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Ministry of Human Resource Development
Department of School Education and Literacy
GOVERNMENT OF INDIA

LEARNING ACHIEVEMENT OF STUDENTS

Class X (Cycle 2)

NAS
2018



NAS 2018

National Achievement Survey

LEARNING ACHIEVEMENT OF STUDENTS Class X (Cycle 2)

विद्यया ऽ मृतमश्नुते



एन सी ई आर टी
NCERT

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

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Foreword

Education in the 21st century has emerged as one of the most essential components of leading a prosperous life, as well as, for the long-term sustainable growth of the society. Achieving good quality education for all is the most cherished objective of policymakers and educationists in a democratic country like India. With education being seen as the prerogative of every citizen, over the years it has emerged as a vital link in socio-economic transformation. Over the past decade, much efforts are being diverted to improve the accessibility, affordability and quality of school education. In this regard, the roles of assessments at different levels are considered of immense importance since they capture the status of learning performance of children in specific age groups in a given time period and also help in monitoring the student learning during that time. These exercises, therefore, evidently help in identifying the existing gaps in the system and lay provisions for future improvements with much more targeted approach.

In light of this, the Ministry of Human Resource Development, Government of India, has entrusted the National Council of Educational Research and Training (NCERT) to conduct a nation-wide achievement survey of students at different levels since the year 2000 on sample basis, with the primary role of providing the 'snapshot' of learning performances of children in different classes across various subjects. While several rounds of achievement surveys have been successfully conducted by NCERT at the elementary stage of school education (at Classes III, V and VIII), the first ever effort for Class X was attempted in 2015, wherein for the first time a holistic picture on 'What students know and can do' was provided through the NAS survey. The current attempt made by the Educational Survey Division (ESD), NCERT is second in line for providing a systematic understanding of learning performances of Class X students in various subjects with much more broadened objectives of providing system-level reflection to facilitate necessary policy interventions in future.

NAS Cycle 2 for Class X was initiated by NCERT from 2017 onwards and was successfully conducted on a sample basis in 34 states and UTs of India in February 2018. The NAS Cycle 2 Class X, was a first ever exercise, where district administrative units were chosen as survey and reporting units, against state units which were chosen in Cycle 1, to provide more realistic regional picture of the status of learning in schools. The survey tools used multiple test booklets in primarily five subjects, i.e., Mathematics, Modern Indian Languages, English, Science and Social Science. Along with test items, a questionnaire pertaining to students, teachers and school were also used to provide relevant additional information.

The technical report presented by NCERT is a cumulative document providing details of the entire process of survey, sampling and methodology used during the process, the execution of the assessment process, the analysis and presentation of achievements, outcome according to gender, social category and location of students and finally providing a detailed subject-wise account of learning achievement by the students of Class X in various government and government-aided schools across India. The document, by highlighting the level of learning performances of the children in Class X, comprehensively provides a constructive feedback so as to identify the existing gaps in the processes, systems, performances related to school education in general and Class X in particular.

The document, by providing a system-level reflection, will surely serve its purpose in guiding policymakers, planners, education experts, curriculum developers and other practitioners in initiating well-structured education strategies and focussed policy interventions in future. Also, at regional level, the document will be useful in assisting States/UTs/Boards in understanding student performances, facilitating them to prepare,

contextualise strategies for enhancing student learning in a holistic manner. The document will also aid periodic monitoring of the status of school education, facilitating establishment of trends and patterns of school education dynamics in India serving as a base for all future endeavours.

I would like to express my gratitude to the institutional and individual support provided for this undertaking from the Minister, Secretary and Joint Secretary School Education and Literacy, Ministry of Human Resource Development (MHRD). The cooperation of and contributions made by the Ministry of Human Resource Development (MHRD), *Samagra* Siksha steering committee, States/UTs, District authorities, School Board administrations and SCERTs/SIEs, teachers, children has been indispensable in successfully completing the monumental task and in the process of planning, developing and producing this NAS Class X Cycle 2 technical report.

New Delhi
3 November 2019

HRUSHIKESH SENAPATY
Director
National Council of Educational
Research and Training

Preface

Our world is constantly transforming and so is the essence of education, which has evolved from mere congregation of information and facts in the past to be the indispensable driver of socio-economic transformation in the 21st century. It has emerged as a decisive link in acquiring or enhancing essential skills and knowledge, predominant for leading a prosperous life, and apparently becoming productive member of a civilised society. India's adherence to Millennium Development Goals (MDGs) are well reflected in its proactive actions towards improving standard of education especially in the last decade. Actions are oriented to bring holistic development of children in schools through improvement in accessibility, affordability, quality and equity in school education. However, over the last decade the focus has shifted from dealing with the challenges pertaining to accessibility of education to ameliorating the quality of learning amongst children. This mandate has intensified the policy initiatives, planning and implementation of education in general and school education in particular.

The NCERT being the apex planning, execution and monitoring body with respect to school education in India, devised the National Achievement Survey in the year 2000, as large scale assessment survey primarily to monitor the performance of students, learning. The research study was led by the Educational Survey Division, NCERT and MHRD to understand the effectiveness of the school system in the country by evaluating the learning performance of students at various levels. The programme later on, in 2002 was subsumed under the *Sarva Siksha Abhiyan*— one of the government's flagship educational programmes. NAS was not designed as a school examination tool, rather it was conceived as a survey system to comprehensively reflect national, state and district level education achievement picture. NAS became a regular and ongoing feature of the education system to reflect the periodic achievement of learners in schools. Subsequently, various cycles of NAS were proposed for Classes III, V and VIII, which were designed to provide an accurate measure of the learning achievement of children at different stages of education providing important insights as to whether the inputs made into the elementary education system had a beneficial effect on learners or not. The third cycle of NAS conducted during 2009–13 made a distinctive shift from past in terms of analysing the assessment results which were analysed through a new method called Item Response Theory (IRT), which effectively increased the reliability, facilitated multispectral comparisons even with large datasets, and was time and cost-effective too.

Realising the importance of secondary education, from a learner's perspective, which is critical to enhance preparedness and competitiveness in rapidly globalising world, in 2015 under the Rashtriya Madhyamik Siksha Abhiyan (RMSA), NAS was extended to Class X. NAS Cycle 1 for Class X was thereafter successfully conducted in 2015, where multiple test booklets in multiple subjects were prepared in 15 languages to assure linguistic equality. The survey was conducted on a sample of 2,77,416 students in 7,216 schools across 33 states/UTs and Boards. The primary outcomes along with baseline observations were shared with the institutions, schools and teachers. Reports were prepared and shared with the MPs of all states and UTs and was put on public domain for wider dissemination.

To observe the improvement in the learning of the students, MHRD decided to conduct the second cycle of the Survey and NAS Cycle 2 for Class X, was initiated by Educational Survey Division, NCERT in 2017. This particular report is a compendium of approaches, practices, process and outcomes pertaining to the National Achievement Survey of Class X, Cycle 2. For the first time in Cycle 2 district administrative units were chosen as survey and reporting units, as against state units which were chosen in Cycle 1 of the survey, to provide

a more realistic regional picture of the status of learning in schools. The objectives of NAS were broadened where in it was developed to provide system-level reflections based on policy directions for systemic interventions with a view to improve quality of education. Extensive training programs and workshops for preparing items were conducted at the National level by NCERT and MHRD. The state and district level institutions were prepared for successful implementation of NAS in their respective areas. In Cycle 2 it covered all the districts in 34 States/UTs and within the districts, sample schools were randomly chosen from all the government, government-aided and private schools having Class X, either affiliated from State Education boards, National Education Boards, CBSE or ICSE board. A sample of 80 schools per district, and 45 students per school from Class X have been included in the survey. Assessment of Achievement Levels was done in five main curricular areas, namely English, Mathematics, Science, Social Science and one Modern Indian Language (MIL) using 60 multiple choice items, based on subject-wise common content domain with varying degree of difficulty. Technology was vastly used in every step including preparation, during survey, reporting, collecting information, creating database, result analysis preparing reports, etc., at every administrative hierarchy involved from District, to National level.

A comprehensive account of the perspective of learning achievement of Class X learners in different subjects has been presented through this NAS technical report of Class X Cycle 2. The report is divided in to nine chapters. Chapter 1 of the report provides a glimpse of the historical evolution of NAS in India, its objectives and the assessment framework along with the details of NAS administration, monitoring, reporting, dissemination, post-NAS interventions and the limitations of NAS. The second chapter presents the methodology followed and the entire process of conducting the survey nationwide. Modern techniques of analysis and interpretation of data are applied to produce findings, using Item Response Theory. The third chapter is based on providing details related to the participating schools, students and different variables of the survey. Chapters 4, 5, 6, 7 and 8 contemplates the class-wise students' achievements in Mathematics, Science, Social Sciences, English and Modern Indian Languages, respectively. The ninth and final chapter of the report is based on the contextual analysis of the background variables used in the report.

This technical report, therefore, is a compendium of perceptible information regarding learning achievements of children in Class X. It not only highlights the achievement of learning outcomes by the learners, but also facilitates comparative analysis against the achievement levels in previous cycles, thus providing a system level reflection on core areas of educational development in India over the years. The document also helps in accentuating the regional trends and patterns across India in the achievement level of learning outcomes amongst the learners of Class X. The detailed contemplation of district-wise information on various subject areas have been done for the first time, which showed a realistic scenario of the performance of the children in various subjects facilitating inter-state and intra-state comparisons at the same time. The collated information through Cycle 2 NAS, Class X, thus can be significantly used in directing policymakers, planners, curriculum developers and other practitioners in initiating relevant policy interventions wherever required with a view to holistically improve and monitor the quality of education at present and in future.

To strengthen the division's capacities in future and to undertake such programmes with more rigour NCERT welcomes comments and suggestions. For any further clarification/query related to the report you may contact the division through e-mail: esdhead@gmail.com.

INDRANI BHADURI
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National Achievement Survey

Executive Summary

National Achievement Survey (NAS) has been one of the most significant research projects undertaken by the MHRD, Government of India, which have been administered periodically since 2001 at the elementary level and since 2015 at the secondary level. The NAS Class X (Cycle 2) was initiated by the NCERT under the guidance of MHRD from 2017 onwards and was successfully conducted on a sample basis, in 36 States/UTs and Boards of India in February 2018.

This technical report of Class X presented by NCERT is a cumulative document, divided into nine chapters providing details of the entire process of survey, sampling and methodology used during the process, the execution of the assessment process, analysis and achievement, outcomes according to gender, social category and location of students and finally providing a detailed subject-wise account of learning achievement by the students of Class X in various government and government-aided schools across India. The document by highlighting the level of learning performances of the children in Class X, comprehensively provides a constructive feedback so as to identify the existing gaps in the processes, systems, performances related to school education in general and Class X in particular.

The First chapter provides a glimpse of the historical evolution of NAS in India, its objectives and the assessment framework along with the details of NAS administration, monitoring, reporting, dissemination, post-NAS interventions and the limitations of NAS. The assessment survey was conducted in all the 36 States/UTs and boards of the country, to provide a systematic understanding of learning performances of Class X students in various subjects with much more broadened objectives of providing system-level reflection to facilitate necessary policy interventions in future. The NAS Class X (Cycle 2) assessment emphasised on providing assessment output pertaining to five main curricular subjects, namely English, Mathematics, Science, Social Science and Modern Indian Language (MIL). The assessment was also significant from the view of its coverage, since it was first ever exercised where district administrative units were chosen as survey and reporting units, against state units, which were chosen in Cycle 1, to provide a realistic regional picture of the status of learning in schools.

The second chapter presents the methodology followed during the assessment process, which was developed around three basic parameters, i.e., **Design**, which includes sample designing and procedures, secondly **Reporting**, which includes the entire process of Data management, and thirdly **Analysis**, which is related to the data analysis using **Item Response Theory** method and preparation of the report. This chapter also provides details on the entire process of conducting the survey nationwide. The target population included Class X students from all the districts, studying in government, government-aided and private schools affiliated with State and National Boards. A comprehensive national sampling plan considering the targeted population was framed and desired school sample was derived based on predefined designated criteria, and a sample of 80 schools was selected from each participating district and from each selected school. A maximum of 45 students were selected through systemic random sampling procedure. Extensive use of information technology for data collection, data analysis and generation of report was done for the first time. Elaborated codebooks were developed based on all variables, mentioned in the assessment data sets. NAS web application was also developed to smoothly conduct the assessment programme. Modern techniques of analysis and interpretation of data have been applied to produce findings, using Item Response Theory, which provide much reliable output for assessment. Item response theory allows to evaluate student's ability

and uses mathematical model to link a student's probability of correctly responding to a particular item in the test. Based on the results, a comprehensive reporting scale was chosen from 0–500 with an average score of 250 initially, on which the performance of children was rated.

The third chapter is based on providing essential details about the three primary aspects of the survey: The school, the student and the teachers, which were crucial for the entire assessment process and outcome. The details related to the participating schools like defining management categories of the schools into government, government-aided and private schools. The Selection of school location as per rural and urban areas along with their affiliation to either national boards like CBSE, ICSE and various state boards have also been considered. Additional information was also undertaken which included—availability and adequacy of facilities in the school, parent-teacher association, attitude of the students, parents, and teachers towards the school, teacher learning process and other behavioural aspects. The student related information includes—gender, social categories, home location, languages spoken by the child, disabilities among children, resources available at home, educational, occupational status of mother and father of the child, distance of school from home, student experience and preference of subject among children. The teacher related information includes educational and professional qualification, employment status, teaching experience, opinion about workload, teaching practices and teaching methods.

Chapters 4, 5, 6, 7 and 8 contemplates Class X students' achievements in the five selected subjects, i.e., Mathematics, Science, Social Sciences, English and Modern Indian Languages, respectively.

Chapter 4 specifically highlights the state-wise assessment outcome in the subject mathematics. The average national score of 254 was achieved from all the participating states with 10 states either performing above or at the same level of national average of 254. The state of Andhra Pradesh with 269 points is the best performing state in mathematics and Sikkim with 226 points remain the least performing state for the subject. The gender-wise analysis reveal that in 8 out of 36 States/UTs and boards the performance of girls was better than boys. Similarly, the assessment output has been generated for location of school, Social Category, School Management. Different content domains, specifically seven domains—Algebra, Geometry, Mensuration, Trigonometry, Coordinate Geometry, Number system, Statistics were assessed against the range of relevant cognitive process, viz., abilities of learners to remember, understand, and apply their knowledge in attempting an item. The average score of 36 per cent in remembering, 33.9 per cent in understanding and 30.9 per cent in applying was achieved for mathematics. Learners have also been categorized into five proficiency level categories ranging from least (less than 200) to highest (greater than 350) and 41 per cent (maximum) of learners in mathematics were observed to be falling in category ranging between 201–250 followed by 31 per cent falling in range 251–300 scores.

Chapter 5 specifically highlights the state-wise assessment outcome in the subject Science. The average national score of 253 was achieved from all the participating states with 14 states either performing above or at same level of national average of 253. The state of Andhra Pradesh with 271 points is the best performing state in Science and Dadra and Nagar Haveli UT with 227s point remain the least performing state for the subject. The gender-wise analysis reveal that in 9 out of 36 States/UTs and Boards the performance of girls was better than boys. Similarly, the assessment output has been generated for location of school, Social Category and School Management. Different content domains, specifically seven— Food, How things work, Material, Moving things, Natural Phenomena, Natural resources, The Living world, were assessed against the range of relevant cognitive process, viz., abilities of learners to remember, understand, and apply their knowledge in attempting an item. The average score of 38 per cent in remembering, 33 per cent in understanding and 34 per cent in applying was achieved for Science. Learners have also been categorized into five proficiency level categories based on their

achieved scores ranging from least score (less than 200) to highest score (greater than 350) and 36 per cent, i.e., maximum of learners in sciences were observed to be falling in category ranging between 201–250 followed by 33 per cent falling in range 251–300.

Chapter 6 specifically highlights the state-wise assessment outcome in the subject Social Sciences. The average national score of 254 was achieved from all the participating districts with 16 States either performing above or at the same level of national average of 254. The state of Delhi with 273 points is the best performing state in Social Science and Jammu and Kashmir with 229 points remain the least performing state in subject. The gender-wise analysis reveal that in 18 States and UTs there was no significant difference in performance of boys and girls, however, in 11 out of 36 States/UTs and boards the performance of girls was better than the boys. Similarly, the assessment output has also been generated for location of school, social category, school management. Different content domains, specifically four— Economics, Geography, History, Political Science have been assessed against the range of relevant cognitive process, viz., abilities of learners to remember, understand, and apply their knowledge in attempting an item. The average score of 41 per cent in remembering, 40 per cent in understanding and 37 per cent in applying was achieved for Social Science by the learners. Learners have also been categorized into 5 proficiency level categorized based on their achieved scores ranging from least score (less than 200) to highest score (greater than 350) and 37 per cent, i.e., maximum of learners in Social sciences were observed to be falling in the category ranging between 201–250 followed by 251–300 score achieved by learners.

Chapter 7 specifically highlights the state-wise assessment outcome in the subject English. The average national score of 253 was achieved from all the participating districts with 22 States/UTs either performing above or at the same level of national average of 253. The state of Nagaland with 306 points is the best performing state and Madhya Pradesh State with 229 points remain the least performing state in English. The overall performance of girls was found to be better in 15 of 36 States/UTs and boards. Similarly, the assessment output has been generated for location of school, social category, school management. Two specific content domains were identified with respect to English, i.e., Reading Comprehension and Language Element (Grammar) and range of relevant cognitive process (skills of children), viz., abilities of learners to remember, understand, and apply their knowledge in attempting an item were identified for each domain. The average score of 38 per cent in remembering, 33 per cent in understanding and 34 per cent in applying was achieved for English by the learners. Learners have also been categorised into five proficiency levels based on their achieved scores ranging from the least (less than 200) to highest score (greater than 350) and 44 per cent i.e., maximum of learners in English scored between 201–250 score range, followed by 28 per cent of them lying between proficiency level of 251 to 300 score.

Chapter 8 specifically highlights the state-wise assessment outcome in the subject of Modern Indian Language (MIL). In the MIL only 33 States/UTs and boards participated and the average national score of 254 was achieved from all the participating districts with 17 states either performing above or at same level of national average of 254. The state of Kerala with 279 points is the best performing state in MIL and the state of Manipur with 187 point remains the least performing state in the subject, which reflects a wide gap between the highest and lowest scores achieved. The gender-wise analysis reveal that the performance of girls was better than boys in MIL. Similarly, the assessment output has been generated for location of school, social category, school Management. Learners have also been categorised into five proficiency level categories based on their achieved scores ranging from least score (less than 200) to highest score (greater than 350) and majority of students in MIL were found to have scored between 251–300.

The ninth and final chapter of the report is based on the contextual analysis of the background variables pertaining to three main key elements of the assessment exercise,

i.e., the school, the students and the teachers. The school factors like learning facilities, resources available, school participation in various academic and cultural activities have been assessed in relation to the achievement output. The student factors and background information of students with respect to student achievement (like distance to school, facilities at home, etc., also have to be assessed. Finally, various academic, professional aspects of the teachers like educational qualifications, experience of teaching, etc., have also been assessed in relation assessment outcome. The analysis of various aspects related to the given three key elements of assessment have been done to provide much realistic and comprehensive picture of the assessment outcome across India and to facilitate comparison in existing socio-economic conditions in different parts of the country to showcase their indirect and direct impact on the learning of children.

