mathematics. Further, the achievement of students who never get home work is highly negatively associated as compared to others. Even after adding key variables, the results were almost similar.

12.3.9 Homework Checked at School

Table 12.21 | Regression Results– Students getting Homework Checked at School

Homework Checked	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
3-4 times per week	-1.25	2.07	NS	-0.9	2.09	NS
1-2 times per week	-9.83	1.57	*	-9.2	1.6	*
Never	-10.87	1.76	*	-10.48	1.69	*

*Significant if P<.05, NS-Not Significant

Output presented in the table 12.21clearly indicates that regular checking of the homework by the teachers has significant positive relationship with the learning achievement of the students without and with key variables.

12.3.10 Taking Private Tuition

Table 12.22 | Regression Results– Students taking Private Tuition

Private tuition	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Yes	3.16	1.32	*	2.56	1.34	NS

*Significant if P<.05, NS-Not Significant

The data in table 12.22, data shows achievement of students taking private tuition is significantly positively correlated. It may be interpreted that private tuition has significant positive association with students' achievement in mathematics without key variable. But, after allowing for key variables, the similar kind of result was not obtained.

12.3.11 Learning-related Home Activities

In addition to formal homework or tutoring, out of school activities may also be associated with the learning of students in a positive or a negative way. Some activities may be directly related to subject taught in school, others less so. In Pupil Questionnaire, students were asked whether they indulged in other activities at home.

Table 12.23 | Regression Results– Students Doing Various Activities outside the School

Activities at Home	Without key variables			With key variables		
	Coeff	SE	Sig.	Coeff	SE	Sig.
Watch TV	-2.61	0.62	*	-2.46	0.61	*
Read Magazine	1.79	0.52	*	1.66	0.52	*
Read Books	1.14	0.6	NS	0.85	0.63	NS
Play Sports	2.92	0.6	*	2.54	0.6	*

*Significant if P<.05, NS-Not Significant

Watching TV, had significant negative association with achievement of students. Besides, the similar result though on the whole was obtained after allowing for the key variables. However, reading magazine and participation in sports, had shown positive association with achievement of students both without and after including key variables. It has an implication that parents have to take care of their children and their involvement in various activities.

Summary of Findings

Findings related to relationship between students achievement in Mathematics and students' home background, learning facilities at home and school clearly indicate positive association in most of the cases. These results are in tune with earlier National Achievement Surveys conducted by NCERT and also with other studies conducted in this area.

The following variables appear to have a robust relationship with attainment in Mathematics, in the sense that the relationship is statistically significant and are not extinguished by allowing for other important variables including home resources, speaking the language of instruction at home and location of the school:

- Students from deprived social groups (negative)
- Less distance to school from residence (positive)
- Being physically challenged (negative)
- Mathematics as Subject liking (positive)
- Mathematics activities in class(positive)
- Regular homework given (positive)
- Homework checked regularly in school(positive)
- Taking private tuition (positive)
- Home activities
  - » Watching TV (negative)
  - » Reading magazines (positive)
  - » Playing games and sports (positive)

Appendix – I

Sample Design and Procedures

This appendix to the Class VIII NAS report explains the sample design and the sampling methods of the survey. It describes the target and sample populations and the sample selection procedures. It sets out the necessary exceptions and their impact on the achieved sample. It also discusses sample weights and sample variance estimation within the survey.

Target Population

The Class VIII NAS was designed to investigate learning achievement in the government system at the level of the state or union territory. Hence, the target population was all Class VIII children studying in government and government-aided schools. Sample schools included those managed by the Department of Education/State Governments, tribal/social Welfare Departments, Zila Parishad and local bodies as well as private-but-government-aided schools. This follows the classification categories of the District Information System for Education (DISE). Completely private schools were not included in this survey.

The survey was available to all 35 states and UTs. However, Assam and Lakshadweep could not participate. Due to different academic year settings across states and UTs, the survey was administered later in eight winter closing states and two districts in Jammu and Kashmir. (See Table A-1.2)

Sampling Frame

The sampling frame of the survey was developed based on the two major national education databases, the All India School Education Survey (AISES) 2009/10 and the District Information System of Education (DISE) 2009/10, for the district and school selection. Utilising two different databases was inevitable due to incomplete Class VIII enrolment coverage of reported education statistics in India. However, this decision of sampling schools from different data sources ultimately led the survey to the failure of calculating ideal sample weights.

In each State sampling frame, school information of Class VIII was extracted from either the AISES or the DISE, whichever reports greater total enrolment figure. Even though the sampling aimed at the best accurate frame possible, school information from Gujarat in AISES 2009/10 was reported incomplete at the time of sampling consideration. However, the same information was not available in DISE 2009/10, because Class VIII is not classified as primary education in the state of Gujarat. Hence, the survey had no choice but considering the information from the AISES as the sampling frame for the State. See Table A-1.1 for the details of the data sources.

Population Exclusions

As is the case in other large-scale educational surveys, some sub-populations were excluded from the total target population at the initial stage of sampling. For logistical reasons, the survey excluded schools with fewer than eleven or, in some cases, six students depending on the enrolment characteristics of the States/UTs. However, the exclusion was allowed only within the limit of maximum 5% of the defined population size. Table A-1.1 shows population coverage of the Class VIII NAS sample after the sub-population exclusions.

Table A-1.1 | Data source of the sampling frame and the effect of small school exclusion on population coverage in States and UTs where Class VIII students were tested

States/Union Territories	Data source	Target population size	Minimum school enrolment	Population size after exclusion	Population coverage
Andhra Pradesh	AISES	7,66,329	11	7,65,332	99.87%
Arunachal Pradesh	DISE	22,355	6	22,163	99.14%
Bihar	DISE	10,92,472	11	10,84,604	99.28%
Chhattisgarh	AISES	3,59,651	6	3,56,581	99.15%
Delhi	AISES	2,92,173	6	2,92,166	100%
Goa	AISES	20,619	11	20,553	99.68%
Gujarat*	AISES	6,45,925	11	6,45,679	99.96%
Haryana	DISE	2,40,113	11	2,37,980	99.11%
Himachal Pradesh	AISES	1,26,868	6	1,26,097	99.39%
Jammu & Kashmir	AISES	1,33,940	6	1,31,978	98.54%
Jharkhand	DISE	3,79,858	11	3,70,473	97.53%
Karnataka	AISES	7,61,040	11	7,58,740	99.70%
Kerala	AISES	4,77,405	11	4,77,215	99.96%
Madhya Pradesh	AISES	7,77,188	11	7,50,709	96.59%
Maharashtra	AISES	15,85,202	11	15,84,948	99.98%
Manipur	AISES	15,862	6	15,539	97.96%
Meghalaya	AISES	40,542	11	39,348	97.05%
Mizoram	AISES	14,404	11	14,136	98.14%
Nagaland	DISE	13,443	6	13,339	99.23%
Odisha	AISES	5,73,249	11	5,68,490	99.17%
Punjab	AISES	3,05,400	11	3,02,907	99.18%
Rajasthan	DISE	6,15,133	6	6,05,560	98.44%
Sikkim	DISE	9,165	11	8,822	96.26%
Tamil Nadu	DISE	9,85,630	11	9,81,326	99.56%
Tripura	AISES	57,790	11	55,992	96.89%
Uttar Pradesh	DISE	15,53,549	11	15,19,132	97.78%
Uttarakhand	DISE	1,29,817	6	1,28,601	99.06%
West Bengal	DISE	12,84,668	11	12,83,925	99.94%
Andaman & Nicobar Islands	AISES	6,523	11	6,316	96.83%
Chandigarh	AISES	11,426	11	11,413	99.89%
Puducherry (State)	AISES	16,313	11	16,296	99.90%
Dadra & Nagar Haveli	AISES	5,143	No Exc	5,143	100%
Daman & Diu	AISES	3,437	No Exc	3,437	100%

*The enrolment data from Gujarat covers 93% of schools in the state at the time of data consideration.

Sample Design and Selection

The Class VIII NAS sampling was conducted targeting 250 sample schools and 5,000 students per subject from each state, except for the bigger and smaller states/UTs, in order to achieve the same data accuracy as simple random selection of 400 students at the 95% confidence level. However, educational conditions in each State vary, so do the numbers of sample schools and students. The number of sample schools ranged from 32 (Daman & Diu) to 300 (Uttar Pradesh) across states. Any number of sample schools smaller than 250 was due to the insufficient total number of schools in states for selecting sample schools with two replacements. Estimated sample size from each state is listed in Table A-1.2. The numbers in the "Estimated Sample Size" column of the table were counted assuming that the maximum of 40 students would be selected for testing in two different subjects per sample school.

In general, developing the sample for each States/UTs involved a three-stage cluster design which used a combination of two probability sampling methods, Simple Random Sampling (SRS) and Probability Proportional to Size (PPS) sampling. In SRS, all sampling units have an equal probability of being selected. When PPS is applied, larger sampling units have a higher probability of selection than smaller units. PPS sampling method was used for district and school selection (first and second stages) and SRS for student selection (third stage). However, different approaches were made in the sampling in small states/UTs where there are fewer numbers of districts and schools yielding relatively small student enrolment. All districts and all schools were sampled in seven state and UTs (Andaman & Nicobar Islands, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Lakshadweep, Puducherry and Sikkim). In five states in the North East, SRS method was applied to select schools after the district selection by PPS. Table A-1.2 summarises the detailed sampling specifics in each state.

At the first stage of sampling, districts were selected using PPS sampling principles except for the small UTs with less than five districts, where all districts were considered for sampling. PPS implies that the probability of selecting a particular district depended on the number of Class VIII students enrolled in that district. There were two general rules to determine the number of sample districts. First, for the seven states with more than 30 districts, 40% of the districts were sampled. Second, for the other states, the number of districts to be selected was determined using an adaptation of the Finite Population Correction (FPC) formula. It was assumed that a sample of twenty districts was sufficient for representing an infinite population of districts. Hence, the following formula was used to calculate the number of sample districts from each state:

$$n_i = n_0/(1 + n_0/N_i)$$

where

n_i = number of districts to be sampled from i^{th} States/UTs;

n_0 = number of districts required to represent infinite population of districts (taken as 20);

N_i = number of districts in i^{th} States/UTs.

At the second stage, in the chosen districts, the requisite number of schools were selected using PPS principles. The measure of size was based on Class VIII enrolment data from the sampling frame (DISE 2009/10 or AISES 2009/10, whichever the state sampling frame data was extracted from).The schools were sorted according to this measure of size in each sample district to give an implicit stratification before taking a systematic sample. Two replacement schools were assigned for each sample school. Thrice as many schools as required were selected, in a set, with one of each set being selected, and the others being utilised as a reserve in case it was not possible to collect data from the original. However, in some states listing only one replacement school was possible due to the limited number of schools in the sampling frame. In addition, for some sample schools, the sampling failed to match any replacement school due to the difficulty of finding similarities in school characteristics.