This technical report, therefore, is a compendium of perceptible information regarding learning achievements of children in Class X. It not only highlights the achievement of learning outcomes by the learners, but also facilitates comparative analysis against the achievement levels in previous cycles, thus providing a system level reflection on core areas of educational development in India over the years. The document also helps in accentuating the regional trends and patterns across India in the achievement level of learning outcomes amongst the learners of Class X. The detailed contemplation of district-wise information on various subject areas have been done for the first time, which showed a realistic scenario of the performance of the children in various subjects facilitating inter-state and intra-state comparisons at the same time. The collated information through NAS Class X (Cycle 2), thus can be significantly used in directing policymakers, planners, curriculum developers and other practitioners in initiating relevant policy interventions wherever required with a view to holistically improve and monitor the quality of education at present and in future.

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Introduction

The National Achievement Survey (NAS) is a large-scale assessment survey to monitor students' learning. NAS is not a school examinations, instead it is a survey that provides National, State and District level pictures of learning levels of students. It is not a reflection on individual student's, teacher's or school's achievement. NAS has been administered

periodically, since 2001 at the elementary level and since 2015 at the secondary level. At the elementary level, NAS assesses the learning levels of children studying in government and government-aided schools, while, at the secondary level, it shows the learning levels of children studying in schools belonging to all managements and boards.

<i>Examination</i>	<i>Assessment Survey</i>
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 in school. 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.	Assessment survey provides 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 in the curriculum. National Assessment surveys provide a 'Snapshot' of the education system by analysing achievement based on a range of background factors (school, home and teachers). They potentially enable policy-makers and practitioners to address the challenges to enhance students' learning.

Fig. 1.1: Difference between Examination and Assessment Survey

1.1. HISTORY OF NAS AND NAS 2018 IN INDIA

Background

The National Achievement Survey was originally planned and designed by NCERT as a research project to assess the quality of education. However, in the year 2000, NAS got subsumed under the *Sarva Shiksha Abhiyan* (SSA) of MHRD. Over the last two decades of SSA implementation, the focus shifted from dealing with challenges around access, to improving quality of learning. NAS emerged as a tool for giving periodic feedback to the system on the health of the education system. NAS became a regular and ongoing feature of the Indian education system, each round of NAS being referred to as a 'Cycle'. Under SSA, the original strategy was to administer three NAS cycles, wherein, each cycle would cover Classes III, V and VIII. The three cycles were to be called as Baseline, Mid-term and Terminal Achievement Surveys. The Baseline Achievement Survey (BAS) was carried out in 2001–04 was termed as Cycle 1, followed by the Mid-term Achievement Survey (MAS) in 2005–08 was named as Cycle 2, and Terminal Achievement Survey 2009–13 was termed as Cycle 3. Students of Classes III, V and VIII were to be tested once every three years. In the year 2017–18 NAS was administered simultaneously in Classes III, V and VIII on one single day. The NAS 2017–18

had many new landmarks first and foremost being the assessment of competencies at different grade levels.

Under *Rashtriya Madhyamik Shiksha Abhiyan* (RMSA), NAS was extended to Class X in 2015. NCERT completed the first Cycle NAS for secondary level (Class X) in 2015. NAS Class X (Cycle 1) assessed student learning at the end of the secondary stage. In NAS X Cycle 1 there were 15 languages of instruction across the country to ensure linguistic quality assurance. Multiple tests (three for each subject), in five subjects, namely Mathematics, Science, Social Science, English and Modern Indian Language (MIL) were developed and used to assess learning achievement. Three questionnaires (school, pupil and teacher) were designed to capture the background information. Item Response Theory (IRT) was used in NAS X Cycle 1, that measures the ability of students to respond correctly to different levels of difficulty in tests. This survey was conducted on a sample comprising 2,77,416 students in 7,216 schools across 33 States/Union Territories (UTs) and Boards.

To observe the improvement in the learning of the students, the MHRD decided to conduct the second Cycle of the Survey. The Educational Survey Division of NCERT initiated the NAS Class X (Cycle 2) in the year 2017. In the previous cycle of NAS Class X, the reporting unit was State however, in Cycle 2 the reporting unit is District.

Survey Cycle	Class	Class	Class	Class
	III	V	VIII	X
Cycle I	2003–2004	2003–2002	2003–2004	2015–2016
Cycle II	2007–2008	2007–2006	2007–2008	2017–2018
Cycle III	2012–2013	2012–2011	2012–2013	
Cycle IV	2015–2016	2015–2015	2015–2016	
Subjects Tested	Mathematics and Language	Mathematics, Language and Environmental Studies	Mathematics, Language and Environmental Studies	Mathematics, Language and Environmental Studies
	Background Questionnaires – Student, Teacher and School			

Figure 1.2: NAS Timeline

Table 1.1: Key Difference between NAS Class X Cycle 1 and Cycle 2

Dimensions	NAS Class X Cycle 1	NAS Class X Cycle 2
Objectives	<ul style="list-style-type: none"> Systemic Feedback at State/UT level 	<ul style="list-style-type: none"> Decentralised systemic feedback at District, State and National levels
Level of Sampling	<ul style="list-style-type: none"> State level 	<ul style="list-style-type: none"> District level
Timeline	<ul style="list-style-type: none"> Once in 3 years 	<ul style="list-style-type: none"> Once in 2 years District and State level results released within the same academic year
Monitoring	<ul style="list-style-type: none"> State level officials 	<ul style="list-style-type: none"> NCERT, MHRD District Monitoring Unit (DMU)
Survey Outcomes	<ul style="list-style-type: none"> State Reports National Report 	<ul style="list-style-type: none"> District Report Cards State Report Cards
Dissemination Strategy	<ul style="list-style-type: none"> Joint Review Missions (JRM)s MHRD/NCERT website 	<ul style="list-style-type: none"> MHRD/NCERT website District level workshops State level workshops Sharing the results with State Level Education Functionaries, such as Principal Secretaries, SPDs and SCERT Directors NAS Mobile Application
Partners	<ul style="list-style-type: none"> MHRD Technical Partners brought in by funding agencies SCERTs RMSA offices DIETs 	<ul style="list-style-type: none"> MHRD NAS Steering Committee NCERT The World Bank SCERTs SPD SSA offices DIETs District level education functionaries

NAS Class X Cycle 2 (2018): Salient Features

NAS Class X Cycle 2 significantly improved upon its previous cycles (Table 1.1). This section summarises the salient features of NAS Class X Cycle 2:

1. It included all the districts of 34 States and Union Territories of the country.
2. In this study random samples of schools were taken from all the schools in the country having secondary classes (Class X) and recognised by State Education Boards or National Boards of Education [Central Board of Secondary Education (CBSE) and The Indian Certificate of Secondary Education (ICSE)].
3. Assessment of achievement levels of Class X students was done in five main curricular/subjects areas, namely English, Mathematics, Science, Social Science and one Modern Indian Language (MIL).
4. A sample of 80 schools per district from each State/Board and maximum 45 students from each sampled school were included in the survey.
5. Technology was extensively used for uploading data into a central web application by States/UTs for analysis and report generation.
6. District Reports were put in to public domain for wider dissemination.

1.2. NAS OBJECTIVES

The purpose of NAS is to derive policy directions for systemic interventions with a view to improve the quality of school education. NAS also diagnoses hard spots in learning and consequently provide pointers for restructuring the in-service teacher education programs, as well as, curriculum renewal. NAS Class X Cycle 2 was designed with the following objectives—

1. To report performance on different subjects on content domain
2. To compare the average performance of the following group of children—
 - a) Girls and boys
 - b) Rural and urban children
 - c) Students studying in government, government-aided and private schools
 - d) Students belonging to different categories, i.e., Scheduled Caste, Scheduled Tribes, other Backward Classes and others

During the preparatory phase of NAS Class X Cycle 2, it became evident that, NAS could be potentially used to give systemic level feedback on students' attainment against content domain and hence Post NAS Interventions Strategy was planned to be undertaken at districts and States/UTs level. The key objectives of the Post NAS Intervention phase are—

1. Support States/UTs/Districts/Blocks/Schools to interpret and understand the findings of NAS
2. Support State/UT/District/Block to improve school-wise attainment of content domain
3. Ensure administrative/budgetary support for design and implementation of interventions to improve student attainment of content domain

1.3. NAS CLASS X CYCLE 2 COVERAGE AND PROCESS

Coverage

NAS X Cycle 2 provides reliable information to various stakeholders on the efficacy of the education system, with specific reference to issues of quality, equity and efficiency. The test is expected to assess learning levels of the students of Class X studying in secondary schools (Govt, Govt-aided and private) in India. In each of the five subject areas (Mathematics, Science, Social Science, English and Modern Indian Language), common core contents have been identified after analysing the syllabi of States/Boards as compared to the syllabus prescribed by NCERT based on National Curriculum Framework (NCF) 2005.

During the try out at the national level, 220–230 items were administered in each of the five subjects. At the State level, up to 20 per cent more items specially in Social Science were included in each subject to cover state-specific curricula. The number of items for each test in all five subjects for the main survey were decided after the try out only.

Process

Activities were designed, implemented and reported using international best practices and met the highest standard of technical rigour (Figure 1.3).



Fig. 1.3: NAS Class X Process Flow

Table 1.2: Details of Test Forms

Class	Subjects	Test Forms	Number of Questions	Question Type
Class X	English	<ul style="list-style-type: none"> • 11 • 12 • 13 	60 questions included in each test form	<ul style="list-style-type: none"> • 48 unique questions across the three test forms • 12 common questions
	Mathematics	<ul style="list-style-type: none"> • 21 • 22 • 23 		<ul style="list-style-type: none"> • 40 unique questions across the three test forms • 20 common questions
	Science	<ul style="list-style-type: none"> • 31 • 32 • 33 		<ul style="list-style-type: none"> • 43 unique questions across the three test forms • 17 common questions
	Social Science	<ul style="list-style-type: none"> • 41 • 42 • 43 		<ul style="list-style-type: none"> • 40 unique questions across the three test forms • 20 common questions
	Modern Indian Language (MIL)	<ul style="list-style-type: none"> • 51 • 52 • 53 		<ul style="list-style-type: none"> • 48 unique questions across the three test forms • 12 common questions

1.4. NAS ASSESSMENT FRAMEWORK

Test Design

For Class X, students were tested in Mathematics, Science, Social Science, English and MIL. Three test booklets were developed for each subject. Each test booklet included 60 items (MCQs) based on common core content domain.

Details of subject-wise test forms are summarised in Table 1.2.

Test Content

NAS Class X Cycle 2 mapped questions to subject-wise common content. The subject-wise common content list is given in Table 1.3:

Table 1.3: Subject-wise Common Content

Subject	Common Content
English	Reading Comprehension and Grammar
Mathematics	<ul style="list-style-type: none"> • Number systems including real numbers • Algebra including polynomials, pair of linear equations in two variables, quadratic equations, arithmetic progressions • Trigonometry including introduction to trigonometry, height and distance • Statistics and Probability • Coordinate Geometry including Lines (In two-dimensions) • Geometry including Triangles, Circles, and Constructions • Mensuration including areas related to circle, surface areas and volumes
Science	<ul style="list-style-type: none"> • Food including higher yields • Materials used in our clothes, different kinds of materials, what are things made of, what is there inside an atom, how things change/react with one another, materials of common uses and how are elements classified • The world of the living including biological diversity, what is the living being made up of, how do we fall sick, how do substances move from cell to cell, our environment, how do we stay alive • Reproduction in the living, heredity and evolution

	<ul style="list-style-type: none"> • Moving things, people and ideas including motion, force and Newton's law, gravitation, work energy and how things work including electric circuits and magnets • Natural phenomena • Natural resources including balance in nature, conservation of natural resources, the regional environment and Sources of energy
Social Science	<p>Geography <i>India—Land the People</i></p> <ul style="list-style-type: none"> • India • Climate • Drainage • Natural Vegetation • Wildlife and Population <p><i>India—Resources and their Development</i></p> <ul style="list-style-type: none"> • Natural Resources • Forest and Wild life Resources • Agriculture • Water Resources • Mineral Resources • Power Resources • Manufacturing Industries <p>History <i>India and the Contemporary World I and II</i></p> <ul style="list-style-type: none"> • Events and processes: French revolution, Russian revolution, Rise of nazism, Nationalism in Europe, Nationalist movement in Indo-China and Nationalism in India: Civil Disobedience Movement. • Economies and livelihoods: Pastoralists in the modern world, forest society and colonialism and farmers and peasants, Industrialisation 1850s–1950s, Urbanisation and Urban Lives and Trade and Globalisation. • Culture, Identity and Society: Sports and politics, clothes and cultures, Print Culture and Nationalism, History of Novel.
Social Science	<p>Political Science <i>Democratic Politics I and II</i></p> <ul style="list-style-type: none"> • Democracy in contemporary world • What is democracy? Why democracy? • Designing of democracy in India • Electoral politics in democracy • Institutions of parliamentary democracy • Citizens' rights in democracy • Working of democracy • Power sharing mechanism in democracy • Competition and contestations in democracy • Outcomes of democracy • Challenges to democracy <p>Economics <i>The Story of village Palampur</i></p> <ul style="list-style-type: none"> • People as resources • Poverty as a challenge facing India • Food security • The story of development • Money and credit • The role of service sector in Indian economy • Globalisation • Consumer awareness
Modern Indian Language (MIL)	Reading Comprehension and Grammar

Table 1.4: Skill-wise Instructions

Skills	Expectation
Skill 1	Students are expected to answer using simple knowledge (recall) or recognition of terms and/or concepts familiar from their lessons. This skill also included the application of basic operations in straightforward tasks.
Skill 2	Students are expected to solve non-complex problems set in familiar situations by way of simple application of the operations/concepts learned in Classes IX and X.
Skill 3	Students are expected to use concepts, principles, facts, etc., learned in the class in new or less familiar situations. In particular, students are expected to apply their abilities to solving real-world problems.

Skills Coverage (Common to Mathematics, Science and Social Science)

From each concept or sub-concept of content area, three types of items were constructed to test— skill 1, skill 2 and skill 3. Under each skill, the question constructed belonged to the categories— easy, average and difficult.

Skill-wise instructions are summarised in Table 1.4.

1.5. NAS ADMINISTRATION

Preparatory work for NAS Class X Cycle 2 commenced several months prior to the actual date of NAS Administration. At the central level, preparatory work was led by MHRD and NCERT in collaboration with NAS Programme Management Unit. A Steering Committee was established to guide and facilitate the activities of NAS.

At the state and district levels, SPD RMSA, SCERTs/SIEs and MIS coordinators undertook preparatory tasks for successful implementation of NAS Class X Cycle 2 in their respective areas.

Key Roles and Responsibilities of Various Organisations/Functionaries

- **SPD**
SPD and his office ensured availability of funds and infrastructure for NAS Class X Cycle 2 administration and post NAS activities. SPD's office also identified nominated and trained personnel and teams for monitoring the survey.
- **SCERTs**
Academic activities of the survey were spearheaded by SCERTs. Tasks, such as, vetting and translations of tests, communication of the final list of sample schools to NCERT, design and framing of post NAS interventions were led

by SCERTs. SCERTs also nominated the District Coordinators.

- **District Coordinators (DCs)**

DCs lead the school related communication and activities, such as verification of NCERT's sample school lists and communication of date of assessment to the school, etc. DCs also conducted trainings of Field Investigators (FIs).

- **Field Investigators (FIs)**

FIs administered the survey on February 5, 2018. District Institute of Education and Training (DIET) students were enrolled as FIs.

However, in Districts/States/UTs where absence of DIETs or shortage in FI members was reported, B.Ed./M.Ed. trainees from government colleges; B.Ed./M.Ed. trainees from Private Teacher Education Institutes (TEI); trained teachers who were not working in government schools; retired school teachers; Master of Social Work students and private school teachers, (in the given order of preference) were used as FIs.

Successful completion of NAS activities required the above mentioned organisations and personnel to work in collaboration with each other. Printing of tests, providing sealed test material to districts and upload of data on the web application are examples of few activities which required coordinated efforts from all.

1.6. NAS MONITORING

NAS Class X Cycle 2 was monitored and quality was assured at various levels. At the central level, MHRD and NCERT kept a thorough vigil over the completion of the NAS preparatory activities. Control units were set up at MHRD, NCERT and SCERTs prior to the day of NAS administration. At the state level the District Monitoring Unit (DMU), overviewed and reviewed the NAS preparatory activities.

NAS on the day of its administration was monitored by an independent observer, who was nominated from the office of the Chief Secretary. Each Observer was to fill a Monitoring Proforma¹ and submit to the SPD's office. The SPD's office was required to send in a single State Monitoring Report to NCERT.

1.7. NAS REPORTING

Under NAS Class X Cycle 2, for the first time, results have been reported at district level. Auto generated District Report Cards (DRCs) were put in the public domain within two months of the conduction of survey. Subsequently, State Report Cards (SRCs) were also released.

This national report which includes all the details of the technical aspects would be the last in the series of reports for NAS Class X Cycle 2. The reports at all levels, i.e., District, State and National levels focus on student performance in the attainment of learning in the desired specific content.

Achievement has been aggregated at the district level in the DRCs. Similar aggregation has been shown at the State and National level in the SRCs and the National Report, respectively. Analysis of pupil, teacher and school questionnaires have been included in SRC and the National Report.

Under the leadership of NCERT, Districts and States are expected to design interventions for improving learning at district and state level.

1.8. NAS DISSEMINATION AND POST NAS INTERVENTIONS

Several regional workshops were organised to disseminate and discuss the findings of the DRCs and SRCs.

The objectives of the workshops were:

1. To sensitise the participants on how assessment helps to transform education systems
2. To share the experiences of the States/UTs in the conduct of the NAS
3. To develop a common understanding on how NAS data will be used in policy, planning and improving pedagogical interventions

NCERT in collaboration with UNICEF also developed a Data Visualisation Application, which enables viewers to see the complex NAS data analytics in a simple and user-friendly manner.

NCERT has also developed a document on 'Post NAS Interventions: Communication and Understanding of the DRCs', which clearly articulates the way to interpret and understand the DRCs. The document also entails the actions, which NCERT proposes to be taking as a follow up of NAS. Follow up steps have been classified under short-, mid- and long-term interventions, as summarised below in Table 1.5.

1.9. LIMITATIONS

1. Languages across India have differences in Grammar. This leads to difficulty in standardising the procedures for scoring. Thus, only reading comprehension could be tested across classes in the language subject.

Table 1.5: Short, Mid and Long-term NAS Interventions

Duration	Interventions
Short-term	Training of State Level Master Trainers (SLMTs) in communication and understanding of the DRCs
Mid-term	Development of an intervention plan Strengthening of State AWPBs by using NAS data Development of an Item Bank (Dynamic) Development of ICT-based Learning Resources/Materials and LMS Data Sharing with States/UTs Adoption of Lowest Performing Districts in States for improving Learning Levels
Long-term	Development of National Policy Perspectives Curriculum Review and Reform

¹ Monitoring proformas were received by the observers prior to 5 February, 2018.

Methodology

This chapter deals with the sample design and procedure followed to conduct NAS Class X (Cycle 2). Sample design and sampling method have been discussed in detail. This is followed by the management of data with the help of single web application. The learning achievement data was analysed using Item Response Theory (IRT).

2.1. TARGET POPULATION

The Class X (Cycle 2) NAS was designed to investigate learning achievement in the system at the level of the state or union territory. Hence, the target population was all Class X children studying in government, government-aided and private schools affiliated with the State Board and private schools affiliated with national level boards.

National Desired Target Population

All students enrolled in Class X in government, government-aided and private schools belong to the national desired target population. In simple terms,

the national desired target population was intended to provide full coverage of all eligible students studying in Class X in government, government-aided and private schools.

National Defined Target Population

The national defined target population is the national desired target population minus certain exclusions. For example, the schools having enrolment less than 8 were removed from the District sampling frame. All exclusions must not exceed 5 per cent of the desired target population, State/UT that exceed this limit will be annotated in the national report.



Fig. 2.1: NAS Class X (Cycle 2) Methodology

District Desired Target Population

All students enrolled in Class X in government, government-aided and private schools in a particular district belonged to the district desired target population.

In cases where district desired target population deviates from the full district coverage of all eligible students, the deviations were described and enrolment data was provided to measure the extent of the reduced coverage.

District Defined Target Population

The district defined target population is essentially the school sampling frame. Differences between the district desired and defined target populations will generally arise out of practical considerations and should be kept to a minimum. All exclusions must not exceed 5 per cent of the district desired target population.

For example, for Sitamarhi district of Bihar, the desired and defined target population is given as below.

design and difficult test conditions. Exclusions can occur at the school-level, i.e., the entire school is excluded, or specific students within sampled schools, or sections, are excluded.

School Level Exclusions

The schools were excluded for the following reasons:

- They were geographically inaccessible.
- They were of extremely small size.
- They offered a curriculum, or school structure, radically different from the mainstream educational system.

Coverage and Exclusions

The distinctions among the Target Population, Desired and Defined Target Populations can be

Example 1: Sitamarhi District of Bihar

An example of Sitamarhi District from the state of Bihar: Desired Target Population and Defined Target Population

Desired Target Population	
Total No. of Schools	Total Enrolment
989	70745

Defined Target Population						
Exclusion Category	Values to be Excluded	Total number of Schools	Total Enrolment excluded	Defined Target Population	% of Exclusions	
School Management	5,6,7,8,97,98	78	3,551	67,194	5.00	
Invalid School Category	1,8,10	0	0	67,194	0.00	
<8		5	21	67,173	0.02	
Total	-	83	3,572	67,173	5.0	It should be less than or equal to 5%
Rest		906	67,173			

Total Defined Target Population is 906 schools with enrolment of 67,173 students

Note: The target population was limited to schools that contain the target class. Schools that did not contain the target class were, therefore, not considered part of the excluded population.

Exclusions

The District Defined Target Population represented a subset of the District Desired Target Population. All the excluded schools and students from the District Desired Target Population are referred to as the excluded population.

Usually, practical reasons are invoked for excluding schools and students, such as increased survey costs, increased complexity in the sample

nebulous. In this survey, we aimed to achieve full coverage of the National Target Population among all participating districts and to keep all exclusions to a minimum.

At district level all other sources of exclusions would constitute exclusions from the District Desired Target Population. Exclusions, therefore, describe the difference between the District Desired and District Defined Target Populations. Ultimately, the

district effective target population is the population that the sample of participating students effectively represent, after all sources of exclusions have been taken into account.

The term 'within-sample exclusions' is used to describe exclusions found among the sampled schools, sections and students. All within-school exclusions will fall in this category. The sizes of the district effective target population and within-sample exclusions will be estimated from the weighted sample.

Example 1: District Defined Target Population

The following is a fictitious example of a District Defined Target population.

In this example, District A has chosen to exclude the South Island because of its remote location, special needs schools because their curriculum is different from the mainstream educational system and very small because of its reduction in sample yield. These school level exclusions account for 3.1 per cent of eligible students in the State Desired Target Population.

District A also expects to exclude disabled students within schools. This would add another 0.8 per cent to this exclusion rate. Bringing the total exclusion rate to 3.9 per cent which is below the acceptable limit of 5 per cent.

2.2. STRATIFICATION

Overview

Prior to sampling, schools were ordered, or stratified, in the sampling frame. Stratification consisted of grouping schools into strata according to some grouping, or stratification variables. Stratification is generally used for the improvement of the efficiency of the sample design, thereby making survey estimates more reliable.

Explicit Stratification

Explicit stratification consisted of building separate school lists, or sampling frames, according to the set of explicit stratification variables under consideration. For example, district was considered as an explicit stratification variable, therefore, separate school sampling frames were constructed for each district. A constant sample size, was then applied to each school sampling frame to select the sample of schools at district level.

In this survey, the major reason for considering explicit stratification is to implement a disproportionate allocation of the school sample to the explicit strata. For example, the same number of

schools could be sampled from each explicit stratum, regardless of the relative size of each stratum. The objective in this situation was to produce equally reliable estimates for each District.

Another important reason for defining explicit strata was to deal with specific sample design issues. For example, explicit strata might be required to deal with very large schools. Very large schools are discussed in Section 2.4.

Implicit Stratification

Implicit stratification consisted of sorting the school sampling frame by a set of implicit stratification variables. It is a very simple way of ensuring a strictly proportional sample allocation of schools across all implicit strata. It can also lead to improved reliability of survey estimates, provided the implicit stratification variables being considered are known to be significant between strata variance component. The implicit strata used in NAS Class X Cycle 2 are—

- Block
- Location/area
- Management
- Type of school
- Medium of instruction

Example 2: Stratification in NAS Class X Cycle 2

The following is an example of the stratification variables using Bihar's Sitamarhi district's data in NAS Class X (Cycle 2).

'District' was defined as its explicit stratification variable and five implicit stratification variables and their levels, listed below:

1. **Block:** This variable refers to the 17 blocks within Sitamarhi district.
2. **School Management:** This variable refers to the three major school management groups in Sitamarhi district: government, government-aided and private.
3. **Location:** This variable refers to the two main locations of Sitamarhi schools— Rural and Urban.
4. **Medium of Instruction:** This variable refers to two medium of instruction, namely Hindi and Urdu across schools of Sitamarhi district.
5. **School Type:** This variable refers to the gender composition of schools in Sitamarhi district of Bihar. That is, co-educational, all boys and all girls schools.

Sitamarhi district defined a total of one explicit stratum and five implicit strata with various levels per explicit stratum, for a total of 408 implicit strata.

2.3. THE NATIONAL SAMPLING PLAN

Introduction

The NAS Class X technical standards had set a high benchmark for sampling precision, participation rates and implementation of sampling plans. These standards were said to result in samples of the highest quality and consequently survey estimates, which are unbiased, accurate and comparable.

Effective Sample Size

Before sampling it is important to set the level of precision. As a thumb rule precision should be around +/- 5 per cent. The NAS Class X standard for sampling precision requires that all state and territory samples achieve an effective sample size, for the main criterion variables, of at least 400 students.

In other words, all state or territory samples should yield sampling errors that are no greater than the sampling errors that would be obtained from a simple random sample of 400 students.

Since NAS Class X will also produce data at the school and section levels, a minimum of 80 schools must be selected from each district and minimum 360 schools in participating States or Union Territories.

The proposed NAS Class X sample design is a two-stage stratified cluster sample, which is far less efficient than a simple random sample. The actual sample sizes will, therefore, be much larger than 400 students. For example, by sampling one section of 45 students from each of 80 schools, sample sizes of approximately 3645 students can be expected from each district.

Participation Rates

The NAS Class X required maximum participation rates for schools and students. This requirement minimised the potential for response biases.

Schools

NAS Class X requires a minimum participation rate of 85 per cent of sampled schools as set in technical standards. Non-participating sampled schools will be substituted with 'replacement schools' to meet sample size requirements. The use of replacement schools does not guarantee that potential response biases have been reduced. State coordinators were encouraged to persuade as many sampled schools as possible to participate in the main survey.

Sections

Section participation rates will not be computed since generally only one section per school was sampled and a non-participating section will result in the school not participating. It is important to mention, however, that the substitution of sampled sections was not allowed. Substituted sections would affect the status of their respective schools, by demotion to either replacement or non-participating school status, resulting in a lower participation rate of sampled schools. If a substituted section did not meet any of these conditions, then its respective school was treated as a non-participating school.

Students

NAS Class X also required a minimum participation rate of 85 per cent of students among participating schools. Student participation rates were calculated for over all participating schools, whether sampled schools or replacement schools. The student participation rate requirement of 85 per cent was met at the district level, not necessarily for each participating school.

Sampling Steps

Overall, there are eight key steps followed to successfully prepare, draw and check the sample of schools. The eight key steps are—

1. Preparation of the sampling frame file
2. Identification of certainties
3. Determine sample selections
4. Sorting the frame and sample selection
5. Checking the assigned replacement schools
6. Handling the certainties
7. Generating a school participation file
8. Populating population and sample summary statistics

Sample Design Framework

The general sample design framework adopted for this study is a two-stage stratified cluster sample design. State or territory sampling plans relied on sound and defensible sampling methods. These methods are briefly described in the following points.

- For the first stage of sampling, schools were stratified, explicitly and/or implicitly, and selected with Probabilities Proportional to Size (PPS). The sampling method is called a PPS systematic sampling method.
- The second stage of sampling consisted of the selection of one section, from each sampled school.

2.4. THE SCHOOL SAMPLING FRAME

School Measure of Size

A suitable school measure of size (MOS) is a critical component of a school sampling frame, since school selection probabilities are based on this MOS. Possible school MOS, in decreasing order of suitability, are—

1. Student enrolment in the medium of instruction
2. Student enrolment in the target class
3. Average student enrolment per section, i.e., total student enrolment divided by the number of sections in the school
4. Number of sections in the target class
5. Total student enrolment

In NAS Class X (Cycle 2), total student enrolment is used as MOS.

School Sample Allocation

For the main survey, a minimum of 80 schools were sampled from each district. If a state or territory has two or more explicit strata, State Coordinators were required to calculate the proportional allocation of 360 schools across the explicit strata.

Excluding Schools from the Sampling Frame

Based on the information reported in Sampling Form 2 (National Defined Target Population), some schools were excluded from the school sampling frame.

Sorting the Sampling Frame

Each school in the sampling frame was assigned a value for each implicit stratification variable. For example, if location (rural or urban) and school management (government or private) are used, each school must be classified as either rural or urban and as either government or private.

The school sampling frame was then sorted by the implicit stratification variables. The schools were first sorted by the first implicit stratification variable, then by the second implicit stratification variable, and so on, until all implicit stratification variables exhausted. The result was a cross-classification structure that represented the implicitly stratified school sampling frame.

Very Large Schools

The district sampling frame contained schools wherein MOS was greater than the calculated

sampling interval. In theory, this would mean that some of these very large schools are sampled more than once. This situation could be problematic during survey operations as this would require sampling more sections in those schools. It also complicates the data base design and computation of sampling weights. In order to avoid these problems, an explicit stratum of very large schools was constructed. This stratum contained all schools wherein MOS was greater than the calculated sampling interval.

Identifying Replacement Schools

It is not always possible to obtain the participation of all sampled schools. In order to avoid the resulting sample size losses, a mechanism of field verification of schools was adopted to identify a priori replacement schools for non-participating sampled schools. Another, perhaps more important, reason for identifying replacement schools a priori was to avoid the haphazard use of alternate schools as replacements, which may amplify response biases. Although this approach does not necessarily avoid non-response bias, it tends to minimise the potential for bias. Furthermore, it is conceptually more palatable than over-sampling to accommodate a low participation rate.

The districts were asked to make every effort to get as many of the sampled schools to participate as possible. In some cases, however, districts are needed to consider the use of replacement schools. To allow for this, where possible, each sampled school in the main survey was assigned two replacement schools in the sampling frame.

2.5. THE SAMPLING OF SCHOOLS

Overview

Schools were selected once the school sampling frames were sorted according to the implicit stratification variables and had been constructed for each explicit stratum. School samples were selected separately for each explicit stratum, with each explicit stratum having its own sampling frame. Each school entry in the sampling frame contained:

1. a unique national school ID (this should be numerical),
2. school contact information, such as name, address, email address, phone number, etc.,
3. all implicit stratification variables and
4. a suitable school measure of size (MOS).

Before progressing further, it was ensured that sampling forms 1 to 4 had been completed. The sampling forms were used as a reference to indicate the implicit stratification variables, their order of importance and their levels. The information outlined in the sampling forms was reflected in the sampling frame and sample selection process.

the OMR sheets were scanned and converted into .csv files. Cleaned .csv files were uploaded into a web application, which was developed specifically for NAS Class X (Cycle 2).

Use of a single web application to collate, carry out preliminary analysis and generation of District Report Cards (DRCs) was a novel feature of NAS Class X (Cycle 2).

2.6. DATA MANAGEMENT

NAS Class X (Cycle 2) was a paper and pencil test, which was administered pan India, following uniform and standardised procedures. Post data collection,

Class X Data Management Sequence in NAS Cycle 2

Several preparatory activities were undertaken prior to the development of NAS Class X web application. Key preparatory activities are shown in Figure 2.2.

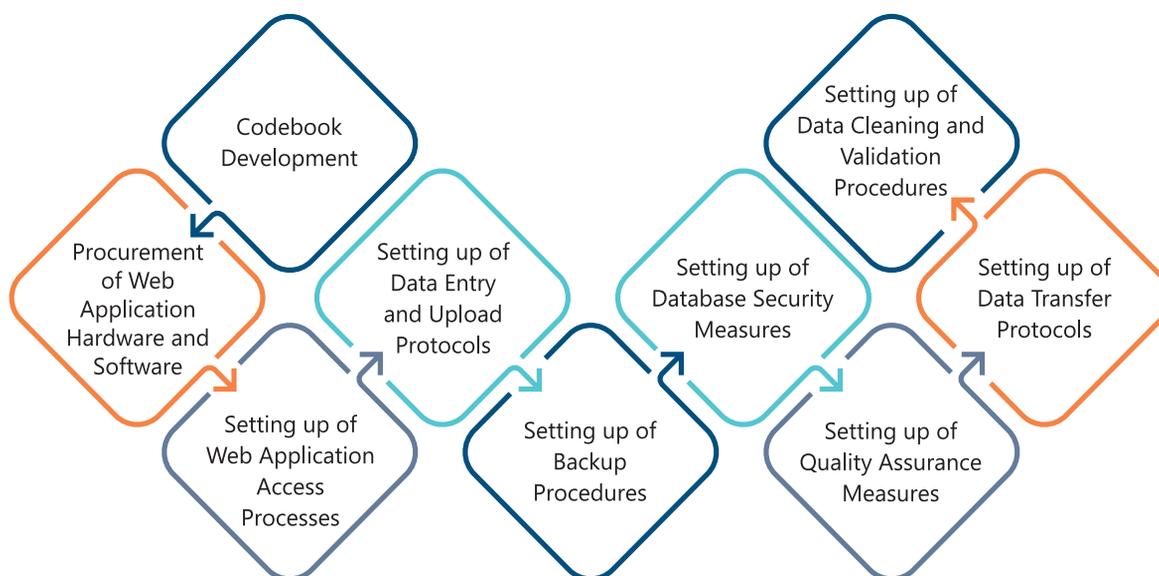


Fig. 2.2: Preparatory Activities for Development of NAS Class X (Cycle 2) Web Application



NCERT



NATIONAL ACHIEVEMENT SURVEY



MHRD
Government of India

Need Help? Please call +91 9818439354 or Email - nashelp17@gmail.com

Download offline data cleaner tool

Go NAS Portal

Welcome
to National Achievement Survey

MHRD in consultation with the NCERT launches National Achievement Survey. The survey aims to create a culture of learning and achievement in the school system by focusing on the learning levels of students. By assessing elementary grade students in Government and Government-aided schools across the country and tracking student-level learning performance, the survey will raise awareness on the current learning levels of students. The survey will be able to provide valuable insights on learning levels which can be used to design support to improve the quality of learning in the school system.

Username	<input type="text"/>
Password	<input type="password"/>
	<input type="text" value="Enter captcha"/>
Forgot Password?	<input type="button" value="Log In"/>

Fig. 2.3: NAS Class X (Cycle 2) Web Application Screenshot

Codebook Development

A codebook includes details on all the variables mentioned in the assessment data set. Details commonly included in the codebook are related to variable definitions/descriptions, variable codes/values, validity parameters and codes for missing values.

For NAS Class X (Cycle 2), codebook was developed and stored within the NAS web application. The codebook served as a structural database, wherein, details on NAS variables were stored. Information on items, form numbers, and keys were all stored in the NAS Class X (Cycle 2) codebook. All the above information was saved separately for each tested subject.

NAS Class X (Cycle 2) online codebook was used to analyse the uploaded raw data and auto-generate DRCs from the web application.

NAS Web Application: Hardware and Software

The NAS web application was hosted on a NIC cloud-based server. Details on the backend infrastructure used to configure the application are given below.

Setting up of Web Application Access Processes

The following 3 category of users were provided access to the web application— (i) National level (ii) State level and (iii) District level.

Each level of user could access the application by logging in through a distinct username and

Web Server:	LAMP or NGINX
Database Server:	MySQL 5.5.54
Database Cache:	Redis 2.4.10
Application Development Framework:	CodeIgniter (CI) 3.1.0
Server Side Language:	PHP 5.6.30
Programming Language:	PHP, Javascript (Jquery), HTML

password. A specific SMS and e-mail system was activated to transmit the username and passwords to the web application users.

Each level of user could perform only pre-defined set of activities on the web application (details on the same are provided in Table 2.1).

Setting up of Data Entry and Upload Protocols

The web application supported two forms of data entry—manual and non-manual. Manual data entry required the DCs to physically enter data into the web application. The information, such as number of FIs, number of students present or absent on the day of assessment, etc., had to be entered manually into the application.

Test and questionnaire data could only be uploaded or entered into the system using the non-manual/software facilitated mode of data entry.

Detailed procedures on uploading test and questionnaire data were mentioned in the Data Capturing Manual (DCM)¹ developed by NCERT.

Table 2.1: NAS Class X (Cycle 2) Web Application User Levels and Activities Performed

User Level	Personnel/Organisations Involved	Activities to be performed on the NAS Class X (Cycle 2) Web application
National	<ul style="list-style-type: none"> Educational Survey Division (ESD), NCERT 	<ul style="list-style-type: none"> View progress of activities at the national level Correct/Modify the Codebook Create State Level Users Download National Data Download DRCs
State	<ul style="list-style-type: none"> State Coordinator 	<ul style="list-style-type: none"> View progress of activities at the State/UT level Create District Level Users Download DRCs
District	<ul style="list-style-type: none"> District Coordinator 	<ul style="list-style-type: none"> Upload District Level Data View Progress of activities at the district level Manually enter details, such as FIs number, contact details, etc. Download DRCs

¹ http://www.ncert.nic.in/programmes/NAS/pdf/Data_Capturing_Manual.pdf

The DCM clearly specified and explained the fields which needed to be filled and completed at the time of upload. The document also specified the validation checks for each of the above mentioned fields. Validation checks referred to the values and its ranges which could be filled and accepted by the application.