At the third stage, the required number of students in each school was selected using SRS. The step-by-step instruction for taking a simple random sample of students was provided by the NCERT in order to facilitate test administration. The maximum number of students to be tested from a school was set as 40 with exceptions in several UTs. Once students were selected, they were divided into two different groups and each student was tested in two subjects. Two different test forms of each subject were evenly distributed among selected students.

Table A-1.2 summarises the criteria applied to the sampling of the survey by state. One aspect of this table may come as something of a surprise to readers not familiar with the details of sampling theory. The precision of a statistic from a sample is a function of the size of the sample, and is essentially independent of the size of the population from which it comes. So, from tables A-1.1 and A-1.2 it can be seen that the size of the target samples from Uttar Pradesh (target Class VIII population 15,53,549) and Himachal Pradesh (target Class VIII population 1,26,868) are comparable, despite the wide range in population sizes.

Table A-1.2 | Sampling Criteria by State

States/UTs	Total Districts	Sample Dist	Sampling Principle: District	Sample Schools	Sampling Principle: School	Estimated sample size**	Schools Participated
Andhra Pradesh	23	11	PPS	270	PPS	10,446	257
Arunachal Pradesh*	16	8	PPS	250	SRS	9,535	237
Bihar	37	15	PPS	270	PPS	10,198	256
Chhattisgarh	18	9	PPS	250	PPS	8,026	239
Delhi	9	6	PPS	250	PPS	10,000	238
Goa	2	2	All dist	250	PPS	9,199	198
Gujarat	26	11	PPS	250	PPS	9,880	233
Haryana	21	10	PPS	250	PPS	8,929	208
Himachal Pradesh	12	8	PPS	250	PPS	8,003	233
Jammu & Kashmir*	22	10	PPS	270	PPS	7,942	243
Jharkhand	24	11	PPS	250	PPS	9,092	209
Karnataka	29	12	PPS	270	PPS	10,284	235
Kerala	14	8	PPS	250	PPS	9,983	244
Madhya Pradesh	50	20	PPS	270	PPS	9,246	226
Maharashtra	35	14	PPS	270	PPS	10,637	245
Manipur*	9	4	PPS	250	SRS	6,664	257
Meghalaya*	7	4	PPS	250	SRS	12,932	159
Mizoram*	8	6	PPS	250	SRS	10,095	263
Nagaland*	11	7	PPS	250	SRS	9,116	83
Odisha	30	12	PPS	250	PPS	9,817	244
Punjab	20	10	PPS	250	PPS	9,225	225
Rajasthan	33	13	PPS	270	PPS	7,501	257
Sikkim*	4	4	All dist	247	All sch	6,781	125
Tamil Nadu	30	12	PPS	250	PPS	9,677	243
Tripura*	4	3	PPS	250	PPS	8,711	233
Uttar Pradesh	71	28	PPS	300	PPS	10,834	232
Uttarakhand	13	8	PPS	270	PPS	8,467	265
West Bengal*	20	9	PPS	270	PPS	10,682	237
Andaman & Nicobar Islands	3	3	All dist	111	All sch	3,677	84
Chandigarh	1	1	All dist	75	All sch	3,588	68
Pondicherry	4	4	All dist	200	All sch	7,628	189
Dadra & Nagar Haveli	1	1	All dist	60	All sch	4,661	41
Daman & Diu	2	2	All dist	32	All sch	1,076	16

*Winter Closing States (In J&K only, 2 Dist. - Udhampur & Rajouri were winter closing states.)

**Total Class Size = 40 or All student

Sampling Frame, Sample Weights and Sample Variance Estimation

In the survey, the sampling for districts and schools was based on Class VIII enrolment data from DISE 2009/10 and AISES 2009/10. Simple random sampling was conducted according to the class registers available in selected schools. Although the DISE and AISES data was not free from criticism, they were used because they were considered to be the most complete and up to date enrolment data available at the time of sampling. Unfortunately, due to discrepancies and incompleteness in the DISE and AISES data and loss of information at the administration stages of the survey, it was impossible to estimate ideal sample weights, which reflect the Class VIII population. The survey managed to calculate the district and school weights based on the enrolment figures from the sampling frame, which were collected in the academic year 2009/10. The student weights, however, were based on the information collected from the participated schools at the time of the survey, the academic year 2012/13. Therefore, each States/ UTs carried equal weight as a reporting unit.

Because of the arrangements for replacing non-co-operating schools with an equivalent (see above), it is considered that response rates at school level are essentially satisfactory in most of the States (See Table A-1.2).However, in some States and UTs, school participation was insufficient by the international standard, 80% participation rate at school level. The school response rate varied from 33% to over 100% (due to over-participation). The low response rates in Uttar Pradesh and Daman & Diu were due to the test data exclusion by the NCERT after the data collection under the suspicion of cheating. Even though the response rates were not satisfactory in some cases, data from all the states was included for the analysis of the survey, considering that low participation is mainly caused by the unavailability of replacement schools due to the limited number of schools in the sampling frame.

Class VIII NAS adopted systematic probability sampling techniques and matrix sampling methods to improve its cost-effectiveness and to reduce the burden on students of responding to a long test. However, improving the efficiency of the survey came at a cost of some variance or uncertainty in the analysis. In order to quantify this uncertainty, the survey estimated the standard errors due to sampling for all reported statistics. Various techniques were explored. For the key statistical indicators, a replication procedure (jack-knife method) was used to estimate standard errors.

Design Effects

The design of the sample, whereby schools were sampled, and then pupils within the sampled schools, rather than a simple random sample meant considerable advantages in terms of convenience of administration and in efficiency of use of school time. Conversely it meant that it reduced the precision of results in comparison with a simple random sample. The impact of sampling clusters rather than individual students is known as the *design effect*, and can be of considerable use in planning future surveys with a similar design. One commonly used measure of the design effect is the statistic 'rho' defined below.

$$\text{Rho} = \frac{\text{estimated variance of achieved sample}}{\text{Estimated variance of simple random sample of the same size}}$$

The design effect for the four subjects tested in the Class VIII NAS, calculated from the survey data, are shown in Table A-1.3 below.

Table A-1.3 | Design Effects Class VIII NAS

Subject Outcome	deff	sqrt_deff
Language	1.08	1.04
Mathematics	1.22	1.10
Science	1.09	1.04
Social Sciences	1.18	1.08

These results mean that, for example, the variance of the estimate of the mean mathematics score is 22% as large as that of a simple random sample of pupils of the same size, and that to give the same degree of precision, the sample would need to be around 10% as large for estimating the mean of the language and science score, around 20% as large for mathematics and social sciences. The last column, labelled sqrt deff, shows the ratio of the standard errors: thus the standard error for mathematics for the achieved design would be 10% as large as that for a comparable simple random sample.

Appendix - II

School Related Variables

Table A-2.1 | State wise Distribution of School Location

States or Union Territories	Rural (%)	Urban (%)	Total (N)
Andhra Pradesh	80.0	20.0	255
Arunachal Pradesh	84.5	15.5	226
Bihar	88.1	11.9	244
Chhattisgarh	83.6	16.4	238
Delhi	20.1	79.9	229
Goa	70.9	29.1	179
Gujarat	63.6	36.4	225
Haryana	83.2	16.8	202
Himachal Pradesh	92.0	8.0	224
Jammu & Kashmir	90.8	9.2	240
Jharkhand	84.5	15.5	193
Karnataka	62.2	37.8	230
Kerala	78.0	22.0	209
Madhya Pradesh	82.7	17.3	202
Maharashtra	54.8	45.2	241
Manipur	64.8	35.2	230
Meghalaya	67.1	32.9	155
Mizoram	69.9	30.1	236
Nagaland	81.7	18.3	82
Odisha	88.4	11.6	242
Punjab	73.3	26.7	221
Rajasthan	92.2	7.8	255
Sikkim	90.8	9.2	120
Tamil Nadu	60.1	39.9	238
Tripura	78.9	21.1	223
Uttar Pradesh	93.7	6.3	222
Uttarakhand	84.6	15.4	259
West Bengal	80.7	19.3	233
A & N Islands	83.7	16.3	98
Chandigarh	27.9	72.1	68
Puducherry	51.6	48.4	184
Dadra & Nagar Haveli	90.9	9.1	33
Daman & Diu	86.7	13.3	15
Overall	**75.4**	**24.6**	**6451**

Table A-2.2 | State wise Distribution of Schools Inspected in 2011-2012

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	41.5	58.5	253
Arunachal Pradesh	85.7	14.3	230
Bihar	92.9	7.1	241
Chhattisgarh	90.5	9.5	231
Delhi	83.6	16.4	225
Goa	26.5	73.5	181
Gujarat	69.5	30.5	226
Haryana	84.5	15.5	200
Himachal Pradesh	53.9	46.1	217
Jammu & Kashmir	79.7	20.3	237
Jharkhand	88.1	11.9	193
Karnataka	49.1	50.9	222
Kerala	62.6	37.4	211
Madhya Pradesh	100.0	0.0	203
Maharashtra	49.8	50.2	239
Manipur	80.9	19.1	246
Meghalaya	55.8	44.2	147
Mizoram	65.7	34.3	236
Nagaland	77.8	22.2	81
Odisha	63.4	36.6	238
Punjab	77.4	22.6	217
Rajasthan	79.4	20.6	253
Sikkim	87.4	12.6	119
Tamil Nadu	44.1	55.9	238
Tripura	97.8	2.2	230
Uttar Pradesh	92.1	7.9	228
Uttarakhand	80.6	19.4	253
West Bengal	59.6	40.4	235
A & N Islands	73.2	26.8	97
Chandigarh	69.7	30.3	66
Puducherry	84.3	15.7	185
Dadra & Nagar Haveli	100.0	0.0	34
Daman & Diu	100.0	0.0	14
Overall	**72.6**	**27.4**	**6426**

Table A-2.3 | State wise Distribution of Schools as per the days of working in 2010-11

States or Union Territories	Less than 150 days (%)	150 to 179 days (%)	180 to 220 days (%)	Total (N)
Andhra Pradesh	0.0	0.0	100.0	242
Arunachal Pradesh	0.9	11.6	87.6	225
Bihar	0.9	3.5	95.6	227
Chhattisgarh	0.9	1.4	97.7	221
Delhi	0.0	1.5	98.5	198
Goa	0.0	0.0	100.0	177
Gujarat	7.4	1.5	91.1	202
Haryana	0.0	3.2	96.8	190
Himachal Pradesh	0.0	1.5	98.5	205
Jammu & Kashmir	1.0	11.0	88.1	210
Jharkhand	0.5	1.1	98.4	182
Karnataka	0.0	0.0	100.0	212
Kerala	0.5	7.1	92.3	196
Madhya Pradesh	0.0	0.5	99.5	198
Maharashtra	0.4	1.8	97.8	228
Manipur	2.1	26.2	71.7	237
Meghalaya	0.7	22.8	76.6	145
Mizoram	1.4	6.3	92.3	207
Nagaland	0.0	25.6	74.4	78
Odisha	2.7	1.8	95.4	219
Punjab	0.0	3.0	97.0	202
Rajasthan	0.0	6.0	94.0	232
Sikkim	0.8	0.8	98.3	118
Tamil Nadu	0.0	1.4	98.6	215
Tripura	0.0	2.6	97.4	228
Uttar Pradesh	0.9	1.4	97.7	214
Uttarakhand	0.0	0.9	99.1	235
West Bengal	0.5	4.6	95.0	219
A & N Islands	0.0	1.1	98.9	91
Chandigarh	0.0	0.0	100.0	65
Puducherry	0.0	2.9	97.1	175
Dadra & Nagar Haveli	3.3	0.0	96.7	30
Daman & Diu	0.0	0.0	100.0	14
Overall	**0.8**	**4.6**	**94.6**	**6037**