Each district uploaded six .csv files — three .csv files for achievement tests and one each for PQ, SQ and TQ data. Each of the achievement .csv files included data on all the subjects tested for a particular class. However, in case of questionnaires, districts uploaded all the data across classes for a particular questionnaire in a single .csv file.

Setting up of Database Security Measures

Several measures were put in place to ensure that the datasets entered into the application were secure and error free. Given below are some key safety measures instituted within the application.

- **Username and password based entry:** A user could enter the application only after entering a preset username and password.
- **All passwords were encrypted:** Plain text passwords were not accepted by the application.
- **File upload:** The application rejected any other type of upload apart from .csv files.
- **Different captchas were built into the application for login, data upload and DRC download:** Users were required to correctly enter a captcha before entering the application, uploading data and downloading DRCs.
- **Access to the application was based on approvals:** People could not independently access or register themselves on the application. Only pre-defined users could access the application. The application accepted only three levels of users— National Level Users (NLUs), State Level Users (SLUs) and District Level Users (DLUs). NLUs could only create SLUs, SLUs could only create DLUs.
- Any users could not change, update or modify data of other users.

Setting up of Backup Procedures

Within the application, the NAS Class X (Cycle 2) database, was set up in a table format and had the following functionalities:

- A login tracker to track the user IDs who logged into the web application along with the date and time of the login.

- A .csv upload tracker to track the user ID who uploaded the file along with the format of the file and the time of modification (if any).
- LO code book along with number and times of modification.
- National/State/District Response Master Trackers which tracked and created back up of all the achievement and questionnaire data, along with the number and date of modifications. Information on the IDs through which the modifications were made and also stored.

Setting up of Data Cleaning and Validation Processes

All efforts were taken to ensure that only clean data got uploaded into the web application. Preliminary levels of data cleaning were done by DCs, following the procedures mentioned in the DCM. While preparing files for upload, the DCs manually scrutinised the OMR sheets to correct errors and cases of duplication.

Post this initial round of manual correction, the data files were scanned and converted into .csv files using specialised scanning software. The .csv files were put through an offline correction tool¹, which helped to identify errors, specifically, in fields which were present as mandatory. Mandatory fields were defined as fields for which entry in a specified format was needed and essential. Fields which required details on UDISE Code, Student ID, Social Group, Area Code, School Management, Gender, and Medium (Language) and Test forms were defined as mandatory.

Data collected in the mandatory fields were crucial to the analysis of NAS Class X (Cycle 2).

A guideline² was also developed to help users understand the procedures of cleaning the data using the tool. Prior to data upload, the offline tool along with its guideline was hosted on the web application.

The NAS Class X (Cycle 2) offline tool was a simple macro-based excel sheet with in-built validations that helped users clean their data. Validation ranges for the mandatory fields were same as those mentioned in the DCM and offline tool guidelines. In addition to the above, item responses were restricted to 1–4 and 8, 9 were affixed for multiple and no responses, respectively. Mandatory fields and columns in which values deviated from the present values/ not filled in

¹ <http://www.ncert.nic.in/programmes/NAS/offline.html>

² http://www.ncert.nic.in/programmes/NAS/pdf/NAS_Correction_Guidelines.pdf

as expected were shown as errors in the offline tool. Upon putting the .csv file through the offline tool, in case of error generation the DCs were expected to check and correct the errors. The final cleaned file was also saved as .csv file which could be uploaded into the application.

Offline cleaning tool was only developed for achievement data in NAS Class X (Cycle 2).

Figure 2.4 gives a snapshot of the offline tool.

Click here to check for errors																				
Validations Results																				
Total number of errors	0																			
UDISE School Code																				
Student ID																				
Social Group																				
Area Code																				
School Management																				
Gender																				
Medium																				
Test from																				
Questions Errors																				

Fig. 2.4: NAS Offline Tool

Upon completion of data upload, UDISE codes of schools included in the .csv files uploaded into the web application were matched against the UDISE codes mentioned in NCERT's verified sample school lists. This step became a precursor to DRC generation.

DRC results were computed for the number of schools which matched between the uploaded .csv file and the NCERT's verified sample school lists.

Setting up of Quality Assurance Measures

An attempt was made to set up stringent quality control processes at every step of data collection, cleaning, verification and upload.

Listed below are few quality control measures which were set up with regards to data management:

- Prior to data upload, all achievement test data had to be screened and corrected using the data offline tool.
- Only .csv files could be uploaded into the web application.

- DRC generation relied completely on the list of sampled schools verified by States/UTs and shared with NCERT making result computation a transparent and bias-free process.
- The web application was screened through a security audit before being put into the public domain.

2.7. ITEM RESPONSE THEORY (IRT)

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.

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 CTT. IRT uses the concept of an Item Characteristic Curve (ICC) to show the relationship between students' ability and performance on an 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.

In Table 2.2, students' responses on five items have been indicated.

Table 2.2: Item-wise Raw Responses of Children

	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	

First student answers all five items correctly and is tentatively considered as possessing 100 per cent proficiency. Similarly, second and third students are attributed to have 80 per cent and 60 per cent proficiency levels. However, under IRT, the above assertions are considered tentative. Student's abilities cannot be judged based on the number of correct items alone. For accurate ability estimation, item attributes, such as discrimination/difficulty also need be taken into account. For example, two children (student 6 and 8) get the same raw scores on a test (shown in Table 2.3). However, it is difficult to state that, whether both the students have the same level of proficiency attainment. The eighth student may have answered two easy items correctly and the sixth student may have answered two difficult items correctly. Hence, both the item attributes and the examinee proficiency need to be measured before estimating student performance.

CTT can help us get estimate only 'tentative item difficulty' and 'tentative student proficiency levels'.

In IRT, tentative proficiency and item difficulty levels are used to fit a model, which is then employed to predict the data. Given the proficiency level of a student, the probability of answering a particular item correctly is computed by the following equation:

$$\text{Probability} = \frac{1}{[1 + \exp\{-(\text{proficiency} - \text{difficulty})\}]}$$

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.

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 or 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 Table 2.4 an attempt has been made to interpret the discrimination values with respect to quality of an item.

Item Difficulty (The 'b' parameter)

Item difficulty is most commonly measured by calculating the percentage of students who

Table 2.3: Item-wise Raw Responses of Children

	Item 1	Item 2	Item 3	Item 4	Item 5	Average
Student 6	0	0	0	1	1	0.4
Student 7	0	0	0	0	1	0.2
Student 8	1	1	0	0	0	0.4

Table 2.4: Discrimination Values and Interpretation

Discrimination 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

Table 2.5: p-Values and Interpretation for Dichotomous Items

p-Value	Interpretational for dichotomous items
1.00	Items are extremely easy (everyone gets it right)
0.80	Items are easy (80% get it right)
0.50	Items are of medium difficulty (half get it right; half get it wrong)
0.30	Items are difficult (70% get it wrong)
0.00	Items are difficult (everyone gets it wrong)

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). Generally, items with 'p' values between 0.21 to 0.79 are considered for inclusion in tests where the average difficulty scores are nearly 0.5. Item difficulty is denoted by letter 'p' and its interpretation for dichotomous item is summarised in Table 2.5 below.

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 low ability of guessing the correct response to an item and therefore has a greater-than-zero probability of responding correctly.

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, having ability θ_i , being successful on the item is

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

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

There is only one parameter for each item, namely the difficulty and is known as Rasch model.

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 j^{th} item.

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

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

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_{ij} the probability of the i^{th} examinee, ability θ_i , being successful on the j^{th} item.

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

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

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.

Use of IRT in NAS Class X (Cycle 2)

The IRT scaling approach used for NAS Class X (Cycle 2) is at par with some international large scale surveys. The psychometric model was used in scaling the Class X (NAS) data and for this commercially available software CONQUEST was used in order to apply IRT models.

In order to calibrate the test items, the 2-PL model was used in NAS Class X (Cycle 2). Under assumptions of the 2-PL model, the probability of a response to an item is modelled 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). Considering these limitations, the 2-PL offered a widely acceptable compromise between the lesser and the more restrictive IRT models available.

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, for English, Mathematics, Science, Social Science and Language other than English the achieved scores ranged approximately from 100 to 450.

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.

Reliability

Reliability of the test score scales was estimated from the IRT scaling. For simplicity and familiarity the marginal reliability coefficient is quoted here. 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.

Estimating Sampling Variance

The NAS Class X (Cycle 2) 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 Jackknife Repeated Replication (JRR) technique 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 statistics of interest (e.g., the states 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 statistics.

To produce a Jackknife estimate of the sampling variance of a statistics 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 j^{th} 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 statistics 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:

$$V_{jrr}(t) = \sum_{h=1}^H [t(J_h) - t(S)]^2$$

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.

The Reporting Scale

In NAS Class X (Cycle 2), 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 2.5).

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 X 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 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 per cent will be true for another test.

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 centre as described above. However, the scores for Mathematics, English, Science, Social Science and Language other than English are derived by applying the same principles, but independently. Therefore, it is important that readers do not compare scores across subjects.

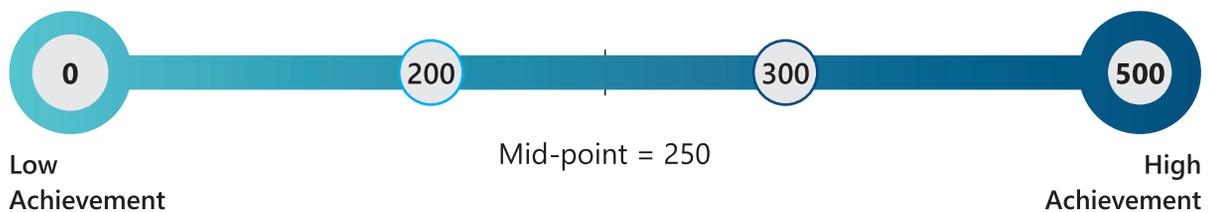


Fig. 2.5: The Reporting Scale

Our Schools, Students and Teachers

The National Achievement Survey of Class X Cycle 2 was designed to decipher into the learning achievement of students studying across different school managements in various States and UTs across the country. In this regard, schools were selected at the district level of all 36 States and Union Territories and Boards in the country having secondary classes through a rigorous sampling technique. A sample of 80 schools were taken from each participating district. Then from each selected school, a maximum of 45 students studying in the sampled schools were selected through systematic random sampling procedure to assess the average performance among the group of student. Besides, teachers teaching these selected students were also considered for this 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 are infrastructural facilities are available 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 this chapter, an attempt has been made to provide highlights on some of these important variables.

3.1. SCHOOLS

Clearly, the success of schools in providing quality of learning is something that governments at various levels need to monitor. This helps in identifying the characteristics of a healthy learning environment, which further maximises student achievement.

In order to access the school related variables, a school questionnaire was used to collect information from school principals. The information asked on various variables in school questionnaire were grouped into four categories—

- School Background
- Home-school Interaction
- Teaching-learning Process
- School Social Climate

School Background

The variables under the category of school background were school management, school location, school affiliation, adequacy of basic facilities available in the school, attitudes of students, teachers and parents towards school and behavioural aspects among students and teachers.

School Management

Out of the total schools that participated in NAS, approximately 56 per cent were government

managed schools, 24 per cent were private schools and other 20 per cent were government-aided schools. Figure 3.1 shows the proportion of each school type.

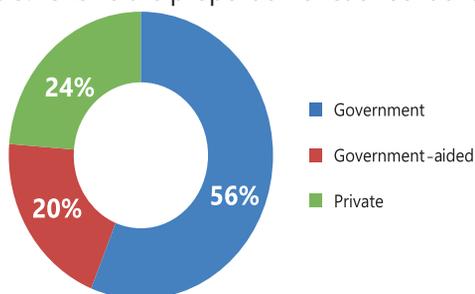


Fig. 3.1: School Management

School Location

Of the sample surveyed, majority of schools, i.e., 71 per cent of them were located in rural areas and rest 29 per cent of schools were in urban areas (Figure 3.2).

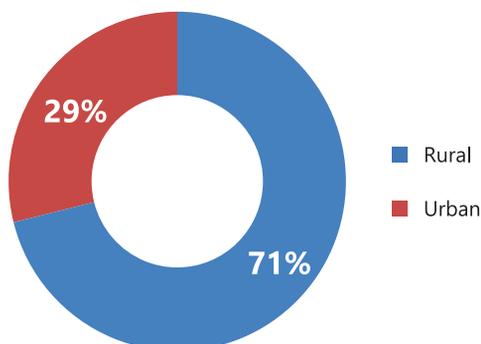


Fig. 3.2: School Location

School Affiliation

Figure 3.3 indicates that a vast majority of schools around 94 per cent of them were affiliated to state education boards for secondary education, whereas only 5 per cent were affiliated to Central Board of

Secondary Education and 1 per cent were affiliated to Indian Certificate of Secondary Examination.

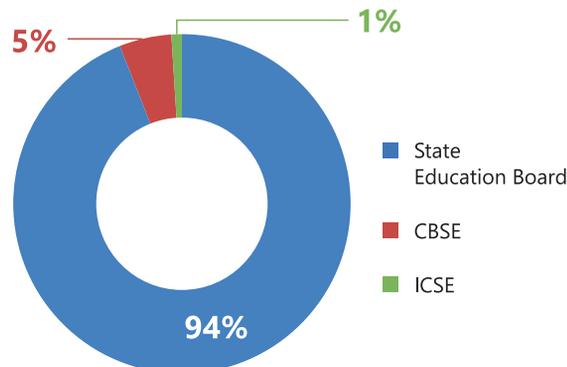


Fig. 3.3: School Affiliation

Facilities Available in the School

The data regarding the availability of various facilities in the schools was obtained and categorised into following three groups:

- **Physical facilities:** Electric connection, safe drinking water, furniture for students, staff room for teachers, Library, Classroom access to children with special needs (CWSN), toilets access to CWSN, and playground.
- **Teaching-learning material:** Science Laboratory, Mathematics Laboratory, Language Laboratory, Social Science room, Library, Indoor Game(s), Computer/ICT labs, trained ICT personnel and, trained physical education teachers.
- **Ancillary facilities:** Audio-visual resources in classrooms, and library resources relevant to subject instruction.

Figure 3.4 shows the availability of physical facilities in the sampled senior secondary schools. Approximately 84 per cent schools had staffroom for

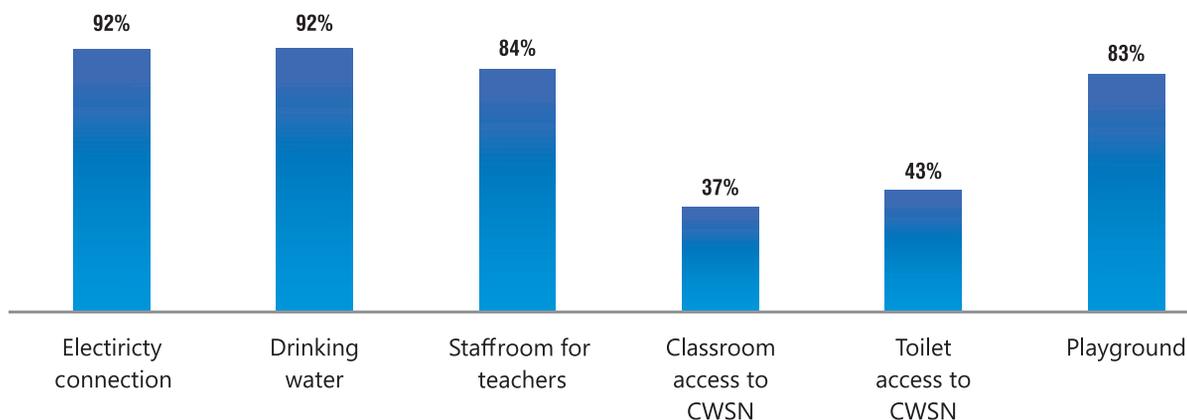


Fig. 3.4: Physical Facilities

teachers. Almost 92 per cent of schools had electricity connection, 92 per cent of schools had access to drinking water facilities and 83 per cent of senior secondary schools had playground facilities. Around 37 per cent schools had special classrooms for CWSN and 43 per cent schools had toilets for CWSN.

Figure 3.5 depicts the availability of teaching-learning material in the sampled schools. Library, science and ICT labs were available in more than 70 per cent of the schools. At the secondary level it becomes even more critical to have well-equipped laboratories for enhancing teaching-learning process. However, only 31 per cent, 21 per cent and 19 per cent of schools had mathematics laboratory, social science room and language laboratory, respectively. Moreover, games are also an interesting way for making the learning process interesting for students. In the sampled schools, almost 49 per cent of schools had facility of indoor games.

Figure 3.6 shows that 34 per cent and 43 per cent of schools had audio-visual resources and library resources relevant to subject instruction, respectively, available at schools.

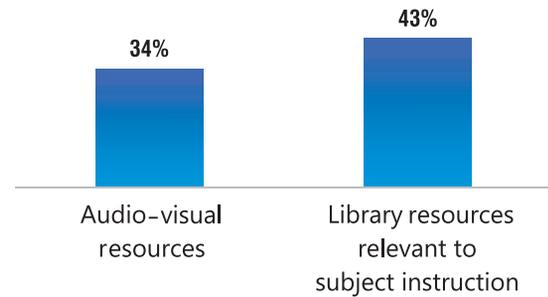


Fig. 3.5: Ancillary Facilities

In the sampled schools, 76 per cent of schools participated in the science exhibitions at secondary stage. Similarly, majority of sampled schools approximately 80 per cent and beyond were found to be participating in sports, cultural and quiz-based activities. Similarly participation in such activities enriches the learning process in the classroom. Specifically, involvement of students in different types of sports brings them pleasant and joyous experiences and provides a breakthrough from routine classroom's teaching-learning activity. While art education is an integral part of curriculum at different stages of education however, only 62 per cent of schools were found to be participating in art activities (Figure 3.7).

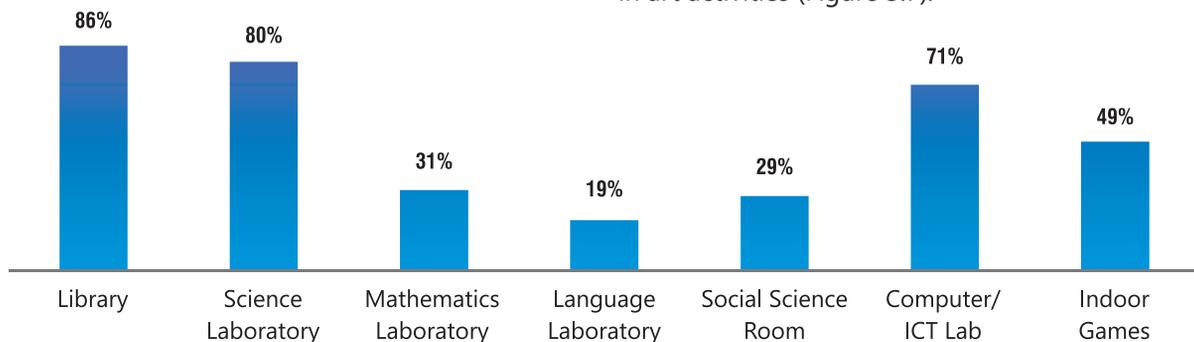


Fig. 3.6: Teaching Learning Material

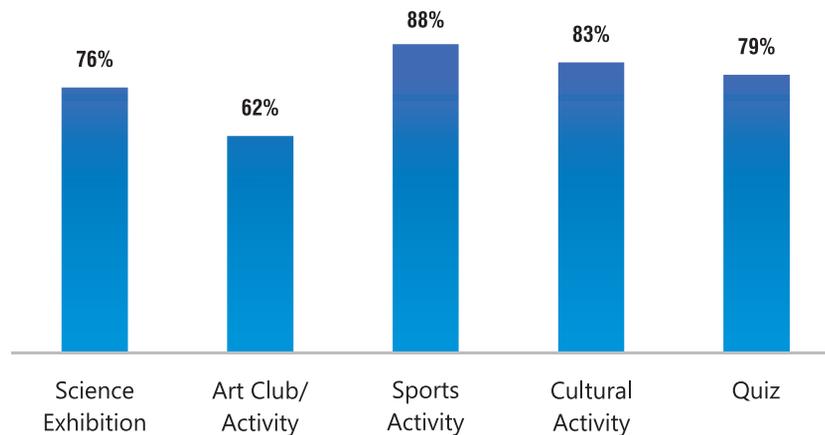


Fig. 3.7: Extracurricular Activities

Home School Interaction

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

Parent Teacher Association

The visible involvement of parents around the school makes school authorities accountable and attentive towards issues conducive for school environment. In the sampled schools, almost 88 per cent had parent-teacher association (Figure 3.8).

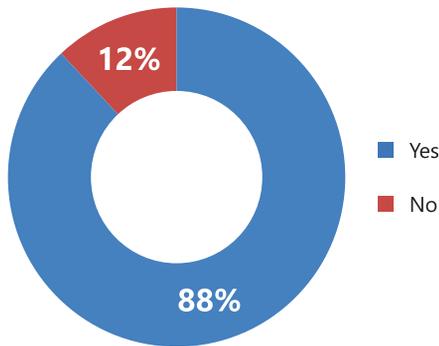


Fig. 3.8: Parent-teacher Association

School Management Committee

School Management Committees (SMCs) act as an important bridge between the community and the school. Active community participation has the potential to improve the efficacy in schools as

stakeholders (parents and community) have the incentive to demand quality education for their children. In the sampled schools, majority of them i.e., 95 per cent of schools have constituted SMCs in their schools (Figure 3.9).

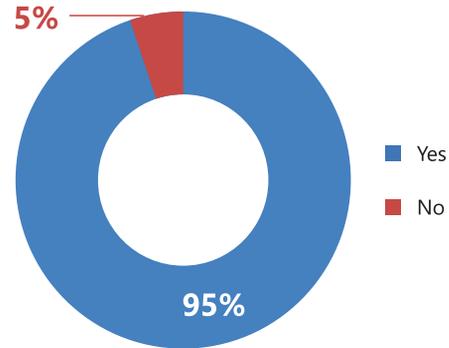


Fig. 3.9: School Management Committee

Attitudes of Students, Teachers and Parents towards the School

This study collected information on the factors relating to teachers, students and parental involvement in school activities. Information relating to teachers pertained to the following factors—teachers’ degree of success in implementing the curriculum, teachers’ expectations for student achievement, teachers working together to improve students achievement, teachers’ ability to inspire students, teachers’ professional development, equity in school and quality of teaching and learning. All the above factors were collected at three levels—high, medium and low.

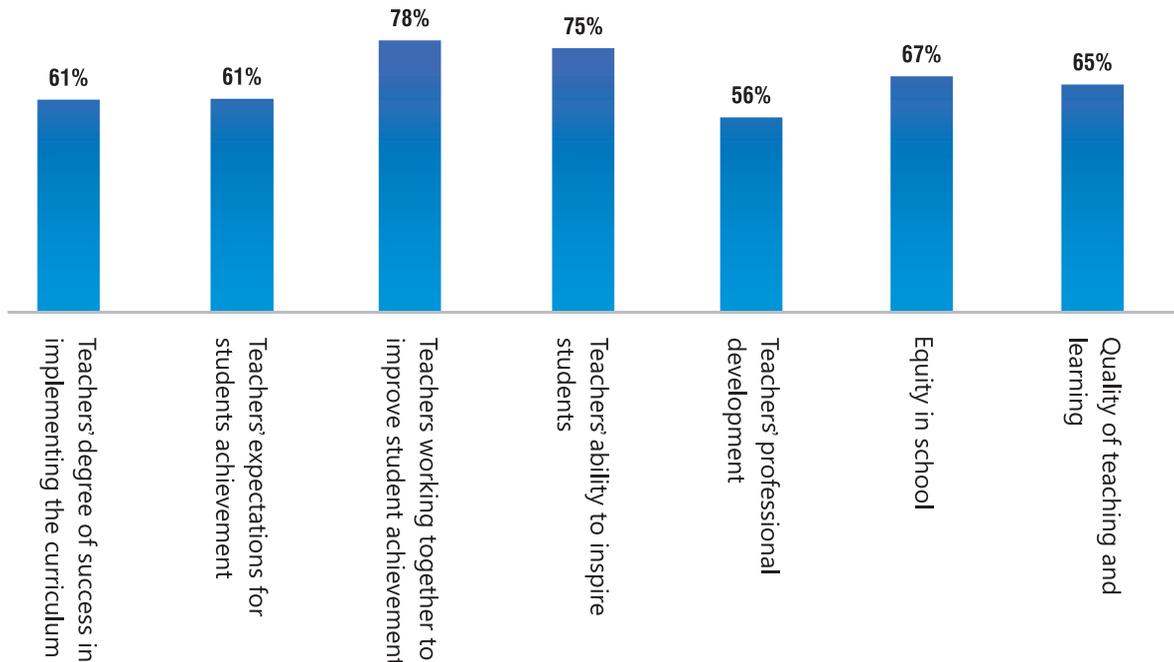


Fig. 3.10: Attitude of Teachers towards the School

Around 78 per cent of the schools reported that teachers working together to improve student achievement are able to inspire students to be at a higher level. Approximately, 61 per cent of the sampled schools also revealed teachers' degree of success in implementing the curriculum and teachers' expectations for students achievement to be at a higher level. However, only 56 per cent of schools observed teachers professional development to be at high level and remaining reported to have teachers' professional development ranging from medium to low. With respect to quality parameters, approximately 65 per cent of schools proclaimed quality of teaching and learning in schools to be at a higher level (Figure 3.10).

Parental involvement is significantly linked with improved behaviour, regular attendance and positive attitude. In this regard, in the sampled schools, approximately 50 per cent of schools corroborated parental involvement in school activities and parental support for students' achievement to be average or medium. Similarly, 48 per cent and 57 per cent of schools reported students desire to do well in school and students ability to reach school's academic goals to be medium (Figure 3.11).

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, behaviours and skills that add to their learning experiences. The present survey included following parameters influencing the teachings learning process:

- Adequacy of basic facilities, resources and staff in schools
- Viewpoints on External Evaluation/ Assessment

Adequacy of Basic Facilities, Resources and Staff in Schools

This study collected information relating to what extent schools were affected by the shortage or inadequacy of resources, facilities and staff, which significantly impacts the teaching-learning process and hence, students achievement. Information obtained on whether schools were affected by the shortage or inadequacy of facilities, resources and learners' achievement were graded into three categories on the basis of their frequency of occurrence, i.e., not at all, some or a lot. The major areas explored were:

- **Resources:** Instructional material, audio-visual resources, library resources relevant to subject instruction, classrooms, furniture for students, drinking water, electric connection/fans, staffroom for teachers.
- **Staff:** Teaching staff, qualified teaching staff and availability of support staff.

Nearly 20 per cent of schools reported they were affected by the inadequacy of facilities, such as drinking water, electric connections and staffroom for teachers in their schools. However, equivalent number of schools were observed to being affected by the inadequacy of these facilities. Similarly, 16 per cent of schools attributed to have affected by the shortages of instructional materials.

With respect to audio-visual resources, 20 per cent of schools were affected by its shortage. A large number of schools corroborated that they were affected by the shortages of library resources relevant to subject, i.e., 15 per cent.

Around 23 per cent and 19 per cent of sampled schools were reported to be affected by the inadequacy of classrooms and furniture for students, respectively (Figure 3.12).

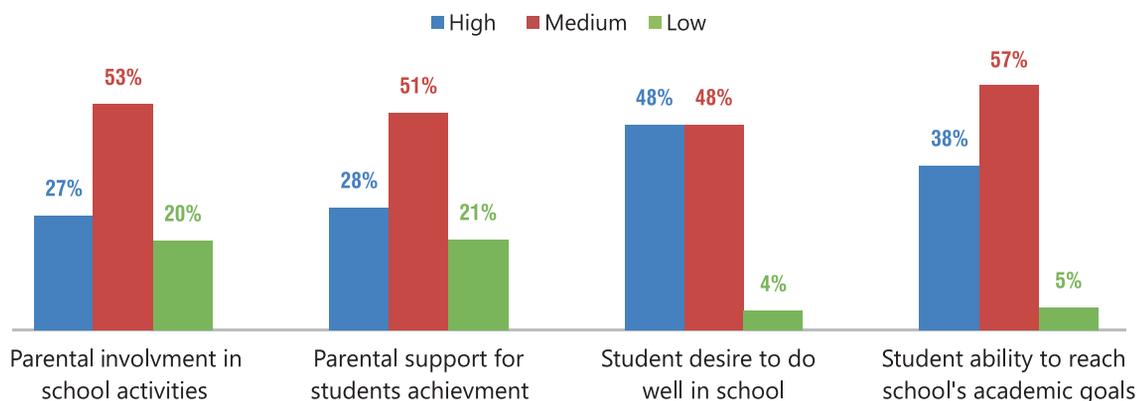


Fig. 3.11: Attitudes of Parents and Students towards the School

Approximately 20 per cent of sampled schools reported the inadequacy of teaching staff in the schools. These schools were affected due to the shortage of teaching staff in the schools. Relevance of qualified teaching is a critical factor having an immense impact on the teaching-learning process and learners achievement due to the expertise possessed by them.

Almost 23 per cent of schools were reported to face difficulties in the teaching-learning process due to the inadequacy of qualified teaching staff. Approximately 19 per cent schools reported to being impacted due to shortages or inadequacy of support staff in their schools (Figure 3.13).

Viewpoints on External Evaluation and Assessment

Data from the Figure 3.14 shows that about 88 per cent of the schools reported that evaluations

led to changes in school development. Majority of schools, i.e., 90 per cent expressed utilising the external evaluation data to plan specific actions for school development and towards the improvement of teaching and learning process in the schools. Finally, 88 per cent of schools proclaimed putting these evaluations into practice promptly.

School Social Climate

The school social climate is concerned with the psychological context in which school behaviour is rooted and is considered to be a relatively enduring quality of the school. The school social climate category here consists of behavioural aspects both among students and teachers.

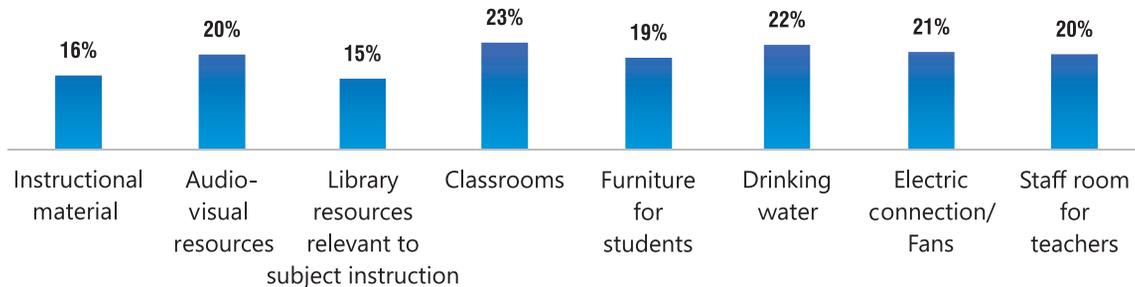


Fig. 3.12: Shortage or Inadequacy of Resources and Facilities in Schools

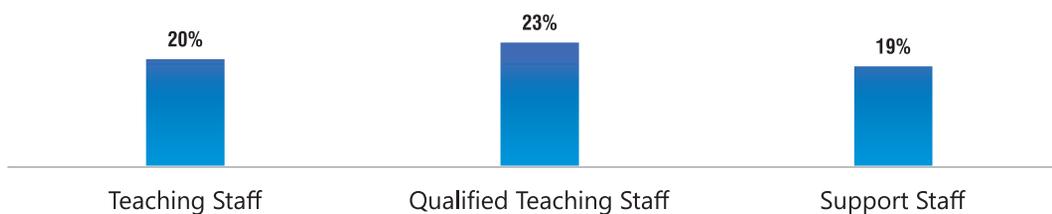


Fig. 3.13: Shortage or Inadequacy of Staff in Schools

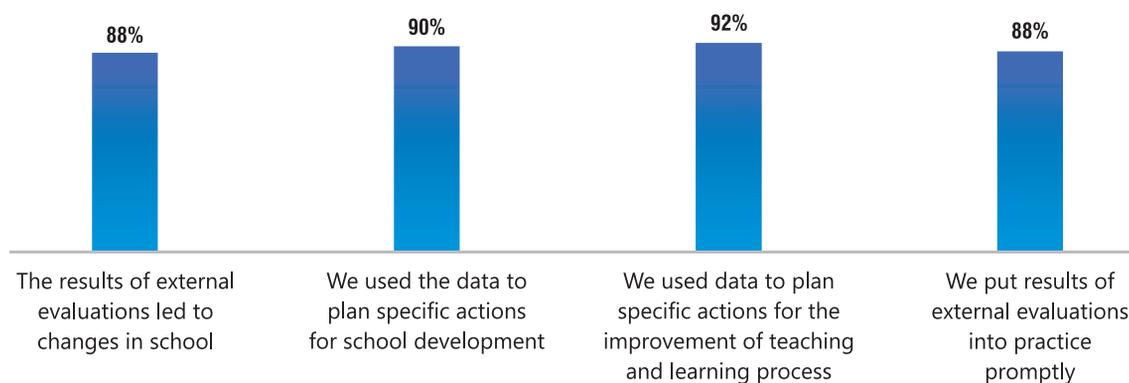


Fig. 3.14: Viewpoints on External Evaluation

Behavioural Aspects among Students

Behavioural aspects of students were graded into three categories on the basis of the frequency of occurrence, i.e., not at all, some, a lot. The major areas explored were:

- Student absenteeism
- Students skipping classes
- Students lacking respect for teachers
- Students use of alcohol or illegal drugs
- Students intimidating or teasing other students

Nearly, 17 per cent of schools ('a lot') observed students skipping classes, students lacking respect for teachers were also found in the only 15 per cent of the sampled schools. Further, 12 per cent of the schools observed the students using alcohol or illegal drugs. These results indicate that such types of problems did not occur 'frequently' in the schools surveyed (Figure 3.15).

Behavioural Aspects among Teachers

Even with respect to teachers, such a typical behaviour was also not evident among teachers in most of the sampled schools. Nearly, 11 per cent of the schools observed teachers not meeting individual students' needs. Additionally, only 7 per cent of schools reported to have experienced staff resisting to changes made in the school, while, 9 per cent even expressed that

they found the teachers to be too strict with students. Further, 11–14 per cent of them, experienced issues relating to teacher absenteeism and teachers not being well prepared for class (Figure 3.16).

3.2. STUDENTS

This 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, experiences

Students, Background

In this sub-section, students' variables covered here are age, gender, social groups, proximity of home location to school, whether they are physically challenged, repeated a grade, language used at home and students, aspiration for further education.

Students' Age

The age distribution of the students is given in Figure 3.17 which shows that overall 82 per cent of the students were in the age group 15–16 years. Moreover, only 10 per cent were in the age group of 17–21 years and 8 per cent of the students belonged to the age group of 12 to 14 years.

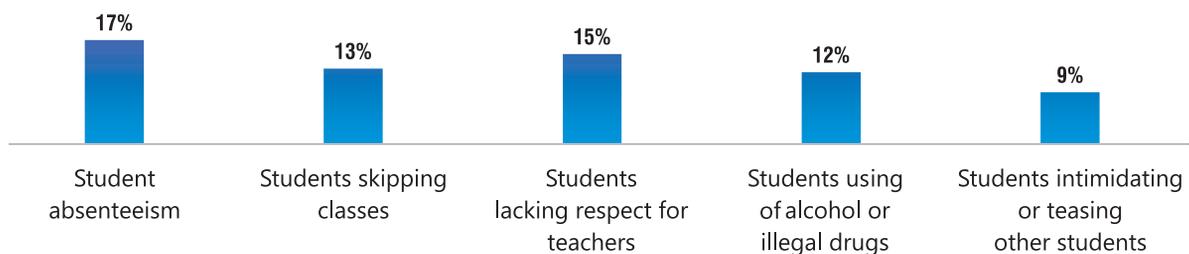


Fig. 3.15: Behavioural aspects among Students



Fig. 3.16: Behavioural aspects among Teachers

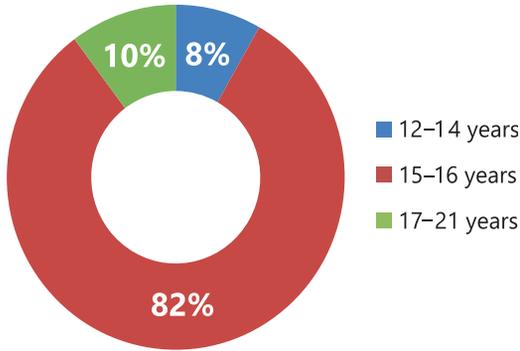


Fig. 3.17: Age

Students' Gender

The gender distribution of students is given in Figure 3.18. Overall, the sample comprised 51 per cent boys and 49 per cent girls.

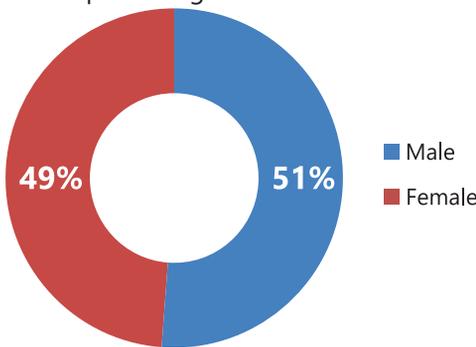


Fig. 3.18: Gender

Category-wise Distribution of Students

Figure 3.19 shows that 18 per cent of the students in the survey were SC students, 17 per cent were ST students, and 42 per cent belonged to Other Backward Classes (OBCs). Out of the sampled data, 23 per cent of students belonged to 'Others' category.