Table A-2.4 | State wise Distribution of Schools as per the days of working in 2011-12

States or Union Territories	Less than 150 days (%)	150 to 179 days (%)	180 to 220 days (%)	Total (N)
Andhra Pradesh	0.4	0.8	98.8	246
Arunachal Pradesh	1.4	12.2	86.5	222
Bihar	1.8	2.2	96.1	228
Chhattisgarh	0.9	3.1	96.0	227
Delhi	0.0	1.4	98.6	210
Goa	0.0	1.2	98.8	162
Gujarat	6.3	6.8	87.0	207
Haryana	0.0	3.1	96.9	193
Himachal Pradesh	1.0	2.0	97.1	205
Jammu & Kashmir	0.0	8.1	91.9	198
Jharkhand	0.0	1.1	98.9	180
Karnataka	0.4	0.4	99.1	226
Kerala	0.5	13.0	86.5	185
Madhya Pradesh	0.0	1.0	99.0	197
Maharashtra	0.4	0.9	98.7	230
Manipur	1.9	16.0	82.0	206
Meghalaya	1.4	19.3	79.3	145
Mizoram	1.4	9.8	88.8	215
Nagaland	0.0	14.5	85.5	76
Odisha	3.0	2.6	94.4	232
Punjab	0.5	2.1	97.4	190
Rajasthan	0.0	10.3	89.7	224
Sikkim	0.9	0.0	99.1	115
Tamil Nadu	0.0	0.4	99.6	227
Tripura	0.0	2.7	97.3	226
Uttar Pradesh	1.5	5.9	92.6	203
Uttarakhand	0.4	0.4	99.2	245
West Bengal	0.9	4.5	94.6	223
A & N Islands	1.1	8.5	90.4	94
Chandigarh	0.0	0.0	100.0	68
Puducherry	0.0	1.1	98.9	174
Dadra & Nagar Haveli	3.3	0.0	96.7	30
Daman & Diu	0.0	0.0	100.0	15
Overall	**0.9**	**4.7**	**94.4**	**6024**

Table A-2.5 | State wise Distribution of Schools as per number of working days per week

States or Union Territories	5 days per week (%)	6 days per week (%)	Total (N)
Andhra Pradesh	1.9	98.1	260
Arunachal Pradesh	3.4	96.6	233
Bihar	2.9	97.1	244
Chhattisgarh	2.1	97.9	237
Delhi	0.4	99.6	230
Goa	1.6	98.4	183
Gujarat	2.2	97.8	227
Haryana	3.0	97.0	202
Himachal Pradesh	1.8	98.2	225
Jammu & Kashmir	2.9	97.1	241
Jharkhand	0.5	99.5	192
Karnataka	3.9	96.1	231
Kerala	97.7	2.3	215
Madhya Pradesh	0.5	99.5	203
Maharashtra	14.0	86.0	242
Manipur	3.6	96.4	249
Meghalaya	96.8	3.2	157
Mizoram	98.8	1.2	241
Nagaland	69.4	30.6	85
Odisha	4.9	95.1	243
Punjab	4.0	96.0	225
Rajasthan	0.4	99.6	256
Sikkim	1.6	98.4	124
Tamil Nadu	73.4	26.6	241
Tripura	0.0	100.0	232
Uttar Pradesh	4.4	95.6	227
Uttarakhand	.4	99.6	261
West Bengal	0.0	100.0	237
A & N Islands	7.1	92.9	98
Chandigarh	0.0	100.0	68
Puducherry	89.2	10.8	186
Dadra & Nagar Haveli	0.0	100.0	34
Daman & Diu	0.0	100.0	15
Overall	**17.6**	**82.4**	**6544**

Table A-2.6 | State wise Distribution of Schools which have received school grants

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	85.5	14.5	249
Arunachal Pradesh	83.5	16.5	224
Bihar	76.1	23.9	238
Chhattisgarh	93.1	6.9	231
Delhi	91.9	8.1	222
Goa	95.5	4.5	177
Gujarat	15.7	84.3	216
Haryana	95.5	4.5	200
Himachal Pradesh	98.2	1.8	222
Jammu & Kashmir	92.3	7.7	235
Jharkhand	92.6	7.4	189
Karnataka	51.2	48.8	213
Kerala	85.8	14.2	212
Madhya Pradesh	86.1	13.9	202
Maharashtra	75.2	24.8	234
Manipur	88.8	11.3	240
Meghalaya	65.8	34.2	155
Mizoram	96.3	3.8	240
Nagaland	85.7	14.3	84
Odisha	42.8	57.2	236
Punjab	87.8	12.2	221
Rajasthan	82.8	17.2	250
Sikkim	100.0	0.0	124
Tamil Nadu	92.1	7.9	240
Tripura	99.6	0.4	231
Uttar Pradesh	82.1	17.9	224
Uttarakhand	81.6	18.4	255
West Bengal	89.6	10.4	231
A & N Islands	98.0	2.0	98
Chandigarh	95.6	4.4	68
Puducherry	96.2	3.8	185
Dadra & Nagar Haveli	94.1	5.9	34
Daman & Diu	100.0	0.0	14
Overall	**83.3**	**16.7**	**6394**

Table A-2.7 | State wise Distribution of Schools according to the utilization of school grants

States or Union Territories	New Classrooms (%)	School Maintenance (%)	Teaching Learning Material (%)	School Development (%)	Total (N)
Andhra Pradesh	22.2	74.4	1.4	1.9	207
Arunachal Pradesh	7.5	79.6	5.9	7.0	186
Bihar	23.3	64.2	6.3	6.3	176
Chhattisgarh	10.0	76.3	7.1	6.6	211
Delhi	4.9	64.0	29.1	2.0	203
Goa	1.8	46.4	51.2	0.6	166
Gujarat	24.2	21.2	48.5	6.1	33
Haryana	38.1	52.4	2.1	7.4	189
Himachal Pradesh	12.5	66.2	12.0	9.3	216
Jammu & Kashmir	6.6	84.0	4.7	4.7	213
Jharkhand	12.2	77.3	5.2	5.2	172
Karnataka	22.4	61.7	14.0	1.9	107
Kerala	6.7	32.2	57.8	3.3	180
Madhya Pradesh	5.8	89.0	3.5	1.7	173
Maharashtra	3.6	32.0	62.1	2.4	169
Manipur	18.5	64.9	12.2	4.4	205
Meghalaya	15.5	57.7	16.5	10.3	97
Mizoram	31.9	63.8	1.3	3.1	229
Nagaland	12.7	78.9	4.2	4.2	71
Odisha	15.1	44.1	33.3	7.5	93
Punjab	30.2	58.2	8.5	3.2	189
Rajasthan	16.6	62.0	13.7	7.8	205
Sikkim	9.8	87.7	0.8	1.6	122
Tamil Nadu	9.5	65.0	18.2	7.3	220
Tripura	10.5	73.4	8.3	7.9	229
Uttar Pradesh	9.4	74.0	4.4	12.2	181
Uttarakhand	3.4	65.7	9.8	21.1	204
West Bengal	55.7	38.8	3.0	2.5	201
A & N Islands	6.3	80.2	7.3	6.3	96
Chandigarh	0.0	90.6	9.4	0.0	64
Puducherry	5.6	85.3	7.3	1.7	177
Dadra & Nagar Haveli	6.5	45.2	29.0	19.4	31
Daman & Diu	7.1	50.0	35.7	7.1	14
Overall	**14.9**	**65.3**	**14.1**	**5.7**	**5229**

Table A-2.8 | State wise Distribution of Schools visited by BRC/CRC

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	49.6	50.4	226
Arunachal Pradesh	89.6	10.4	230
Bihar	97.5	2.5	236
Chhattisgarh	91.8	8.2	232
Delhi	84.7	15.3	209
Goa	85.6	14.4	167
Gujarat	19.7	80.3	173
Haryana	93.5	6.5	199
Himachal Pradesh	84.7	15.3	222
Jammu & Kashmir	74.5	25.5	231
Jharkhand	97.9	2.1	193
Karnataka	72.9	27.1	221
Kerala	82.6	17.4	207
Madhya Pradesh	96.6	3.4	203
Maharashtra	61.2	38.8	227
Manipur	76.1	23.9	230
Meghalaya	68.0	32.0	150
Mizoram	98.8	1.3	240
Nagaland	72.5	27.5	80
Odisha	85.8	14.2	240
Punjab	82.8	17.2	203
Rajasthan	61.4	38.6	249
Sikkim	88.7	11.3	124
Tamil Nadu	97.0	3.0	235
Tripura	96.1	3.9	230
Uttar Pradesh	92.0	8.0	225
Uttarakhand	91.4	8.6	256
West Bengal	71.6	28.4	229
A & N Islands	95.9	4.1	98
Chandigarh	97.0	3.0	67
Puducherry	72.2	27.8	176
Dadra & Nagar Haveli	100.0	0.0	33
Daman & Diu	93.3	6.7	15
Overall	**81.7**	**18.3**	**6256**

Table A-2.9 | State wise Distribution of Schools having Parent Teacher Association

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	90.2	9.8	246
Arunachal Pradesh	42.5	57.5	226
Bihar	54.0	46.0	226
Chhattisgarh	85.8	14.2	232
Delhi	98.7	1.3	226
Goa	97.7	2.3	176
Gujarat	51.4	48.6	179
Haryana	85.4	14.6	198
Himachal Pradesh	52.4	47.6	210
Jammu & Kashmir	72.4	27.6	232
Jharkhand	46.2	53.8	184
Karnataka	53.3	46.7	214
Kerala	94.8	5.2	212
Madhya Pradesh	35.7	64.3	199
Maharashtra	96.6	3.4	234
Manipur	50.0	50.0	216
Meghalaya	45.3	54.7	148
Mizoram	63.1	36.9	233
Nagaland	50.0	50.0	80
Odisha	75.0	25.0	236
Punjab	98.6	1.4	221
Rajasthan	85.5	14.5	249
Sikkim	63.9	36.1	122
Tamil Nadu	94.8	5.2	233
Tripura	99.1	0.9	232
Uttar Pradesh	92.3	7.7	222
Uttarakhand	76.5	23.5	251
West Bengal	76.3	23.7	228
A & N Islands	100.0	0.0	95
Chandigarh	71.9	28.1	64
Puducherry	88.5	11.5	182
Dadra & Nagar Haveli	50.0	50.0	32
Daman & Diu	86.7	13.3	15
Overall	**74.7**	**25.3**	**6253**