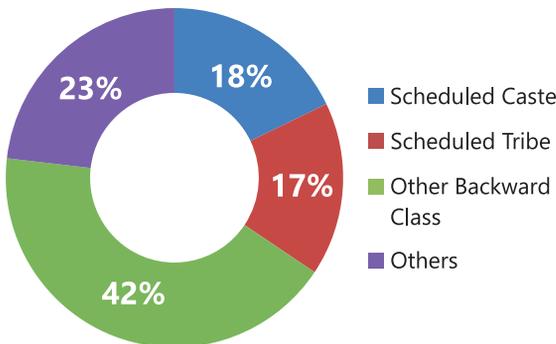


Fig. 3.19: Category-wise Distribution of Students

Location of the Home

Figure 3.20 shows that 26 per cent of the students in the sampled survey came from urban areas. However,

majority of the students in the sampled survey, i.e., 74 per cent of them came from rural areas.

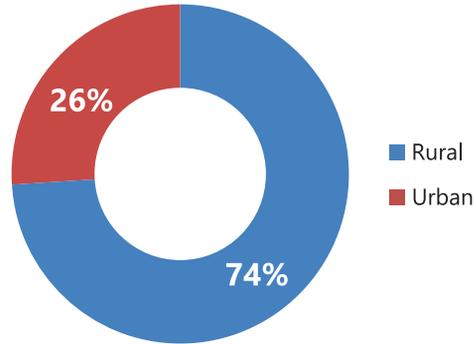


Fig. 3.20: Area

Grade Repetition among the Students

Majority of students in the sample, i.e., (79 per cent) have never repeated grade at the primary level, whereas 10 per cent of the students once repeated the grade at primary level and 11 per cent of the students repeated the primary grade more than once. With respect to middle level, majority of sampled students i.e., 77 per cent of them never repeated grade at the middle level, 15 per cent repeated grade once at the middle level and 8 per cent of them repeated the middle level more than once. Whereas, in case of secondary level, 75 per cent of students have never repeated the grade at secondary level, while, 9 per cent of the students have repeated secondary level once and 16 per cent of them repeated secondary level more than once (Figure 3.21).

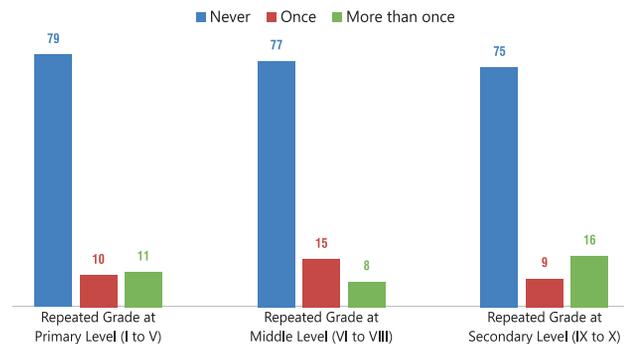


Fig. 3.21: Grade Repetition

Language Spoken at Home

Figure 3.22 shows that 57 per cent of the students spoke the same language at home as their medium of instruction in the class. However, 38 per cent of the sampled students in the survey reported that they were studying with a different medium of instruction vis-à-vis the language spoken and a

small percentage of 5 per cent students in the survey tend to speak English at home.

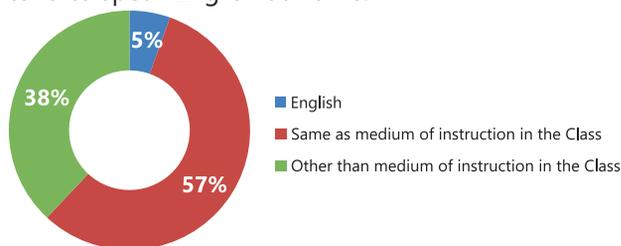


Fig. 3.22: Language spoken at Home

Disabilities among the Students

In the survey, data was also gathered from the sampled students regarding disabilities. It was found 3.6% students with disabilities took part in the achievement survey.

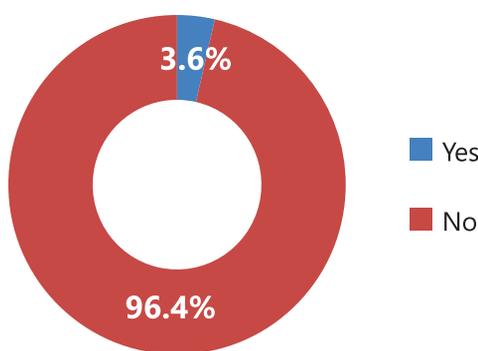


Figure 3.23: Students with disability

Students Aspiring for Further Education

The graph shown in Figure 3.24 depicts students' aspiring for higher education. Out of the sampled survey, 7 per cent students aspired to study only till secondary level of education, whereas 19 per cent reported that they aim to complete higher/senior secondary level of education. Approximately, 20 per cent of students aspired to complete education up to graduation level or equivalent, further, 24 per cent of students aimed to study up to post graduation

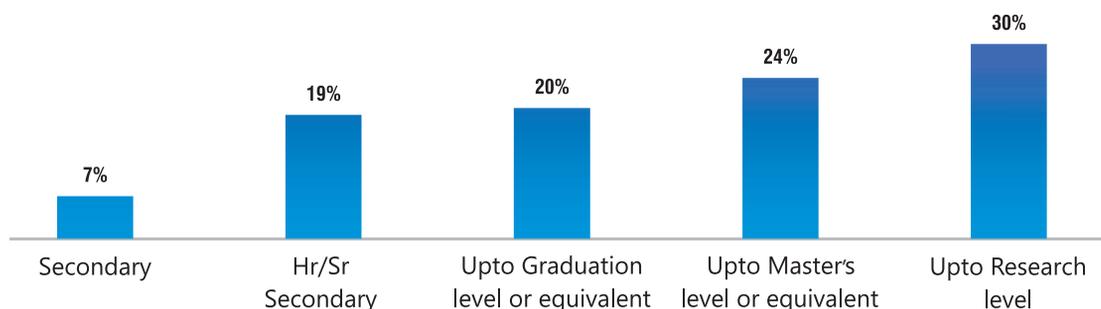


Fig. 3.24: Students aspiring for Higher Education

level. Interestingly, 30 per cent of students in the sample surveyed reported to go till the research level studies.

Resources Available at Home

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

Educational Status of Parents

Parents are the first teachers of the child and they play a pivotal role in providing the stimulating environment to facilitate cognitive development of their child. The educational status of the surveyed students' fathers and mothers are discussed in the following sections.

Educational Status of Father

For educational status of father, it is found that 18 per cent of the students' fathers were illiterate, nearly 41 per cent of them had basic literacy or competency of being able to read and write. Almost 26 per cent of the students' fathers had completed the formal level of schooling. While, only 10 per cent of students reported of their fathers' attaining graduation degree and approximately 5 per cent of the fathers were reported to have completed the masters level of education or beyond that (Figure 3.25).

Educational Status of Mother

Figure 3.26 indicates that about 31 per cent of the students' mothers were illiterate and they cannot read and write, and nearly, 34 per cent of the students' mothers had basic level of literacy of being able to read and write. Additionally, approximately 26 per cent of the students reported that their mothers had undergone basic level of formal

schooling. However, only 7 per cent of the mothers had completed education till graduation level and only around 3 per cent had done master's level of education.

Occupational Status of Parents

The occupational status of the surveyed students' father and mother are depicted in the following section.

Occupational Status of Father

About occupational status of the father indicated that 6 per cent of them were unemployed and another 5 per cent of them were engaged in the household chores. Majority of fathers, i.e., 47 per cent were involved in farming activities. However, 9 per cent of fathers had government jobs and 14 per cent of fathers had private jobs. Approximately, 15 per cent were being engaged in self-employed or professional activities (Figure 3.27).

Occupational Status of Mothers

The occupational status of mothers show that 7 per cent of them were unemployed and another 61 per cent of them were involved in household work. Further, 19 per cent of the mothers were farmers. Around 4 per cent of mothers had government and private employment. Moreover, sampled data asserted that mothers of 3 per cent were self-employed or involved in a professional activity (Figure 3.28).

Resources at Home

In the view of the importance of resources in enhancing students' learning, information was collected about the availability of resources, such as newspaper, magazine, radio, television, calculator, mobile phones, computer and Internet facilities at home. With respect to this, wide variety of variations was observed in the availability of these facilities at home. Approximately, 43 per cent of students

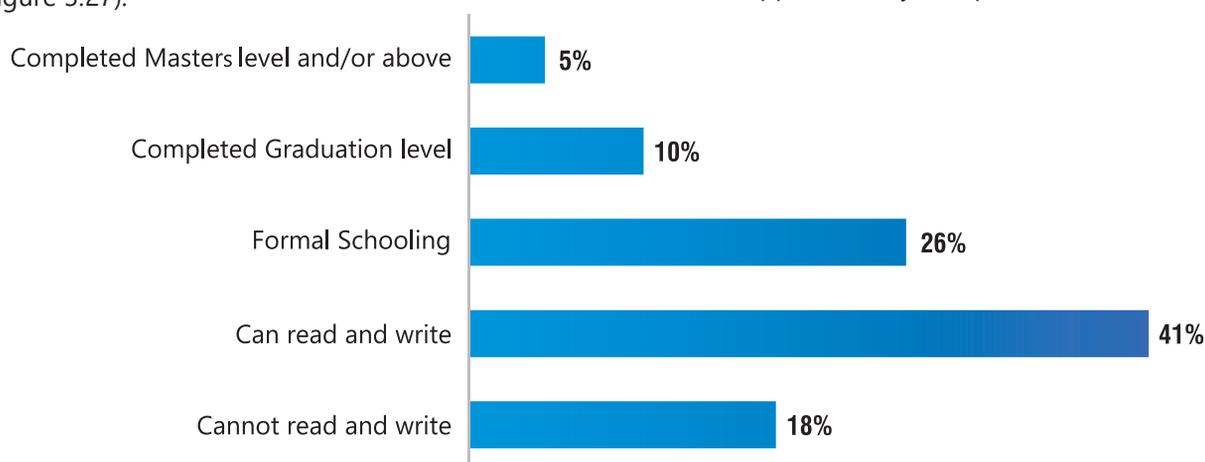


Fig. 3.25: Educational Qualification of Father

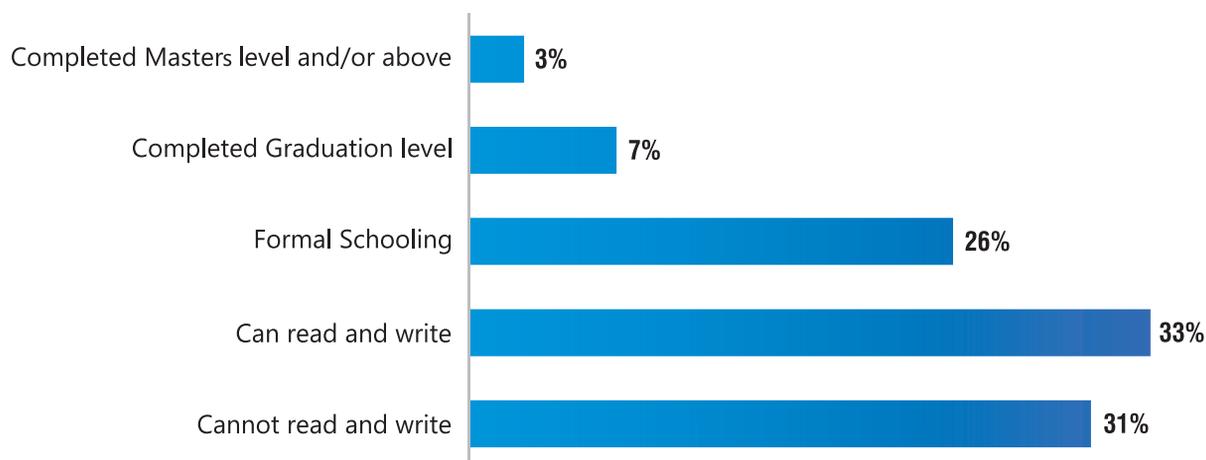


Fig. 3.26: Educational Qualification of Mother

reported that they had newspapers coming to their homes, however; only 26 per cent of them had the provision of magazines at home. A vast majority of 69 per cent of students had television available at home, but only 38 per cent of them had the radio facility. Similarly, 58 per cent of students had the provision of calculators at home. Rapid growth of technology and its growing accessibility lead to greater mobile usage across rural-urban areas, i.e., 94 per cent, similarly 28 per cent of the sample surveyed students having computer facility at home and approximately 44 per cent students reported of having internet services available at home (Figure 3.29).

Resources Available at Schools

Schools are almost like a second home for children as they usually spend one third of their time in schools.

The survey conducted covered information relating to important variables, such as distance from home to school, availability of library and its usage, and availability of science laboratory and opportunity to conduct practical experiments in the laboratory.

Distance from Home to School

School distance acts as an important impeding to students growth, because in this case a child has to cover long distances daily to reach school. With respect to gender, accessibility of school within few kilometers from home serves as an impetus for families to send their girls to school regularly. In the sampled data, 76 per cent of the surveyed students reported that their school was within five-kilometer distance from their residence. While, only 24 per cent of sampled schools mentioned that they have to

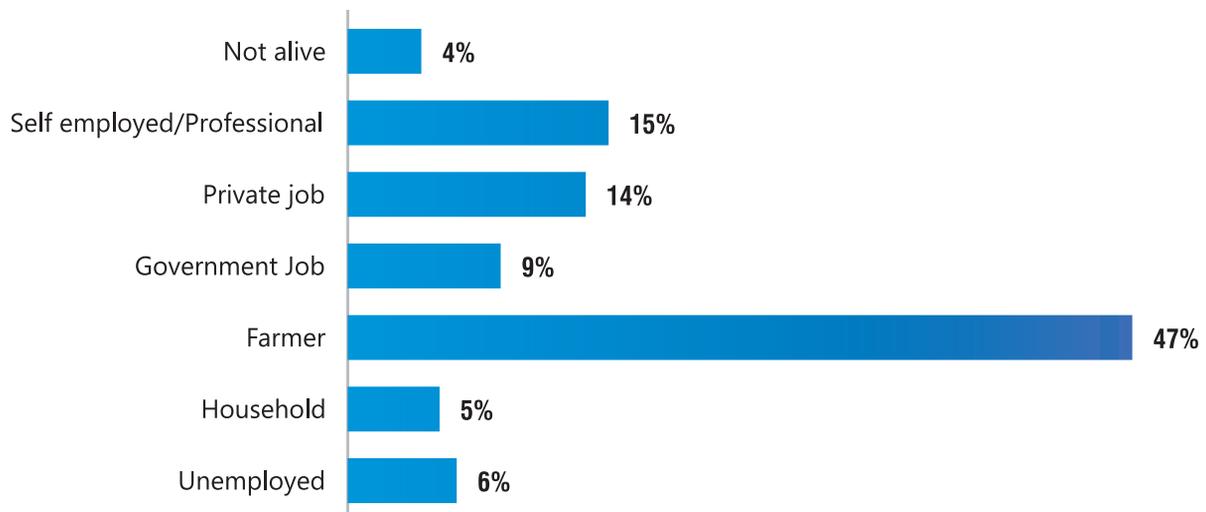


Fig. 3.27: Fathers' Occupation

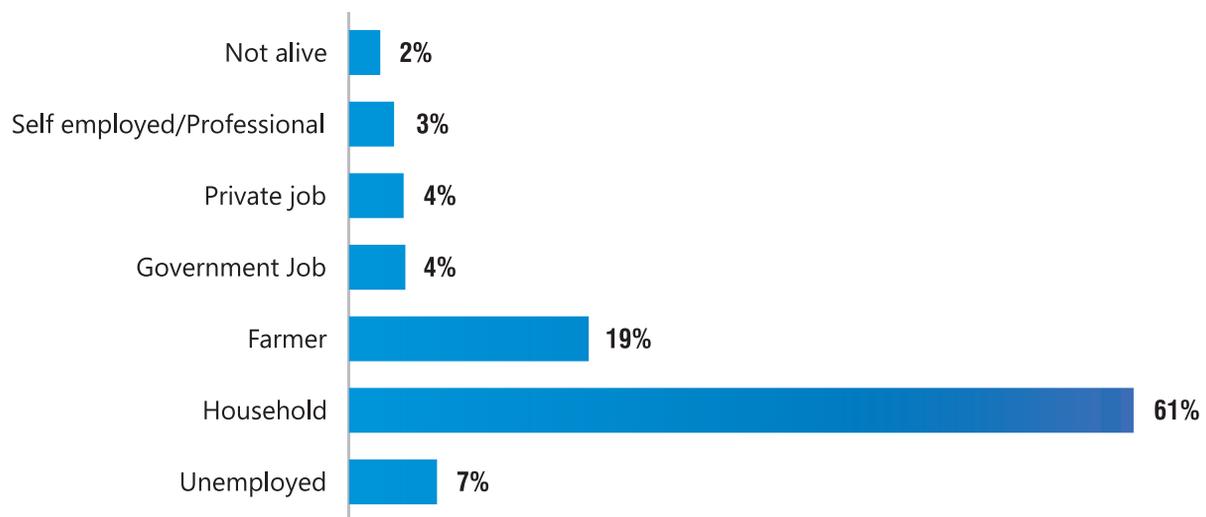


Fig. 3.28: Mothers' Occupation

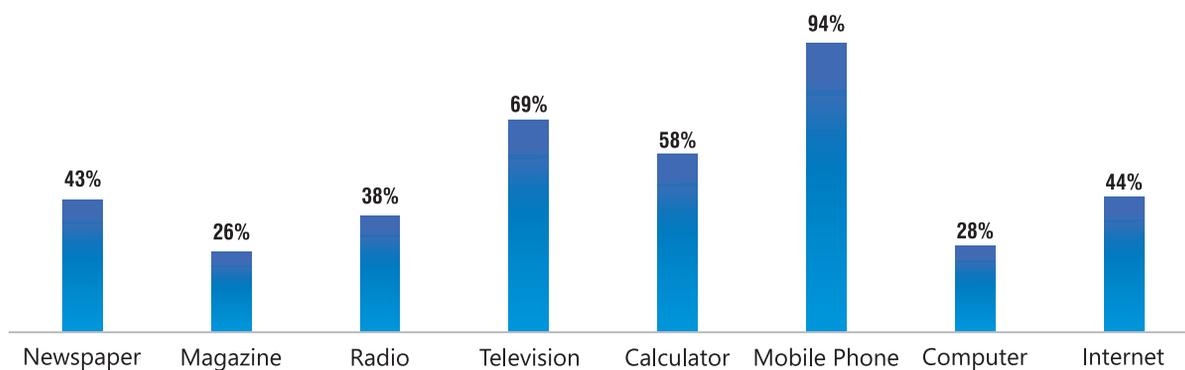


Figure 3.29: Literacy Resources at Home

travel more than 5 kilometers of distances everyday to reach school (Figure 3.30).