Table A-2.10 | State wise Distribution of Schools whether parents attend special events or not

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	95.3	4.7	253
Arunachal Pradesh	91.3	8.7	231
Bihar	97.0	3.0	236
Chhattisgarh	98.7	1.3	236
Delhi	97.3	2.7	225
Goa	98.3	1.7	178
Gujarat	100.0	0.0	219
Haryana	99.5	0.5	198
Himachal Pradesh	98.7	1.3	224
Jammu & Kashmir	84.7	15.3	235
Jharkhand	98.4	1.6	192
Karnataka	98.2	1.8	226
Kerala	97.6	2.4	212
Madhya Pradesh	98.5	1.5	202
Maharashtra	97.1	2.9	239
Manipur	73.6	26.4	231
Meghalaya	91.4	8.6	151
Mizoram	65.2	34.8	227
Nagaland	73.5	26.5	83
Odisha	93.7	6.3	238
Punjab	92.3	7.7	220
Rajasthan	98.8	1.2	255
Sikkim	93.4	6.6	122
Tamil Nadu	97.9	2.1	234
Tripura	98.7	1.3	230
Uttar Pradesh	94.1	5.9	222
Uttarakhand	98.4	1.6	258
West Bengal	97.4	2.6	233
A & N Islands	100.0	0.0	97
Chandigarh	97.1	2.9	68
Puducherry	91.8	8.2	182
Dadra & Nagar Haveli	100.0	0.0	33
Daman & Diu	93.3	6.7	15
Overall	**94.1**	**5.9**	**6405**

Table A-2.11 | State wise Distribution of Schools whether head teacher teaches class or not

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	93.6	6.4	249
Arunachal Pradesh	95.6	4.4	229
Bihar	98.4	1.6	243
Chhattisgarh	95.3	4.7	233
Delhi	91.4	8.6	221
Goa	99.4	0.6	175
Gujarat	93.6	6.4	219
Haryana	89.3	10.7	197
Himachal Pradesh	84.2	15.8	215
Jammu & Kashmir	91.2	8.8	238
Jharkhand	99.0	1.0	191
Karnataka	97.4	2.6	229
Kerala	30.0	70.0	200
Madhya Pradesh	94.6	5.4	202
Maharashtra	96.2	3.8	234
Manipur	85.7	14.3	245
Meghalaya	95.5	4.5	156
Mizoram	93.2	6.8	235
Nagaland	67.1	32.9	82
Odisha	99.1	0.9	235
Punjab	96.8	3.2	220
Rajasthan	98.4	1.6	256
Sikkim	79.3	20.7	121
Tamil Nadu	92.8	7.2	237
Tripura	99.6	0.4	228
Uttar Pradesh	98.7	1.3	227
Uttarakhand	97.3	2.7	255
West Bengal	98.7	1.3	233
A & N Islands	85.4	14.6	96
Chandigarh	95.5	4.5	66
Puducherry	91.8	8.2	184
Dadra & Nagar Haveli	82.4	17.6	34
Daman & Diu	78.6	21.4	14
Overall	**92.0**	**8.0**	**6399**

Table A-2.12 | State wise Distribution of Schools having computers that have Internet facility

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	62.4	37.6	189
Arunachal Pradesh	35.2	64.8	128
Bihar	67.6	32.4	34
Chhattisgarh	32.7	67.3	49
Delhi	80.4	19.6	102
Goa	37.0	63.0	173
Gujarat	78.1	21.9	215
Haryana	44.8	55.2	145
Himachal Pradesh	51.9	48.1	54
Jammu & Kashmir	34.6	65.4	52
Jharkhand	30.6	69.4	36
Karnataka	55.8	44.2	129
Kerala	95.2	4.8	210
Madhya Pradesh	31.3	68.8	48
Maharashtra	64.2	35.8	212
Manipur	29.2	70.8	120
Meghalaya	27.0	73.0	100
Mizoram	29.0	71.0	107
Nagaland	14.1	85.9	64
Odisha	50.9	49.1	55
Punjab	89.9	10.1	207
Rajasthan	34.7	65.3	95
Sikkim	39.4	60.6	94
Tamil Nadu	66.1	33.9	165
Tripura	19.8	80.2	111
Uttar Pradesh	21.4	78.6	70
Uttarakhand	21.0	79.0	143
West Bengal	54.8	45.2	126
A & N Islands	52.6	47.4	76
Chandigarh	93.4	6.6	61
Puducherry	88.7	11.3	159
Dadra & Nagar Haveli	14.8	85.2	27
Daman & Diu	50.0	50.0	14
Overall	**54.4**	**45.6**	**3570**

Table A-2.13 | State wise Distribution of Schools having sections made on the basis of ability grouping

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	49.7	50.3	159
Arunachal Pradesh	39.1	60.9	23
Bihar	40.0	60.0	65
Chhattisgarh	17.6	82.4	34
Delhi	18.9	81.1	212
Goa	34.8	65.2	89
Gujarat	64.4	35.6	132
Haryana	29.3	70.7	82
Himachal Pradesh	25.0	75.0	12
Jammu & Kashmir	80.0	20.0	5
Jharkhand	32.7	67.3	55
Karnataka	49.5	50.5	111
Kerala	24.6	75.4	134
Madhya Pradesh	18.9	81.1	37
Maharashtra	53.2	46.8	139
Manipur	92.3	7.7	13
Meghalaya	38.7	61.3	31
Mizoram	50.0	50.0	2
Nagaland	37.5	62.5	8
Odisha	68.8	31.3	64
Punjab	56.4	43.6	117
Rajasthan	57.1	42.9	7
Sikkim	20.0	80.0	25
Tamil Nadu	43.1	56.9	160
Tripura	55.2	44.8	58
Uttar Pradesh	42.0	58.0	50
Uttarakhand	26.0	74.0	50
West Bengal	52.9	47.1	204
A & N Islands	25.6	74.4	43
Chandigarh	7.1	92.9	56
Puducherry	35.3	64.7	116
Dadra & Nagar Haveli	22.2	77.8	9
Daman & Diu	33.3	66.7	3
Overall	**40.9**	**59.1**	**2305**

Student Related Variables

Table A-2.14 | Gender wise Distribution of Students

States or Union Territories	Boys (%)	Girls (%)	Total (N)
Andhra Pradesh	46.3	53.7	7762
Arunachal Pradesh	48.9	51.1	4984
Bihar	47.7	52.3	7253
Chhattisgarh	49.8	50.2	7030
Delhi	45.1	54.9	7354
Goa	50.4	49.6	6674
Gujarat	57.3	42.7	7889
Haryana	46.0	54.0	5993
Himachal Pradesh	48.2	51.8	5872
Jammu & Kashmir	48.0	52.0	4883
Jharkhand	44.4	55.6	5627
Karnataka	48.2	51.8	7294
Kerala	46.1	53.9	8742
Madhya Pradesh	41.3	58.7	5647
Maharashtra	52.1	47.9	8783
Manipur	44.0	56.0	3547
Meghalaya	41.5	58.5	3668
Mizoram	49.7	50.3	3724
Nagaland	47.7	52.3	1919
Odisha	44.5	55.5	5496
Punjab	53.4	46.6	7309
Rajasthan	51.9	48.1	5474
Sikkim	44.0	56.0	3572
Tamil Nadu	50.5	49.5	8217
Tripura	48.6	51.4	6295
Uttar Pradesh	42.3	57.7	5398
Uttarakhand	47.5	52.5	5743
West Bengal	44.2	55.8	6836
Andaman Nicobar	50.9	49.1	2510
Chandigarh	53.9	46.1	3707
Puducherry	48.2	51.8	6824
Dadra & Nagar Haveli	53.0	47.0	2370
Daman & Diu	44.3	55.7	483
Overall	**48.1**	**51.9**	**184782**

Table A-2.15 | Age wise Distribution of Students

States or Union Territories	Up to 11 years (%)	12 years (%)	13 years (%)	14 years (%)	15 years (%)	16 years and above (%)	Total (N)
Andhra Pradesh	0.6	7.7	53.3	30.2	6.7	1.5	7538
Arunachal Pradesh	0.9	6.2	27.7	32.7	17.9	14.6	4888
Bihar	1.6	16.4	39.8	31.2	7.7	3.3	6795
Chhattisgarh	0.1	2.5	25.4	43.4	20.1	8.5	6833
Delhi	0.3	7.6	32.1	35.6	16.4	8.0	7155
Goa	0.0	0.5	34.2	46.6	13.0	5.7	6614
Gujarat	0.2	3.6	51.8	36.2	6.4	1.9	7274
Haryana	0.7	10.9	34.4	32.9	14.2	6.9	5880
Himachal Pradesh	0.3	9.2	50.7	31.0	6.6	2.2	5753
Jammu & Kashmir	0.4	10.5	33.2	39.4	11.7	4.8	4698
Jharkhand	0.7	8.4	34.4	39.0	12.6	5.0	5313
Karnataka	0.2	2.1	32.6	57.8	6.2	1.1	7125
Kerala	0.1	5.9	65.0	24.7	3.5	0.8	8498
Madhya Pradesh	0.8	8.2	33.0	37.1	12.8	8.1	5446
Maharashtra	0.2	3.5	32.6	50.8	9.9	3.1	8554
Manipur	0.3	9.4	73.2	13.1	3.0	1.0	3577
Meghalaya	0.5	3.3	19.0	31.3	24.2	21.7	3607
Mizoram	0.7	6.3	28.8	37.3	18.4	8.4	3707
Nagaland	0.2	1.5	12.4	24.2	25.7	36.0	1879
Odisha	0.2	5.2	45.3	38.8	5.3	5.1	5275
Punjab	0.2	5.0	24.3	40.4	19.9	10.3	7085
Rajasthan	2.4	15.5	33.1	31.4	12.6	4.9	5239
Sikkim	0.1	1.7	9.6	20.3	23.6	44.7	3544
Tamil Nadu	0.1	5.5	63.1	27.0	3.4	0.9	8096
Tripura	0.4	1.8	13.1	63.0	13.1	8.7	5780
Uttar Pradesh	1.1	10.3	34.1	37.3	12.8	4.4	5046
Uttarakhand	0.5	6.7	34.4	38.1	15.7	4.5	5517
West Bengal	0.7	9.6	38.4	29.1	9.7	12.5	5971
A & N Islands	0.4	10.0	40.5	32.7	11.0	5.5	2471
Chandigarh	0.2	5.8	33.2	34.6	17.0	9.2	3649
Puducherry	0.1	5.4	60.8	27.6	4.5	1.6	6755
Dadra & Nagar Haveli	0.4	5.6	43.0	34.6	11.9	4.6	2231
Daman & Diu	0.0	3.2	42.1	34.0	14.8	5.9	473
Overall	**0.5**	**6.6**	**38.7**	**36.2**	**11.5**	**6.6**	**178266**

Table A-2.16 | Category wise Distribution of Students

States or Union Territories	SC (%)	ST (%)	OBC (%)	Other (%)	Total (N)
Andhra Pradesh	24.9	13.6	35.3	26.2	7607
Arunachal Pradesh	2.4	76.1	1.3	20.2	4794
Bihar	17.4	5.2	54.5	22.8	6719
Chhattisgarh	19.9	21.3	54.8	4.0	6825
Delhi	21.1	5.7	9.8	63.3	6605
Goa	2.7	16.5	23.0	57.8	5523
Gujarat	13.0	12.2	51.7	23.2	7365
Haryana	37.8	8.5	26.3	27.4	5598
Himachal Pradesh	30.8	10.1	20.9	38.2	5389
Jammu & Kashmir	9.6	5.8	20.7	64.0	4397
Jharkhand	13.5	20.8	55.0	10.7	5283
Karnataka	23.0	11.2	27.0	38.8	7063
Kerala	11.4	2.5	63.4	22.7	8253
Madhya Pradesh	22.4	17.9	48.5	11.1	5560
Maharashtra	21.9	12.7	29.9	35.5	8217
Manipur	6.8	3.6	41.5	48.2	3520
Meghalaya	5.6	85.0	2.7	6.8	3539
Mizoram	1.8	97.7	0.2	0.3	3649
Nagaland	5.7	91.5	0.9	1.8	1843
Odisha	20.2	15.5	30.4	33.8	4996
Punjab	56.5	3.6	18.1	21.8	6888
Rajasthan	25.4	20.5	37.5	16.6	5126
Sikkim	7.1	35.4	41.2	16.3	3519
Tamil Nadu	30.6	2.2	46.1	21.0	8053
Tripura	25.9	23.3	26.5	24.3	6089
Uttar Pradesh	26.9	3.0	53.1	17.0	5117
Uttarakhand	27.8	6.7	22.6	43.0	5339
West Bengal	32.8	5.8	13.4	48.0	6539
A & N Islands	2.3	11.0	15.9	70.9	2461
Chandigarh	24.6	4.1	5.2	66.2	3408
Puducherry	29.6	1.0	48.5	20.9	6713
Dadra & Nagar Haveli	7.3	84.7	1.4	6.6	2298
Daman & Diu	10.1	28.9	30.8	30.2	477
Overall	**21.0**	**17.6**	**32.3**	**29.0**	**174772**

Table A-2.17 | State Wise Students who use same Language in Home as Medium of Instruction in School

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	85.4	14.6	7612
Arunachal Pradesh	11.5	88.5	4825
Bihar	42.3	57.7	6585
Chhattisgarh	26.3	73.7	6860
Delhi	88.2	11.8	7073
Goa	24.2	75.8	6523
Gujarat	86.5	13.5	7646
Haryana	69.8	30.2	5803
Himachal Pradesh	27.7	72.3	5640
Jammu & Kashmir	24.1	75.9	4635
Jharkhand	33.9	66.1	5274
Karnataka	76.5	23.5	7093
Kerala	95.8	4.2	8485
Madhya Pradesh	83.5	16.5	5464
Maharashtra	89.7	10.3	8558
Manipur	38.4	61.6	3517
Meghalaya	15.3	84.7	3583
Mizoram	53.5	46.5	3651
Nagaland	11.2	88.8	1872
Odisha	79.6	20.4	5224
Punjab	90.7	9.3	6979
Rajasthan	51.5	48.5	5169
Sikkim	17.2	82.8	3486
Tamil Nadu	97.0	3.0	8129
Tripura	75.8	24.2	3647
Uttar Pradesh	80.4	19.6	5037
Uttarakhand	56.9	43.1	5504
West Bengal	88.2	11.8	2382
A & N Islands	45.6	54.4	2458
Chandigarh	70.7	29.3	3597
Puducherry	80.8	19.2	6741
Dadra & Nagar Haveli	35.9	64.1	2260
Daman & Diu	85.4	14.6	480
Overall	**63.1**	**36.9**	**171792**

Table A-2.18 | State wise Distribution of Number of Siblings

States or Union Territories	Single Child (%)	1 sibling (%)	2 sibling (%)	3 sibling (%)	4 and above sibling (%)	Total (N)
Andhra Pradesh	4.4	37.1	32.5	14.0	12.0	7763
Arunachal Pradesh	2.2	6.5	15.7	20.8	54.9	4984
Bihar	2.4	2.8	7.6	20.6	66.7	7254
Chhattisgarh	1.3	6.4	18.6	28.2	45.5	7030
Delhi	2.6	11.9	24.6	26.0	35.0	7357
Goa	8.5	39.6	30.7	12.1	9.0	6674
Gujarat	4.9	22.7	26.9	19.8	25.7	7889
Haryana	1.6	8.8	22.9	29.7	37.1	5993
Himachal Pradesh	2.6	20.5	31.7	22.8	22.5	5872
Jammu & Kashmir	3.6	4.6	14.6	21.1	56.0	4883
Jharkhand	2.3	4.8	12.0	24.8	56.0	5632
Karnataka	4.2	31.2	31.0	15.7	17.9	7294
Kerala	5.7	49.9	28.3	9.0	7.0	8742
Madhya Pradesh	1.3	4.4	15.6	28.2	50.5	5647
Maharashtra	4.6	31.0	33.9	17.3	13.3	8785
Manipur	1.9	9.6	21.3	27.0	40.2	3626
Meghalaya	3.8	8.1	14.7	15.9	57.6	3687
Mizoram	2.7	9.0	24.5	27.0	36.9	3724
Nagaland	3.6	5.1	12.6	18.1	60.6	1919
Odisha	4.9	22.9	26.4	21.2	24.6	5496
Punjab	3.2	12.4	26.2	30.6	27.6	7309
Rajasthan	1.7	6.3	15.1	22.1	54.7	5474
Sikkim	2.6	18.6	23.3	20.2	35.4	3577
Tamil Nadu	4.8	40.2	35.1	12.5	7.3	8218
Tripura	6.1	14.1	33.7	22.4	23.7	6295
Uttar Pradesh	2.7	2.9	8.7	17.4	68.3	5400
Uttarakhand	1.4	5.1	15.3	25.8	52.4	5743
West Bengal	18.3	28.8	24.1	12.7	16.1	6836
A & N Islands	3.3	26.5	32.7	18.2	19.4	2510
Chandigarh	3.0	23.1	29.0	22.2	22.7	3707
Puducherry	3.8	42.0	35.6	11.5	7.2	6824
Dadra & Nagar Haveli	2.8	9.0	21.3	23.0	43.9	2390
Daman & Diu	5.6	25.3	34.4	15.9	18.8	483
Overall	**4.1**	**19.8**	**24.2**	**20.1**	**31.8**	**185017**

Table A-2.19 | State wise distribution of Number of Students According to Father's Education

States or Union Territories	Illiterate (%)	Primary level (%)	Second-ary level (%)	Senior second-ary level (%)	Degree and above (%)	Not ap-plicable (%)	Total (N)
Andhra Pradesh	49.4	39.3	7.7	0.9	0.7	2.0	7281
Arunachal Pradesh	19.4	27.6	26.4	8.8	8.9	8.9	4725
Bihar	30.5	31.4	20.4	8.9	6.6	2.3	6849
Chhattisgarh	29.9	36.4	19.8	8.7	2.7	2.6	6736
Delhi	22.8	32.0	25.4	11.6	4.1	4.1	7006
Goa	11.6	25.6	27.7	12.4	9.1	13.6	6342
Gujarat	25.2	38.1	20.8	7.5	6.4	1.9	7575
Haryana	31.9	29.8	23.7	10.1	1.9	2.6	5773
Himachal Pradesh	17.7	30.2	29.0	17.4	2.0	3.8	5546
Jammu & Kashmir	48.7	21.9	22.7	2.9	1.1	2.8	4559
Jharkhand	33.1	34.2	21.3	4.4	3.8	3.2	5250
Karnataka	42.1	38.7	13.1	1.8	1.8	2.5	6851
Kerala	5.2	12.3	58.9	9.7	7.3	6.6	8504
Madhya Pradesh	30.4	37.2	19.7	9.0	2.1	1.6	5506
Maharashtra	24.4	29.2	30.5	9.5	4.1	2.4	8327
Manipur	18.5	33.1	27.3	6.1	7.3	7.6	3531
Meghalaya	16.1	34.7	26.3	7.4	4.5	11.0	3500
Mizoram	6.6	42.9	33.6	6.7	2.9	7.3	3655
Nagaland	21.7	41.9	24.0	3.7	1.5	7.2	1818
Odisha	15.0	33.4	25.8	8.8	5.2	11.7	5313
Punjab	39.3	31.7	21.9	3.1	0.8	3.2	6829
Rajasthan	40.9	32.5	19.0	3.4	2.3	1.8	5156
Sikkim	16.3	49.6	24.7	3.6	1.0	4.9	3459
Tamil Nadu	26.6	40.4	23.2	5.3	2.0	2.6	8017
Tripura	18.5	44.7	24.6	4.1	3.2	4.9	5877
Uttar Pradesh	35.2	31.6	21.3	6.0	4.1	1.7	5062
Uttarakhand	22.0	35.7	27.5	8.6	3.3	2.9	5468
West Bengal	20.2	35.5	25.1	6.2	6.4	6.6	6398
A & N Islands	20.9	34.0	29.3	9.4	2.9	3.5	2401
Chandigarh	17.3	27.2	27.8	15.0	6.2	6.7	3594
Puducherry	22.9	33.9	27.6	6.1	3.4	6.1	6682
Dadra & Nagar Haveli	43.4	35.2	13.8	2.8	1.1	3.8	2179
Daman & Diu	26.2	33.1	29.0	6.9	2.2	2.6	462
Overall	**26.0**	**33.2**	**25.0**	**7.3**	**3.9**	**4.5**	**176231**

Table A-2.20 | State Wise Distribution of Number of Students According to Mother's Education