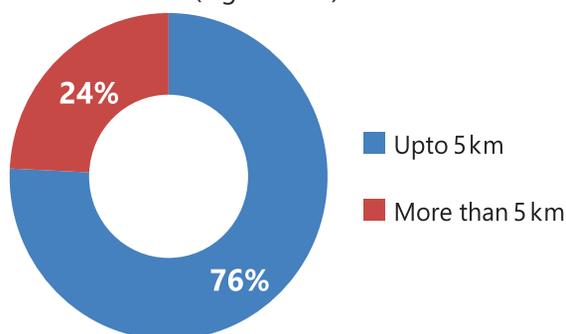


Fig. 3.30: Distance from Home to School

Availability of Library and Reference Books in Library

Figure 3.31 depicts that approximately 82 per cent of the students had library facilities in their schools. Within this, the question of availability of reference books is pivotal towards effective teaching-learning environment conducive for students' learning outcomes. In response to this, 74 per cent of the sampled students reported available reference books in library.

Availability of Science Laboratory

It was reported that approximately 79 per cent of schools had the provision of science laboratory in their schools. Additionally, 69 per cent of sampled students in the survey highlighted of getting opportunities to conduct practical/experiments in the laboratory (Figure 3.32).

Students' Experiences

Secondary school students' viewpoints about learning and schooling experiences are important considerations in teaching-learning environment. Students' comprehensions are critical parameters for their active and productive involvement and when

there is motivation to improve learning outcomes. Today, students' views and experiences play an important role in enriching the learners' experiences and needs of the students. Therefore, information relating to students experiences preference of subjects, utilising Internet in completing schoolwork or homework, self-assessment, parental support, teachers support, peer behaviour in the schools and students confident in seeking support from parents or teachers was sought in this questionnaire.

Students' Preference of Subjects

Students' preferences of the subjects were graded into three categories on the basis of their frequency of inclination towards the subjects, i.e., most, least and not at all. In the graph, of the sampled surveyed students, 49 per cent of them preferred English 'most'. Similarly, in case of Language other than English, 45 per cent of the sampled students seemed preferring language other than English.

With respect to other subjects, 39 per cent of the students mentioned having inclination towards mathematics.

However, a percentage of approximately 46 per cent of students reported their preference for science as 'most'. For social sciences, 46 per cent mentioned to be preferring social science 'most' (Figure 3.33).

Utilising Internet Facility for Completing School Work or Homework

Figure 3.34 shows the students usage of Internet for completing school work or homework. Information was sorted from sampled students on various aspects for which they used Internet facilities in completing their tasks. Responses gathered reflected that majority of students, i.e., 52 per cent of them utilised Internet for communicating with classmates, roughly 40 per cent of students also reported to using Internet for doing school assignments and

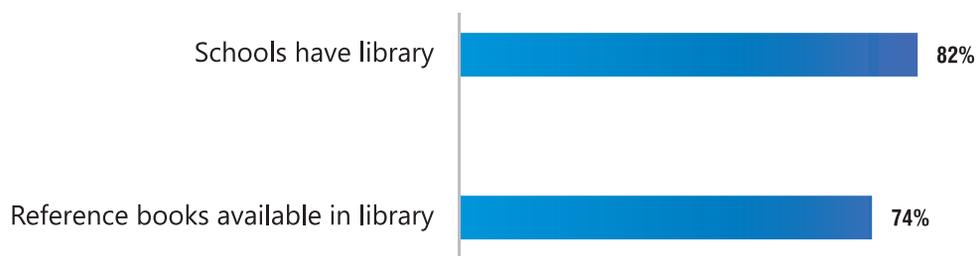


Fig. 3.31: Availability and Utilisation of Library

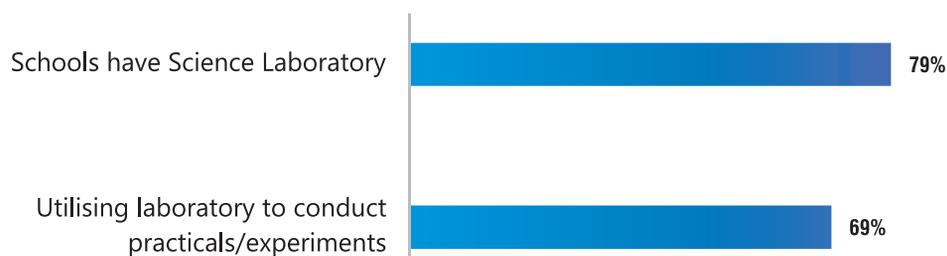


Fig. 3.32: Availability and Utilisation of Laboratory

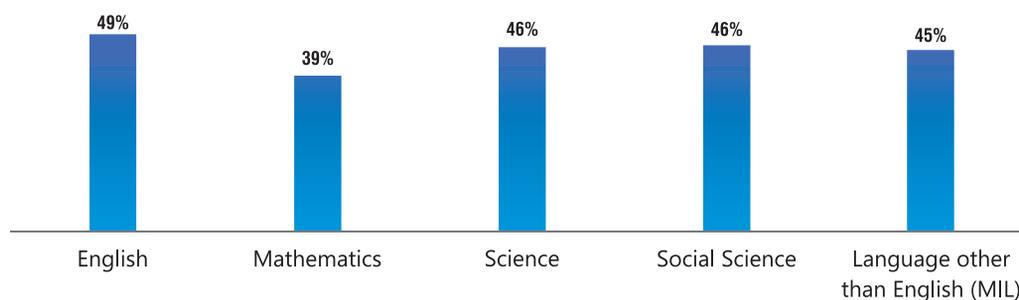


Fig. 3.33: Students' Preference of the Subject

projects. Students also seemed to be using Internet to communicate with teachers i.e., 44 per cent of them and 49 per cent of students mentioned of using Internet to read textbook or reference materials for completing school work or homework.

Self Assessment

Students' self assessment is an important tool, which involves learners evaluating their own learning progress. It is a valuable tool of learning through which students stay involved, motivated, encourage self reflection and are responsible for their learning outcomes. Students' responses were taken on 4 point scale with four labels 'strongly disagree', 'disagree', 'agree' and 'strongly agree'. In the first parameter 15 per cent of the students 'strongly agreed' about worrying of getting poor grades at school. Further, 33 per cent of them 'agreed' that they feel very anxious for the test even if they are prepared well.

Additionally, 39 per cent of students 'agreed' that they could have asked teachers more questions about which they are not clear, 29 per cent of them 'strongly agreed' to asking teachers questions

for which students were not clear. With respect to grades, 51 per cent of the sampled students in the survey 'strongly agreed' of getting top grades in most or all of their course (Figure 3.35).

Parental Support

An attempt was made to look into parental support in terms of students opinion. Responses were graded into four categories strongly disagree, disagree, agree and strongly agree. The responses collated that parents supported their children in their schooling. Around 32 per cent and 28 per cent of the sample of surveyed students reported that they 'agreed' and 'strongly agree' with the statement that their parents were interested in school activities.

Similarly, 28 per cent of the students were reported to 'agree' and 39 per cent of them 'strongly agreed' with the assertion that their parents supported them in their educational efforts and achievements. Finally, majority of students affirmed that is, 32 per cent of them 'agreed' and 44 per cent of them 'strongly agreed' that parents encourage them to be confident (Figure 3.36).

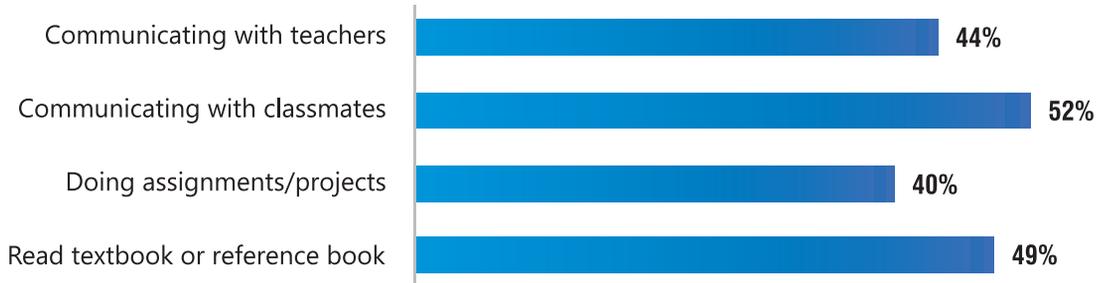


Fig. 3.34: Students using Internet for Completing School Work or Homework

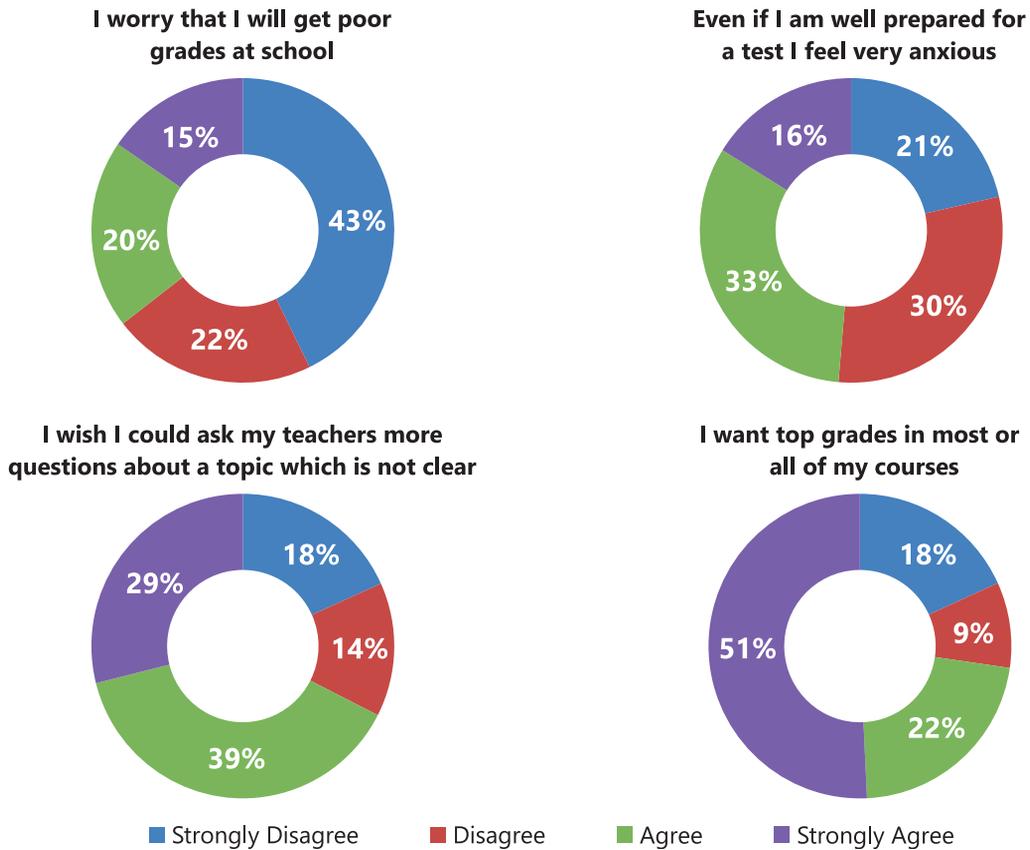


Fig. 3.35: Self Assessment

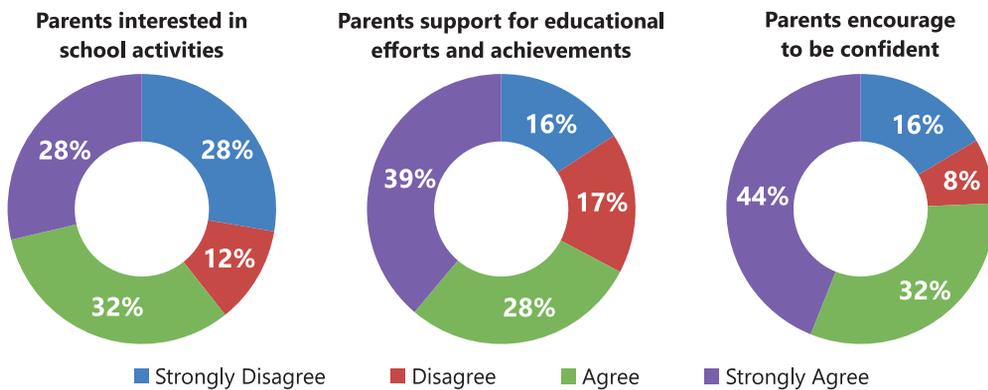


Fig. 3.36: Parental Support

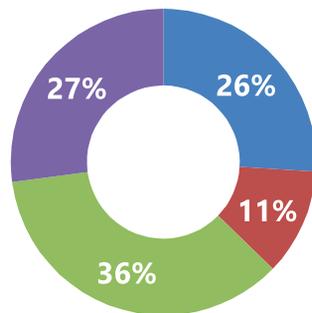
Teachers' Support

Students were also sought to give opinion regarding teachers' support for their academic work. Figure 3.37 depicts that 36 per cent of students 'agreed' and 27 per cent of students 'strongly agreed' with the statement that they find it easy to understand the way teachers teach in the class. Similarly, 37 per cent of students 'agreed' that teachers give interesting activities to do in the class. Another, 30 per cent of them 'strongly agreed' with this aspect of teacher conducting interesting activities during the classroom transactions. However, there were 37 per cent of students who reported to being in disagreement with the statement that they find it easy to understand what teacher teaches in class. Another, 33 per cent of sampled students were also under disagreement regarding teachers using interesting activities for the teaching-learning process.

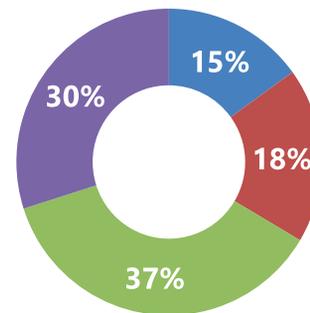
However, in Figure 3.38, almost 41 per cent of students 'agreed' to the statement that they

need more help from teachers to understand a topic and another 26 per cent also 'strongly agreed' to this statement that they tend to need extra support from teachers to develop an understanding on a topic. Whereas, 33 per cent of students reported to being in disagreement that they needed any extra support from teachers for understanding the topic. Further, teachers' encouragement tends to act as an important tool for students' behaviour, performance and shaping up their future opportunities. With respect to this, 45 per cent of students 'strongly agreed' that teachers encouraged them to ask questions and address their queries. Another 30 per cent of students also 'agreed' with the statement that teachers encouraged them to ask questions. However, 16 per cent of students 'strongly disagreed' and 9 per cent of students 'disagreed' that teachers encouraged them to ask questions (Figure 3.38).

Easy to understand what teachers teach in class



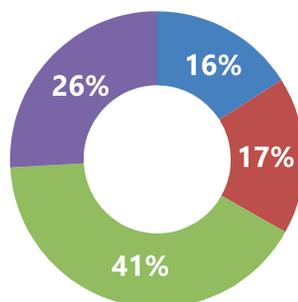
Teachers give interesting activities



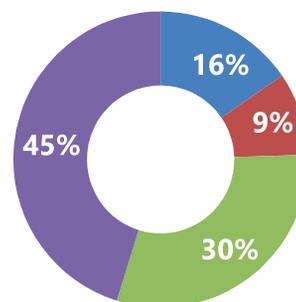
■ Strongly Disagree ■ Disagree ■ Agree ■ Strongly Agree

Fig. 3.37: Teachers' Support

Need more help/extra time from teachers to understand a topic



Teachers encourage to ask questions



■ Strongly Disagree ■ Disagree ■ Agree ■ Strongly Agree

Fig. 3.38: Teachers' support

Students' Schooling Experiences with Peers

It is widely acknowledged that peers have a dual influence in the students' participation and learning in the school. In general peers are a network of support and encouragement in their studies depending upon the students' experiences in the school.

Approximately, 63 per cent of the students reported that they 'never' experienced any erratic behaviour from their peers in the school. However, 37 per cent of students mentioned that they were teased by other students out of which 17 per cent said few times a year, 10 per cent reported few times a month and 10 per cent said once a week. Similarly, 36 per cent mentioned of being purposefully left out of group activities. Students making fun of others was in fact experienced by 42 per cent of sampled students. Nearly, 17 per cent of them reported to experience this few times a year, 14 per cent of them experienced this few times a month and 11 per cent mentioned encountering this frequently 'once a week'.

While 68 per cent of students reported that other students 'never' threatened them but 13 per cent mentioned that they were threatened 'few times a year' from other students, another 8 per cent of students mentioned that they were threatened from fellow students few times a month. Moreover, 11 per cent of students also highlighted that they were threatened from other peers once a week.

Students also responded to their experiences of other students taking away or destroying their things with 66 per cent of them never experiencing such behaviour towards them. While, 34 per cent of students reported of other students taking or destroying their things. Almost 68 per cent of students mentioned that they 'never' experienced

other students either hitting or pushing them in the school. While 32 per cent of students pointed that they experienced such behaviour from their fellow schoolmates (Table 3.1).

Students' Experiences

In general students' experiences with regard to parents, teachers and their fellow schoolmates were graded on the basis of their frequency of occurrence, i.e., never, sometimes and frequently. The major areas explored were:

- Sharing schooling activities with parents
- Discussing difficult concepts with teachers
- Discussing problems with friends
- Seeking help from parents or teachers with a problem
- Parental support in homework
- Punishment by teachers

Nearly, 83 per cent of students shared what is happening at school with their parents either sometimes (47%) or often (36%). While only 17 per cent did not share their school experiences with parents. Similarly, 47 per cent of surveyed students reported that they 'sometimes' discussed difficult concepts with teachers and 36 per cent of them 'often' discussed difficult concepts with teachers. Only, 17 per cent of them 'never' discussed difficult problems with teachers. Interestingly, 49 per cent of students reported that they 'often' discuss problems with their friends; another 34 per cent mentioned that 'sometimes' even they tend to discuss problems with friends. Additionally, 80 per cent of students sought help from parents/teachers if stuck with a problem either often (40%) or sometimes (40%). Only 20 per cent of students 'never' sought help from parents or teachers.

Table 3.1: Students' Experiences with Peers at School

Students' Experiences with Peers at School	Never	Few times a year	Few times a month	Once a week
Got teased by other students	63%	17%	10%	10%
Purposefully left out of group activities	64%	19%	9%	8%
Other students made fun of me	58%	17%	14%	11%
Other students threatened me	68%	13%	8%	11%
Other students took away or destroyed my things	66%	15%	9%	10%
I got hit or pushed around by other students	68%	13%	8%	11%

Students reported that 24 per cent of parents 'never' checked their homework. However, 40 per cent of students mentioned that 'sometimes' parents checked their homework and another 36 per cent highlighted that parents 'often' checked their homework. Around 39 per cent of students reported that they 'never' got any punishment by teachers. While, 43 per cent of sampled students mentioned that 'sometimes' they did get punishment from teachers and only 18 per cent reported of getting punishment 'often' by teachers (Table 3.2).