States or Union Territories	Illiterate (%)	Primary level (%)	Second-ary level (%)	Senior second-ary level (%)	Degree and above (%)	Not ap-plicable (%)	Total (N)
Andhra Pradesh	57.4	34.8	5.6	0.5	0.3	1.5	6925
Arunachal Pradesh	35.7	26.7	20.6	5.0	3.3	8.7	4527
Bihar	45.8	31.3	14.2	4.6	1.8	2.3	6225
Chhattisgarh	54.1	28.5	12.6	2.7	0.4	1.7	6466
Delhi	42.7	29.7	16.7	5.6	1.8	3.6	6495
Goa	17.2	25.9	26.4	10.4	8.1	12.1	6219
Gujarat	35.0	36.0	17.9	5.0	3.7	2.4	7149
Haryana	51.0	27.4	14.6	4.3	0.6	2.1	5495
Himachal Pradesh	25.9	33.4	25.6	11.3	0.6	3.2	5322
Jammu & Kashmir	75.7	13.9	7.5	0.9	0.2	1.7	4255
Jharkhand	57.1	27.1	10.4	1.6	0.6	3.3	4964
Karnataka	50.2	34.5	11.8	1.0	0.5	2.0	6620
Kerala	5.4	8.5	58.0	13.6	10.5	4.0	8424
Madhya Pradesh	54.1	33.1	9.2	2.1	0.4	1.2	5344
Maharashtra	31.5	27.5	32.2	5.4	2.0	1.4	8048
Manipur	37.7	29.7	19.2	3.7	3.7	6.1	3431
Meghalaya	19.5	39.2	25.6	5.1	2.7	7.9	3395
Mizoram	6.9	48.0	33.4	4.2	1.0	6.5	3542
Nagaland	41.7	33.2	15.4	2.2	0.9	6.6	1740
Odisha	23.8	33.7	21.4	6.6	2.7	11.8	5130
Punjab	27.1	31.4	30.7	5.4	1.5	3.9	6668
Rajasthan	65.8	25.5	5.7	0.6	0.4	2.0	4702
Sikkim	29.6	43.3	18.8	2.2	0.5	5.6	3329
Tamil Nadu	35.1	36.8	22.0	3.5	0.8	1.7	7892
Tripura	30.8	36.2	23.4	3.0	1.6	5.0	5029
Uttar Pradesh	61.4	23.7	9.9	1.9	1.2	1.9	4574
Uttarakhand	46.2	33.7	14.0	2.6	1.1	2.5	5207
West Bengal	47.6	18.9	17.3	4.0	6.6	5.5	3871
A & N Islands	24.7	32.0	30.1	7.8	1.7	3.7	2369
Chandigarh	32.4	25.9	22.0	9.2	3.6	7.0	3432
Puducherry	29.6	33.0	27.2	5.1	2.2	2.9	6516
Dadra & Nagar Haveli	67.3	19.9	7.9	1.3	0.6	3.0	2130
Daman & Diu	28.4	36.2	27.7	5.0	1.1	1.5	458
Overall	**38.8**	**29.8**	**20.5**	**4.7**	**2.3**	**3.9**	**165893**

Table A-2.21 | State Wise Distribution of Distance of School

States or Union Territories	Up to 1 km (%)	More than 1 to 3 km (%)	More than 3 to 5 km (%)	More than 5 km (%)	Total (N)
Andhra Pradesh	54.0	21.1	12.1	12.8	7598
Arunachal Pradesh	56.3	19.6	6.7	17.4	4863
Bihar	75.1	16.5	5.9	2.5	6809
Chhattisgarh	73.0	20.3	4.1	2.6	6666
Delhi	63.5	23.2	8.0	5.3	7112
Goa	44.8	26.8	12.2	16.3	6499
Gujarat	59.6	20.1	10.2	10.1	7636
Haryana	74.5	17.3	4.8	3.4	5840
Himachal Pradesh	62.2	24.5	7.5	5.7	5698
Jammu & Kashmir	72.2	19.9	5.0	2.9	4729
Jharkhand	58.7	26.7	8.5	6.1	5394
Karnataka	61.5	19.8	8.9	9.8	6917
Kerala	34.6	31.6	17.1	16.8	8298
Madhya Pradesh	66.2	23.4	6.8	3.6	5455
Maharashtra	55.4	21.0	11.5	12.1	8451
Manipur	65.8	23.8	7.1	3.3	3573
Meghalaya	58.4	22.8	8.3	10.6	3621
Mizoram	87.3	10.0	1.4	1.3	3596
Nagaland	74.5	17.2	5.5	2.8	1874
Odisha	60.6	24.5	7.2	7.6	5370
Punjab	66.6	22.1	7.6	3.7	7047
Rajasthan	73.1	16.9	5.8	4.2	5179
Sikkim	59.3	25.4	7.4	7.9	3533
Tamil Nadu	58.2	23.2	8.1	10.5	8074
Tripura	70.1	20.9	6.2	2.8	6198
Uttar Pradesh	72.2	21.0	4.4	2.4	5131
Uttarakhand	63.0	25.4	7.2	4.4	5608
West Bengal	48.9	29.3	12.5	9.2	6758
A & N Islands	42.8	27.6	14.1	15.5	2470
Chandigarh	60.8	19.1	8.3	11.7	3661
Puducherry	70.2	17.6	6.4	5.9	6717
Dadra & Nagar Haveli	47.4	30.7	12.7	9.3	2216
Daman & Diu	80.5	14.0	3.4	2.1	472
Overall	**61.7**	**22.2**	**8.3**	**7.7**	**179063**

Table A-2.22 | State Wise Distribution of Availability and use of Computer

States or Union Territories	No computer (%)	Yes, but never use (%)	Once in month (%)	Once in a week (%)	Daily (%)	Total (N)
Andhra Pradesh	10.3	14.3	6.8	60.8	7.8	7674
Arunachal Pradesh	26.2	41.9	7.4	19.9	4.6	4910
Bihar	78.3	3.5	2.1	5.2	10.9	6821
Chhattisgarh	72.0	11.6	3.1	7.2	6.1	6906
Delhi	16.4	53.2	4.9	15.1	10.4	7167
Goa	0.3	3.0	7.4	82.4	6.9	6665
Gujarat	1.1	7.7	2.6	66.2	22.3	7815
Haryana	14.3	22.8	4.5	38.6	19.8	5944
Himachal Pradesh	35.4	31.4	4.3	13.7	15.2	5743
Jammu & Kashmir	61.8	12.7	4.9	13.1	7.6	4735
Jharkhand	69.6	8.8	2.1	10.4	9.1	5458
Karnataka	20.4	22.6	6.1	41.5	9.5	7183
Kerala	0.6	2.4	1.2	91.2	4.7	8654
Madhya Pradesh	75.4	5.9	3.6	8.6	6.5	5573
Maharashtra	6.3	15.5	4.6	59.2	14.2	8721
Manipur	43.6	14.9	5.4	30.4	5.7	3588
Meghalaya	23.3	17.4	9.1	35.3	14.9	3671
Mizoram	28.7	41.0	10.5	13.7	6.0	3689
Nagaland	16.6	40.2	8.9	26.5	7.8	1892
Odisha	64.6	16.4	2.7	11.4	4.9	5341
Punjab	1.8	4.6	4.1	62.4	27.2	7234
Rajasthan	41.6	19.4	5.3	19.1	14.6	5310
Sikkim	5.3	36.7	12.1	41.7	4.1	3562
Tamil Nadu	9.2	34.0	16.1	37.0	3.7	8155
Tripura	41.0	9.0	8.3	34.9	6.8	6190
Uttar Pradesh	57.5	17.3	3.5	11.2	10.5	5178
Uttarakhand	21.2	25.5	7.9	28.1	17.4	5630
West Bengal	21.9	34.1	4.1	35.1	4.8	6783
A & N Islands	2.8	34.0	5.2	52.3	5.6	2485
Chandigarh	2.0	11.6	6.4	72.4	7.6	3694
Puducherry	1.4	29.3	8.0	53.7	7.6	6799
Dadra & Nagar Haveli	7.8	18.1	11.1	51.3	11.8	2333
Daman & Diu	0.4	4.0	5.2	79.0	11.4	481
Overall	**26.7**	**19.4**	**5.7**	**37.9**	**10.2**	**181984**

Table A-2.23 | State Wise Distribution of Students Whether they like being in School or Not

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	98.2	1.8	7656
Arunachal Pradesh	97.9	2.1	4866
Bihar	96.7	3.3	6926
Chhattisgarh	97.5	2.5	6914
Delhi	97.5	2.5	7195
Goa	97.9	2.1	6599
Gujarat	95.4	4.6	7765
Haryana	97.4	2.6	5893
Himachal Pradesh	98.4	1.6	5741
Jammu & Kashmir	97.1	2.9	4691
Jharkhand	97.6	2.4	5455
Karnataka	98.4	1.6	7123
Kerala	97.8	2.2	8450
Madhya Pradesh	97.5	2.5	5551
Maharashtra	97.8	2.2	8552
Manipur	96.7	3.3	3559
Meghalaya	97.4	2.6	3620
Mizoram	97.5	2.5	3691
Nagaland	96.4	3.6	1874
Odisha	97.3	2.7	5303
Punjab	98.3	1.7	7190
Rajasthan	98.1	1.9	5317
Sikkim	98.6	1.4	3530
Tamil Nadu	98.0	2.0	8156
Tripura	99.1	0.9	6148
Uttar Pradesh	97.5	2.5	5196
Uttarakhand	98.7	1.3	5655
West Bengal	99.0	1.0	6757
A & N Islands	98.5	1.5	2469
Chandigarh	98.0	2.0	3631
Puducherry	95.3	4.7	6748
Dadra & Nagar Haveli	98.4	1.6	2320
Daman & Diu	96.8	3.2	475
Overall	**97.7**	**2.3**	**181016**

Teacher Related Variables

Table A-2.24 | Employment Status of Teachers

States or Union Territories	Permanent/ Regular (%)	Temporary (%)	Para Teacher (%)	Any Other (%)	Total (N)
Andhra Pradesh	92.4	6.3	0.8	0.5	1024
Arunachal Pradesh	67.0	20.2	6.9	5.9	845
Bihar	72.9	4.8	17.6	4.8	860
Chhattisgarh	40.1	4.6	54.8	0.5	766
Delhi	94.0	5.0	0.3	0.7	915
Goa	88.8	10.4	0.3	0.6	704
Gujarat	91.3	5.4	2.6	0.7	876
Haryana	82.2	15.0	0.9	2.0	768
Himachal Pradesh	64.5	16.1	8.8	10.7	833
Jammu & Kashmir	91.9	2.4	3.6	2.1	891
Jharkhand	51.3	3.6	44.7	0.4	720
Karnataka	91.7	7.7	0.1	0.5	870
Kerala	93.3	6.1	0.0	0.5	927
Madhya Pradesh	63.9	22.6	11.0	2.4	654
Maharashtra	92.2	3.0	4.4	0.4	949
Manipur	79.4	15.5	1.2	3.9	917
Meghalaya	67.1	30.2	0.9	1.8	553
Mizoram	61.3	24.8	9.8	4.1	925
Nagaland	81.0	16.2	0.6	2.2	321
Odisha	72.1	9.8	3.8	14.2	885
Punjab	81.1	11.9	1.4	5.6	857
Rajasthan	88.8	6.0	1.5	3.7	983
Sikkim	75.5	24.3	0.0	0.2	519
Tamil Nadu	93.3	5.7	0.2	0.8	912
Tripura	83.4	9.4	4.4	2.9	873
Uttar Pradesh	91.6	6.4	1.5	0.5	606
Uttarakhand	82.1	14.5	1.8	1.5	840
West Bengal	88.8	1.1	9.9	0.2	847
A & N Islands	64.6	23.5	5.9	5.9	370
Chandigarh	66.8	17.2	2.6	13.4	268
Puducherry	85.1	12.0	0.7	2.3	736
Dadra & Nagar Haveli	71.7	24.2	4.2	0.0	120
Daman & Diu	66.1	30.4	3.6	0.0	56
Overall	**79.8**	**10.8**	**6.5**	**2.9**	**24190**

Table A-2.25 | State wise Distribution of Teachers Attending in-service Training Programmes

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	84.4	15.6	988
Arunachal Pradesh	53.8	46.2	823
Bihar	59.2	40.8	844
Chhattisgarh	88.2	11.8	761
Delhi	82.7	17.3	907
Goa	76.0	24.0	683
Gujarat	74.7	25.3	865
Haryana	73.6	26.4	758
Himachal Pradesh	88.8	11.2	831
Jammu & Kashmir	57.6	42.4	870
Jharkhand	71.1	28.9	685
Karnataka	51.7	48.3	847
Kerala	85.3	14.7	895
Madhya Pradesh	71.6	28.4	647
Maharashtra	85.9	14.1	944
Manipur	48.9	51.1	878
Meghalaya	52.5	47.5	541
Mizoram	78.1	21.9	883
Nagaland	50.5	49.5	303
Odisha	55.8	44.2	847
Punjab	72.0	28.0	845
Rajasthan	62.7	37.3	960
Sikkim	65.3	34.7	490
Tamil Nadu	82.4	17.6	896
Tripura	67.0	33.0	843
Uttar Pradesh	81.4	18.6	596
Uttarakhand	81.7	18.3	829
West Bengal	64.4	35.6	808
A & N Islands	84.5	15.5	362
Chandigarh	72.3	27.7	264
Puducherry	65.6	34.4	719
Dadra & Nagar Haveli	91.0	9.0	122
Daman & Diu	91.2	8.8	57
Overall	**71.2**	**28.8**	**23591**

Table A-2.26 | State wise Distribution of Teachers as Per the Number of Programmes Attended by them

States or Union Territories	1 to 3 (%)	4 to 6 (%)	7 to 9 (%)	More than 10 (%)	Total (N)
Andhra Pradesh	78.4	12.8	3.5	5.2	821
Arunachal Pradesh	82.0	14.1	2.1	1.8	434
Bihar	67.3	5.8	3.3	23.6	483
Chhattisgarh	73.3	12.6	4.6	9.6	658
Delhi	87.0	7.0	2.8	3.2	745
Goa	63.1	23.0	6.5	7.5	509
Gujarat	78.0	11.8	4.2	6.1	626
Haryana	83.5	9.6	2.9	4.0	551
Himachal Pradesh	62.6	19.6	3.4	14.3	728
Jammu & Kashmir	76.5	10.9	4.3	8.2	486
Jharkhand	62.7	17.6	6.1	13.6	477
Karnataka	76.6	11.9	1.6	9.8	427
Kerala	42.0	23.3	11.4	23.4	748
Madhya Pradesh	78.2	15.0	3.3	3.5	459
Maharashtra	66.8	21.4	5.0	6.8	798
Manipur	82.1	12.4	2.6	2.9	419
Meghalaya	69.1	17.6	8.3	5.0	278
Mizoram	75.6	19.4	2.4	2.7	676
Nagaland	87.6	9.7	1.4	1.4	145
Odisha	89.6	8.0	1.1	1.3	462
Punjab	68.2	16.4	3.1	12.3	584
Rajasthan	81.2	13.5	2.4	2.9	591
Sikkim	87.6	6.7	2.9	2.9	314
Tamil Nadu	32.4	16.5	9.1	42.0	722
Tripura	78.4	10.1	2.9	8.6	555
Uttar Pradesh	65.4	20.5	6.1	8.0	474
Uttarakhand	61.0	14.9	4.2	20.0	671
West Bengal	87.0	9.4	1.2	2.4	499
A & N Islands	75.8	18.9	2.6	2.6	302
Chandigarh	73.7	16.8	3.7	5.8	190
Puducherry	78.2	14.3	3.9	3.6	467
Dadra & Nagar Haveli	35.2	2.9	2.9	59.0	105
Daman & Diu	48.0	28.0	8.0	16.0	50
Overall	**71.4**	**14.5**	**4.2**	**9.9**	**16454**

Table A-2.27 | State wise Distribution of Teachers whether they Attended Training Programme based on NCF or Not

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	28.4	71.6	970
Arunachal Pradesh	13.5	86.5	813
Bihar	37.3	62.7	818
Chhattisgarh	45.9	54.1	723
Delhi	40.5	59.5	872
Goa	41.0	59.0	639
Gujarat	19.6	80.4	835
Haryana	25.7	74.3	719
Himachal Pradesh	29.4	70.6	779
Jammu & Kashmir	15.5	84.5	826
Jharkhand	31.8	68.2	666
Karnataka	21.5	78.5	820
Kerala	25.6	74.4	864
Madhya Pradesh	58.7	41.3	630
Maharashtra	46.5	53.5	923
Manipur	32.5	67.5	867
Meghalaya	37.4	62.6	535
Mizoram	46.0	54.0	876
Nagaland	28.8	71.2	299
Odisha	25.6	74.4	823
Punjab	9.8	90.2	779
Rajasthan	27.8	72.2	920
Sikkim	26.6	73.4	470
Tamil Nadu	18.1	81.9	875
Tripura	16.0	84.0	807
Uttar Pradesh	68.0	32.0	557
Uttarakhand	55.8	44.2	807
West Bengal	37.2	62.8	791
A & N Islands	17.6	82.4	358
Chandigarh	35.4	64.6	260
Puducherry	19.0	81.0	707
Dadra & Nagar Haveli	22.5	77.5	111
Daman & Diu	23.6	76.4	55
Overall	**31.3**	**68.7**	**22794**

Table A-2.28 | State wise Distribution of Teachers Whether using Revised Textbooks based on NCF or Not

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	42.7	57.3	940
Arunachal Pradesh	62.9	37.1	795
Bihar	74.9	25.1	829
Chhattisgarh	77.3	22.7	714
Delhi	88.6	11.4	872
Goa	91.6	8.4	665
Gujarat	50.5	49.5	821
Haryana	86.2	13.8	726
Himachal Pradesh	82.9	17.1	774
Jammu & Kashmir	62.8	37.2	811
Jharkhand	75.9	24.1	665
Karnataka	34.5	65.5	804
Kerala	65.6	34.4	850
Madhya Pradesh	82.4	17.6	624
Maharashtra	71.4	28.6	915
Manipur	59.7	40.3	861
Meghalaya	72.2	27.8	528
Mizoram	73.2	26.8	882
Nagaland	74.7	25.3	296
Odisha	64.1	35.9	831
Punjab	48.8	51.2	748
Rajasthan	80.3	19.7	908
Sikkim	75.4	24.6	467
Tamil Nadu	38.2	61.8	855
Tripura	52.8	47.2	791
Uttar Pradesh	91.6	8.4	573
Uttarakhand	89.4	10.6	823
West Bengal	45.5	54.5	763
A & N Islands	77.7	22.3	355
Chandigarh	90.2	9.8	265
Puducherry	41.7	58.3	690
Dadra & Nagar Haveli	53.2	46.8	109
Daman & Diu	66.1	33.9	56
Overall	**67.0**	**33.0**	**22606**

Table A- 2.29 | State wise Distribution of Teachers Whether Maintaining Teacher's Diary or Not

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	97.2	2.8	1015
Arunachal Pradesh	72.2	27.8	756
Bihar	74.9	25.1	717
Chhattisgarh	96.3	3.7	705
Delhi	98.2	1.8	890
Goa	93.0	7.0	684
Gujarat	98.2	1.8	831
Haryana	93.0	7.0	740
Himachal Pradesh	98.6	1.4	796
Jammu & Kashmir	95.6	4.4	867
Jharkhand	74.1	25.9	634
Karnataka	90.3	9.7	853
Kerala	91.2	8.8	897
Madhya Pradesh	84.8	15.2	604
Maharashtra	91.5	8.5	929
Manipur	67.6	32.4	751
Meghalaya	81.7	18.3	508
Mizoram	46.0	54.0	798
Nagaland	77.5	22.5	253
Odisha	96.6	3.4	887
Punjab	97.3	2.7	856
Rajasthan	94.9	5.1	905
Sikkim	94.8	5.2	463
Tamil Nadu	81.1	18.9	882
Tripura	97.3	2.7	805
Uttar Pradesh	87.0	13.0	478
Uttarakhand	92.0	8.0	761
West Bengal	70.5	29.5	730
A & N Islands	98.9	1.1	364
Chandigarh	99.3	0.7	268
Puducherry	74.6	25.4	704
Dadra & Nagar Haveli	98.3	1.7	116
Daman & Diu	94.2	5.8	52
Overall	**87.6**	**12.4**	**22499**

Table A-2.30 | State Wise Distribution of Teacher's Handbook (Whether available or not)

States or Union Territories	Not available (%)	Available (%)	Total (N)
Andhra Pradesh	7.4	92.6	958
Arunachal Pradesh	46.4	53.6	798
Bihar	24.0	76.0	775
Chhattisgarh	10.3	89.7	708
Delhi	11.6	88.4	820
Goa	16.8	83.2	570
Gujarat	3.4	96.6	844
Haryana	20.9	79.1	674
Himachal Pradesh	13.9	86.1	671
Jammu & Kashmir	16.6	83.4	800
Jharkhand	27.2	72.8	657
Karnataka	23.1	76.9	761
Kerala	3.7	96.3	911
Madhya Pradesh	14.8	85.2	603
Maharashtra	15.0	85.0	909
Manipur	14.4	85.6	796
Meghalaya	17.0	83.0	500
Mizoram	10.7	89.3	876
Nagaland	18.9	81.1	296
Odisha	12.9	87.1	829
Punjab	11.4	88.6	731
Rajasthan	13.0	87.0	867
Sikkim	13.5	86.5	468
Tamil Nadu	14.7	85.3	842
Tripura	8.8	91.2	809
Uttar Pradesh	13.6	86.4	514
Uttarakhand	11.0	89.0	746
West Bengal	18.9	81.1	710
A & N Islands	9.6	90.4	342
Chandigarh	14.3	85.7	224
Puducherry	29.2	70.8	661
Dadra & Nagar Haveli	12.9	87.1	116
Daman & Diu	12.2	87.8	49
Overall	**15.5**	**84.5**	**21835**

Table A-2.31 | State wise Distribution of availability and use of Teacher's Handbook

States or Union Territories	Used regularly (%)	Used sometimes (%)	Available but never used (%)	Total (Available) (N)
Andhra Pradesh	89.4	10.4	0.2	887
Arunachal Pradesh	77.1	21.0	1.9	428
Bihar	90.0	9.2	0.8	589
Chhattisgarh	88.8	10.9	0.3	635
Delhi	90.3	9.2	0.4	725
Goa	78.5	20.9	0.6	474
Gujarat	89.6	9.7	0.7	815
Haryana	85.7	14.3	0.0	533
Himachal Pradesh	92.7	6.6	0.7	578
Jammu & Kashmir	84.4	15.4	0.1	667
Jharkhand	83.5	15.3	1.3	478
Karnataka	80.9	18.6	0.5	585
Kerala	92.0	8.0	0.0	877
Madhya Pradesh	78.8	19.5	1.8	514
Maharashtra	70.5	28.7	0.8	773
Manipur	74.4	23.6	1.9	681
Meghalaya	74.2	24.8	1.0	415
Mizoram	65.1	33.4	1.5	782
Nagaland	64.6	34.6	0.8	240
Odisha	91.1	8.9	0.0	722
Punjab	90.1	9.3	0.6	648
Rajasthan	87.4	11.5	1.1	754
Sikkim	82.0	17.5	0.5	405
Tamil Nadu	87.9	11.7	0.4	718
Tripura	84.7	15.0	0.3	738
Uttar Pradesh	81.5	16.7	1.8	444
Uttarakhand	86.6	12.5	0.9	664
West Bengal	71.0	28.0	1.0	576
A & N Islands	81.9	17.8	0.3	309
Chandigarh	75.0	25.0	0.0	192
Puducherry	84.6	14.5	0.9	468
Dadra & Nagar Haveli	94.1	5.0	1.0	101
Daman & Diu	97.7	2.3	0.0	43
Overall	**83.4**	**15.8**	**0.7**	**18458**

Table A-2.32 | State wise Distribution of Teacher's, Whether or not received TLM Grants

States or Union Territories	Yes (%)	No (%)	Total (N)
Andhra Pradesh	63.5	36.5	964
Arunachal Pradesh	57.4	42.6	799
Bihar	64.4	35.6	859
Chhattisgarh	85.3	14.7	750
Delhi	83.5	16.5	897
Goa	64.5	35.5	589
Gujarat	26.4	73.6	812
Haryana	78.2	21.8	751
Himachal Pradesh	81.8	18.2	819
Jammu & Kashmir	73.1	26.9	881
Jharkhand	81.6	18.4	708
Karnataka	43.6	56.4	792
Kerala	67.4	32.6	778
Madhya Pradesh	76.5	23.5	638
Maharashtra	58.9	41.1	823
Manipur	53.5	46.5	851
Meghalaya	72.5	27.5	530
Mizoram	74.3	25.7	902
Nagaland	68.7	31.3	300
Odisha	38.8	61.2	863
Punjab	67.3	32.7	834
Rajasthan	65.1	34.9	970
Sikkim	45.3	54.7	481
Tamil Nadu	78.8	21.3	880
Tripura	90.1	9.9	862
Uttar Pradesh	64.4	35.6	587
Uttarakhand	57.2	42.8	825
West Bengal	80.4	19.6	792
A & N Islands	84.0	16.0	363
Chandigarh	86.1	13.9	252
Puducherry	84.1	15.9	718
Dadra & Nagar Haveli	91.7	8.3	121
Daman & Diu	85.5	14.5	55
Overall	**67.8**	**32.2**	**23046**

Appendix-III

List of Surveyed States, Districts, Schools, Teachers and Students

S. No.	States/UTs	No. of Selected District	District Name	School	Teacher	Student
1	Andhra Pradesh	11	Medak, Rangareddi, Mahbubnagar, Khamman, Vishakhapatnam, East Godavari, West Godavari, Guntur, Sri Potti Sriramulu Nellore, Cuddapah, Chittoor	257	1029	7807
2	Arunachal Pradesh	8	West Kameng, Papum Pare, Upper Subansiri, West Siang, East Siang,Lohit , Changlang, Lower Dibang Valley	237	873	5012
3	Bihar	15	Pashchim Champaran, Purba Champaran , Katiahar, Darbhanga, Muzaffarpur, Saran, Khagaria, Lakshisarai, Nalanda, Patna, Bhojpur, Buxar, Kaimur, Rohtas, Gaya	256	878	7386
4	Chhattisgarh	9	Surguja, Jashpur, Raigarh, Bilaspur, Rajnandgaon, Durg, Raipur, Mahasamund, Dantewada	239	773	7063
5	Delhi	6	North West, North East, East, Central, West, South	238	928	7588
6	Goa	2	North Goa, South Goa	198	708	6619
7	Gujarat	11	BanasKantha, Patan, Sabar Kantha, Gandhinagar, Ahmadabad, Surendranagar, Junagadh, Bhavnagar, Dohad, Surat, The Dangs	233	896	7934
8	Haryana	10	Panchkula, Ambala, Kurukshetra, Panipat, Sonipat, Sirsa, Bhiwani, Jhajjar, Gurgaon, Palwal	208	771	6549
9	Himachal Pradesh	8	Chamba, Kangra, Lahul Spiti, Mandi, Hamirpur, Una, Sirmaur, Shimla	233	846	6090
10	Jammu and Kashmir	10	Baramula, Badgam, Anantnag, Doda, Udhampur, Rajouri, Jammu, Ramban, Kishtwar, Kulgam	243	898	5035

S. No.	States/UTs	No. of Selected District	District Name	School	Teacher	Student
11	Jharkhand	11	Garhwa, Hazaribag, Giridih, Deoghar, Dhanbad, Bokaro, Ranchi, Gumla, Purbi Singhbhum, Jamtara, Saraikela-Kharsawan	209	721	6354
12	Karnataka	12	Belgaum, Bagalkot, Gulbarga, Haveri, Bellary, Davangere, Chikmagalur, Kolar, Bangalore Urban, Bangalore Rural, Mandya, Mysore	235	877	7487
13	Kerala	8	Kannur, Wayanad, Kozhikode, Malappuram, Thrissur, Kottayam, Kollam, Thiruvananthapuram	244	929	8887
14	Madhya Pradesh	20	Sheopur, Morena, Bhind, Datia, Shivpuri, Guna, Tikamgarh, Sagar, Damoh, Rewa, Sidhi, Ujjain, Dewas, Indore, West Nimar, Rajgarh, Vidisha, Chhindwara, Seoni, Balaghat	226	655	5950
15	Maharashtra	14	Jalgaon, Buldana, Amravati, Nagpur, Gondiya, Gadchiroli, Nanded, Thane, Mumbai Suburban, Mumbai, Raigarh, Pune, Ahmednagar, Sangli	245	956	9181
16	Manipur	4	Bishnupur, Thoubal, Imphal West, Imphal East	257	948	3730
17	Meghalaya	4	East Garo Hills, West Garo Hills, South Garo Hills, East Khasi Hills	159	562	3759
18	Mizoram	6	Kolasib, Aizawl, Champhai, Serchhip, Lunglei, Saiha	263	950	3714
19	Nagaland	7	Mon, Tuensang, Mokokchung, Dimapur, Kohima, Phek, Kiphere	83	324	1918
20	Odisha	12	Sambalpur, Debagarh, Kendujhar, Mayurbhanj, Baleshwar, Bhadrak, Jagatsinghapur, Cuttack, Jajapur, Puri, Kalahandi, Rayagada	244	897	5670
21	Punjab	10	Gurdaspur, Amritsar, Jalandhar, Hoshiarpur, Ludhiana, Firozpur, Sangrur, Tarn Taran, Barnala, Sas Nagar	225	864	7541
22	Rajasthan	13	Churu, Alwar, Bharatpur, Karauli, Nagaur, Jaisalmer, Jalor, Pali, Bundi, Bhilwara, Udaipur, Banswara, Chittaurgarh	257	988	5566
23	Sikkim	4	East Sikkim, North Sikkim, South Sikkim, West Sikkim	125	522	3644
24	Tamil Nadu	12	Chennai, Vellore, Dharmapuri, Viluppuram, Salem, Namakkal, Coimbatore, Dindigul, Tiruchirappalli, Cuddalore, Virudhunagar, Krishanagiri	243	919	8315
25	Tripura	3	West Tripura, South Tripura, North Tripura	233	895	6295

S. No.	States/UTs	No. of Selected District	District Name	School	Teacher	Student
26	Uttar Pradesh	28	Saharanpur, Bijnor, Moradabad, Ghaziabad, Mainpuri, Bareilly, Sitapur, Hardoi, Unnao, Rae Bareli, Farrukhabad, Jalaun, Jhansi, Hamirpur, Kaushambi, Allahabad, Barabanki, Sultanpur, Bahraich, Gonda, Basti, Kushinagar, Deoria, Azamgarh, Mau, Jaunpur, Mirzapur, Sonbhadra	232	613	5400
27	Uttarakhand	8	Rudraprayag, Tehri Garhwal, Dehradun, Garhwal, Pithoragarh, Bageshwar, Udham Singh Nagar, Hardwar	265	848	5815
28	West Bengal	9	Jalpaiguri, Koch Bihar, Maldah, Murshidabad, Barddhaman, Nadia, North Twenty Four Pargana, Hugli, South Twenty Four Pargana	237	856	6837
29	A & N Islands	3	South Andamans, Nicobars, North Middle Andamans	84	371	1986
30	Chandigarh	1	Chandigarh	68	272	3728
31	Puducherry	4	Yanam, Puducherry, Mahe, Karaikal	189	739	6873
32	Dadra & Nagar Haveli	1	Dadra & Nagar Haveli	41	123	2401
33	Daman & Diu	1	Daman & Diu	16	57	513
	Total	**285**		**6722**	**24486**	**188647**

List of State Coordinators and Associate Coordinators

S. No	State/ UT	State Coordinator	Associate Coordinator
1	Andhra Pradesh	Director, SCERT, Hyderabad Andhra Pradesh	Dr. K. Bramhaiah SCERT, Hyderabad Andhra Pradesh
2	Arunachal Pradesh	Principal, State Institute of Education Gohpurtinali, Itanagar, Arunachal Pradesh	Shri. V.R Sharma State Institute of Education Gohpurtinali, Itanagar, Arunachal Pradesh ..... Shri S.P Singh District Institute of Education and Training, Arunachal Pradesh
3	Assam	Director, SCERT, Guwahati, Assam	Shri L.K Das SCERT, Assam
4	Bihar	Director, SCERT, Mahendru, Patna, Bihar	Shri Sayad Abdul Moin SCERT, Bihar
5	Chhattisgarh	Smt Vidya Dange SCERT, Raipur, Chhattisgarh	Shri K.P. Rao SCERT, Raipur, Chhattisgarh
6	Delhi	Dr. Subhasri Sinha Sr. Lecturer, P & M SCERT, New Delhi	Dr. Anil Tewatia, Sr. Lecturer, CMDE, District Institute of Education and Training, Delhi
7	Goa	Director, SCERT, Goa	Shri. Richard Cabral, Coordinator SCERT, Goa
8	Gujarat	Dr. T.S Joshi Principal DIET, GCERT, Gandhi Nagar, Gujarat	Manoj Korodia, DIET, GCERT
9	Haryana	Director, SCERT, Gurgaon, Haryana	
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An examination is a formal test of an individual student's knowledge or proficiency in a subject on the curriculum. The results of examinations apply to individual students, enabling them to progress through school or apply for further education or employment. Taken together, examination results provide an overall snapshot of students' performance at the end of a school year or course of learning. Examination results do not indicate the reasons behind high or low achievement of students.

Achievement Surveys

Achievement Surveys provide a measure of learning across a representative sample of students. They allow classification of students at a specific grade level by their ability (what students know and can do) in different subjects on the curriculum.

National Achievement Surveys provide a "Health Check" to the education system by analysing achievement based on a range of background factors (school, home, teachers). They potentially enable policy makers and practitioners to address the challenges to enhance student learning.

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