3.3. Teachers

This section provides information about teachers' characteristics and perceptions of teachers, such as teachers' background, teaching experience and training, teachers' professional engagement, teachers' opinion about schools, fellow teachers and teaching practices. Table 3.3 represents the responses collected from a total of 2,05,447 teachers.

Teachers' Background

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

Gender

Of the surveyed Class X teachers, nearly 39 per cent were males and 61 per cent were females (Figure 3.39).

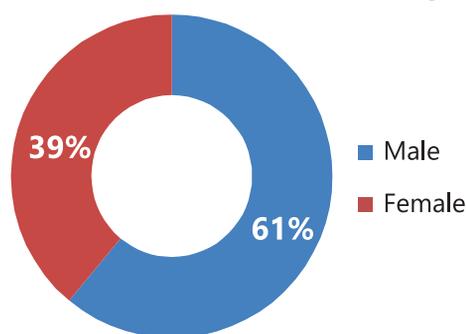


Fig. 3.39: Gender

Age

Table 3.4 depicts the age profile of the teachers which revealed that 15 per cent of the teachers were between the age group of 20–30 years, 33 per cent of the teachers were in the age group of 31–40 years of age, 32 per cent of them were in the age group of 41–50 years and remaining, i.e., 20 per cent of them were above the age of 50 years. About 2/3rd of teachers are in the age group of 31–50 years.

Table 3.4: Age

Age	Total
20–30 years	15%
31–40 years	33%
41–50 years	32%
Above 50 Years	20%

Category

Figure 3.40 indicates the social categories to which teachers belonged. Approximately 41 per cent of teachers belonged to 'Others' category in the sample, 38 per cent of them reported to be belonged to 'Other Backward Classes'. Moreover, 12 per cent of teachers belonged to 'Scheduled Caste' category and remaining 9 per cent belonged to 'Scheduled Tribe' category.

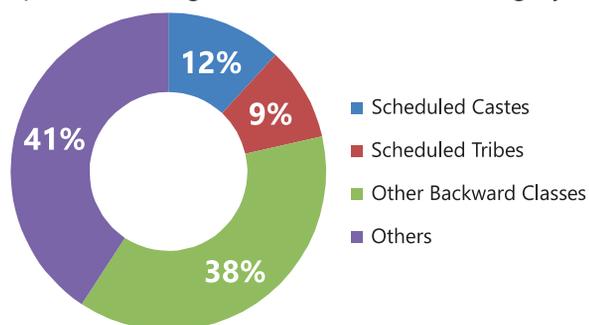


Fig. 3.40: Social Categories of Teachers

Table 3.2: Students' Experiences

Students Experiences	Never	Sometimes	Often
Share with my parents what is happening at school	17%	47%	36%
Discuss the difficult concepts with teachers	17%	47%	36%
Discuss problems with my friends	17%	34%	49%
Ask help from parents or teachers if stuck with a problem	20%	40%	40%
Parents check if I do homework or not	24%	40%	36%
Got punished by teachers	39%	43%	18%

Table 3.3: Teachers included in Survey

State/UT/Board	Number of Teachers Participated	State/UT/Board	Number of Teachers Participated
Andaman and Nicobar Islands	519	Madhya Pradesh	19,091
Andhra Pradesh	5213	Maharashtra	13,459
Arunachal Pradesh	1521	Manipur	2257
Assam	9883	Meghalaya	Meghalaya
Bihar	11,021	Mizoram	1153
Chandigarh	445	Nagaland	1623
Chhattisgarh	9269	Odisha	10,446
Dadra and Nagar Haveli	162	Puducherry	800
Daman and Diu	160	Punjab	7997
Delhi	4181	Rajasthan	12,564
Goa	1662	Sikkim	882
Gujarat	10,855	Tamil Nadu	12,246
Haryana	7727	Telangana	12,107
Himachal Pradesh	3357	Tripura	2896
Jammu and Kashmir	7915	Uttarakhand	4873
Jharkhand	6905	CBSE	970
Karnataka	13,413	ICSE	802
Kerala	5364	National	20,5,447
Lakshadweep	48		

Educational and Professional Qualification

The graph below shows that overall, 63 per cent of the teachers in the sample were postgraduates, 31 per cent of them were graduates. Almost 3 per cent of the teachers had M.Phil. degrees and another 2 per cent had Ph.D. degree. A small percentage of teachers, i.e., 1 per cent had qualification only till higher secondary (Figure 3.41).

It is acknowledged that teachers possessing educational training are found to be more effective

in classrooms as compared to teachers who do not possess any training. 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 essential for appointing a regular teacher in any recognised school is a certificate diploma or degree programme, for example, JBT, B.Ed., M.Ed., etc. In this section we are considering information relating to pre-service qualification quintessential for entering into the field of teaching. Majority of teachers in

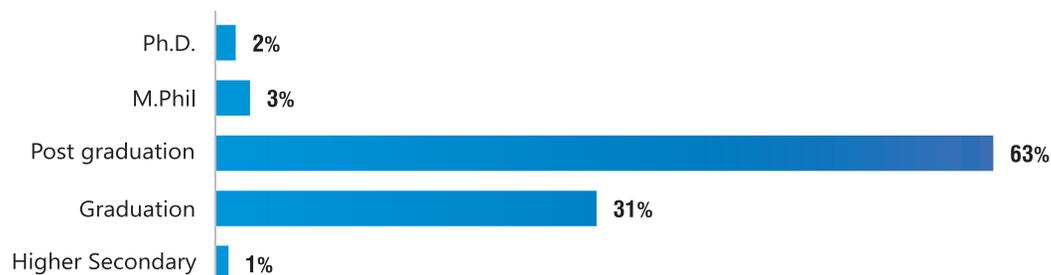


Fig. 3.41: Educational Qualification of Teachers



Fig. 3.42: Teacher Training Qualification

the sample possessed B.Ed. degree which acts as mandatory criteria to teach at secondary levels. Approximately 7 per cent of teachers had M.Ed. degree however, 14 per cent of teachers in the sample reported of not possessing any educational training (Figure 3.42).

Teaching Experience and Training

This section caters to information relating to teaching experience in terms of employment status, teaching experience at secondary stage and in-service training programmes attended.

Employment Status

The employment status of teachers is presented in Figure 3.43. While majority of teachers, nearly 84 per cent were found to be working as permanent/contractual/regular employees. Whereas 16 per cent of teachers in the sample reported to be working on a temporary/part time/against leave vacancy position

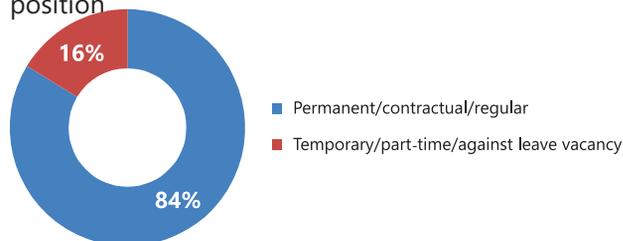


Fig. 3.43: Employment Status

Teaching Experience at Secondary Stage

The data reveals that around 45 per cent of the teachers had teaching experience of more than 10 years of teaching at secondary stage. Moreover,

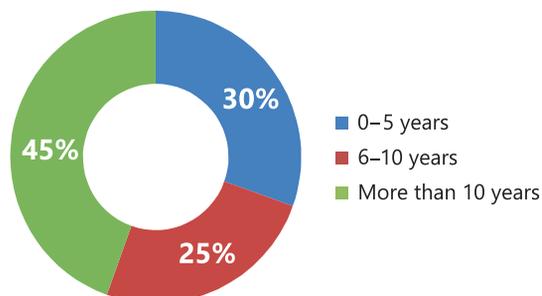


Fig. 3.44: Teaching Experience at Secondary Stage

25 per cent of teachers reported of having teaching experience ranging between 6 to 10 years at secondary stages and remaining 30 per cent of teachers in the sample asserted teaching experience from 0 to 5 years for teaching at secondary level of classes (Figure 3.44).

Attended In-service Training Programmes

Figure 3.45 depicts that 46 per cent of teachers in the sample reported that they attended 1 to 2 programmes over the last year and 22 per cent of them mentioned that they attended 3 to 5 programmes under in-service teacher training during the last one year. However, almost 32 per cent of teachers did not attend any programme during the past year, which could be a matter to reflect upon for the states.

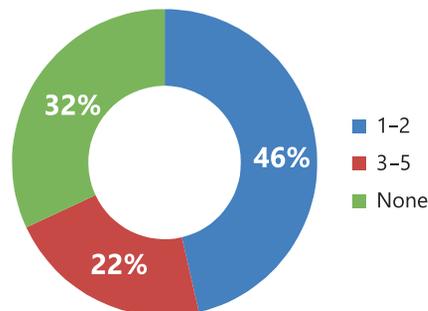


Fig. 3.45: In-service Training Programmes Attended

Teachers' Opinion about the School

It is important to know how well teachers are aware about their profession, teaching methods and the curriculum goals, whether they are satisfied with their job and what are their expectations from fellow teachers, their school and students. In this regard, information was sought on parameters, such as teachers' professional engagement, problems in school facilities, opinions relating to fellow teachers and workload.

Teachers' Professional Engagement

Engagement of teachers in different professional activities to augment interesting teaching-learning practices in the classroom can play a vital role in improving the quality of teaching across rural-urban segmentation. It is asserted that teacher-centered

collaborative activities to learn about effective teaching and learning through collaboration and communication between teachers are found to be effective in improving the learning achievements.

Figure 3.46 depicts the opinion of teachers on the professional activities that they were engaged over the last year. With regard to this, 41 per cent of teachers were engaged in the teachers qualification enrichment programme. Similarly, 50 per cent of teachers participated in professional development program. Around 31 per cent of teachers involved themselves in some independent or collaborative research on a topic of interest. However, 51 per cent reported to be engaged in mentoring and peer-observation as a part of formal school management. However, majority of teachers i.e., 81 per cent were engaged in informal dialogues in order to improve their teaching practices.

Physical Facilities in the School

As a part of universalising secondary education, central government and state governments made substantive efforts by launching *Rashriya Madhyamik Shiksha Abhiyan* to enhance the access and improve the quality of schooling at secondary stages of education. Some of the critical aspects relating to the quality of education pertain to make all secondary school conform to prescribed norms, standards and removing gender socio-economic and disability barriers thereby increasing the enrollment and achieving universal retention. While considerable improvement have been made in this regard in the elementary stages however, at secondary stage there

is a need to work more in this area. The observations of teachers on certain aspects are given as under:

- **School building needs significant repair:** Table 3.5 shows that 15 per cent of teachers felt 'a lot' that school building needs significant repair, whereas 42 per cent teachers felt to 'some' extent school building requires some repair and 43 per cent of teachers did not feel at all that school building required any repairs.
- **Teachers do not have adequate space:** Teachers need adequate space for effective classroom transaction for organising activities and conducting games in the classroom. Almost 43 per cent of teachers reported that there was no issue pertaining to adequate workspace in the schools. However, 43 per cent of teachers felt to 'some' extent that they did not have adequate workspace and 14 per cent attributed a feeling of 'a lot' inadequacy relating to workspace available in schools.
- **Teachers do not have adequate instructional material and supplies:** Table 3.5 collates that 48 per cent of sampled teachers reported to 'some' extent that do not have adequate instructional material and supplies facilitating the teaching-learning process in the classroom. Whereas, 15 per cent greatly asserted that they did not have adequate materials to help them in teaching practice and 37 per cent of teachers reported that they 'not at all' have any inadequacy relating to instructional materials in their schools.

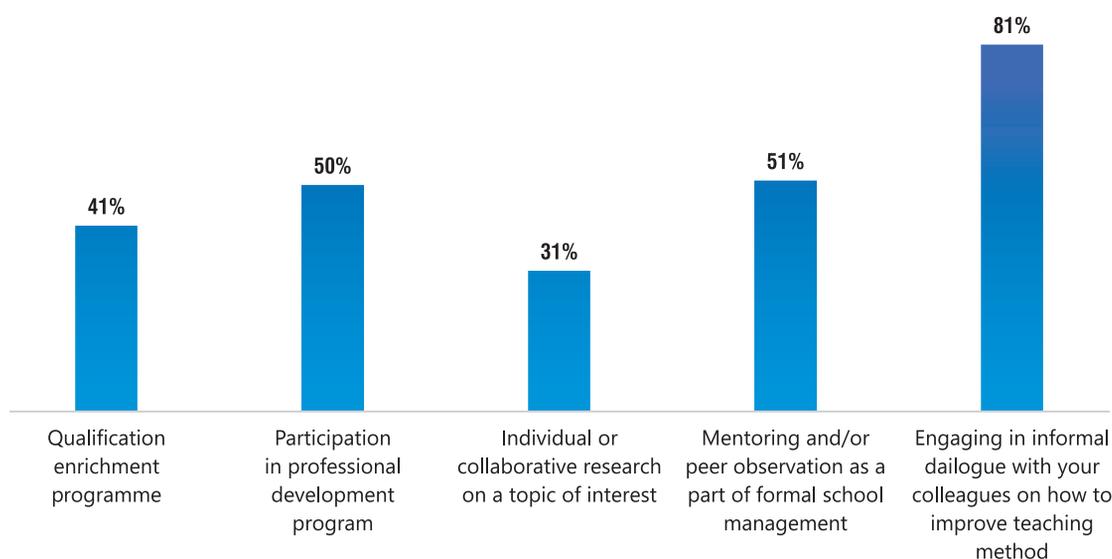


Fig. 3.46: Teachers, Professional Engagement

- **Lack of drinking water:** With respect to basic facilities, 59 per cent of teachers reported they 'not at all' have any shortages relating to the availability of drinking water facilities. However, 27 per cent of teachers reported that to 'some' extent there was a lack of drinking water facilities and 14 per cent of teachers felt 'a lot' schools did not have proper drinking water facilities.
- **Lack of adequate toilet facilities:** Around 53 per cent of teachers reported schools did not have any inadequacy relating to toilet facilities, however, 32 per cent felt to 'some' extent schools faced issues relating to adequacy of toilet facilities and almost 15 per cent mentioned that their schools suffered 'a lot' due to inadequacy of toilet facilities.

Teachers Opinions about Workload

Information was collated from teachers relating to their opinions about the workload faced by them in schools. Most of the teachers in the sample

tend to disagree with workload aspects in school. Around 59 per cent of teachers disagreed with the perception that there are too many students in the class; however, 41 per cent agreed that there are too many students in the class. Similarly, 54 per cent disagreed if they had too much syllabus to cover, whereas 46 per cent agreed that they indeed have too much syllabus to cover in class. Almost 60 per cent of teachers in the sampled disagreed if they have too many teaching hours however, only 40 per cent felt that teaching hours were sufficient. Almost 71 per cent of teachers agreed that they need more time to assist individual students. While 61 per cent teachers disagreed that there were too many administrative tasks, 39 per cent reported to being in agreement with respect to 'too many administrative tasks'. Around 66 per cent of teachers disagreed to encountering any difficulty in keeping up with all of the changes to curriculum while 34 per cent agreed to have difficulties in the keeping up with the changes to the curriculum (Table 3.6).

Table 3.5: Physical facilities in the schools

Frequency	School building needs significant repair	Teachers do not have adequate workspace	Teachers do not have adequate instructional material and supplies	Lack of drinking water	Lack of adequate toilet facilities
Not at all	43%	43%	37%	59%	53%
Some	42%	43%	48%	27%	32%
A lot	15%	14%	15%	14%	15%

Table 3.6: Workload on Teachers in Schools

Teachers' Opinion about Workload	Strongly Disagree	Disagree	Agree	Strongly Agree
There are too many students in the class	24%	35%	25%	16%
There is too much syllabus to cover in class	16%	38%	32%	14%
There are too many teaching hours	16%	44%	31%	9%
Need more time to assist individual students	8%	21%	50%	21%
There are too many administrative tasks	19%	42%	28%	11%
Difficulty in keeping up with all of the changes to the curriculum	22%	44%	27%	7%

Teaching Practices

The teachers were asked to fill-up a questionnaire where information on teaching style, academic facilities and modification of curriculum according to NCF-2005, etc., was sought in the questionnaire.

Utilising Different Teaching Activities while Teaching Students

The graph shown in Figure 3.47 teacher responses towards using activities while teaching students. These responses were graded into three categories on the basis of their occurrence, i.e., almost, sometimes and never. Around 62 per cent of teachers reported 'almost' of utilising students' daily life experiences for transacting a lesson. Whereas 33 per cent of teachers reported to be

using students' daily experiences 'sometimes' for relating to the lesson in the classroom transaction. With respect to using questions to elicit responses from students, 68 per cent of teachers utilised this activity 'almost' every time, 29 per cent utilised this activity sometimes and 3 per cent of teachers used this activity 'never'. 'Almost' 74 per cent of teachers constantly encouraged discussions in the classroom, only 23 per cent utilised discussion 'sometimes' and remaining 3 per cent of teachers 'never' encouraged discussion in the classroom. Further, 'almost' 86 per cent of teachers tend to praise students for their good effort. Around 73 per cent of teachers reported that they 'almost' deployed problem solving techniques while teaching students, only 24 per cent used this technique 'sometimes' and remaining 3 per cent 'never' deployed it during classroom engagement.

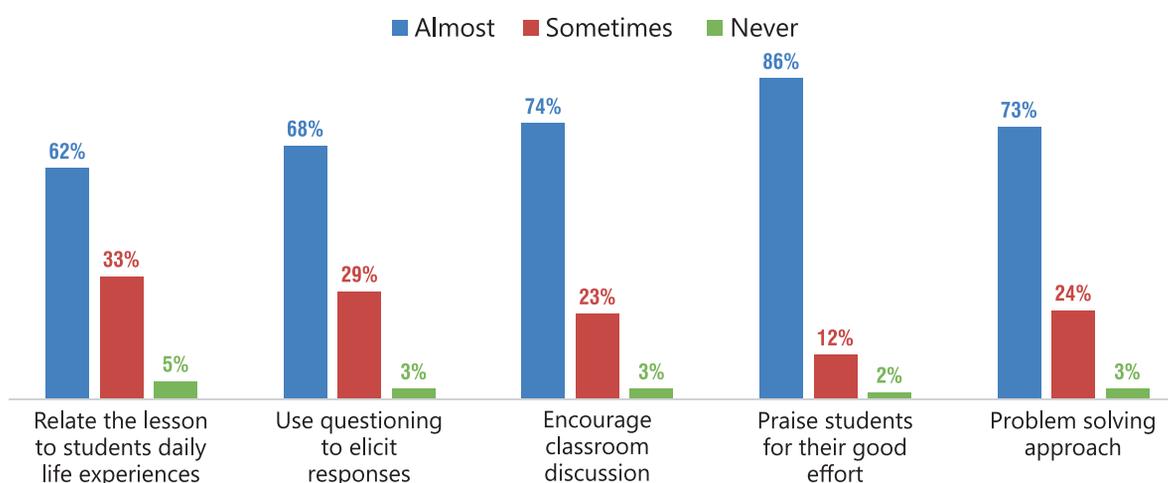


Fig. 3.47: Utilising Teaching Activities while Teaching Students

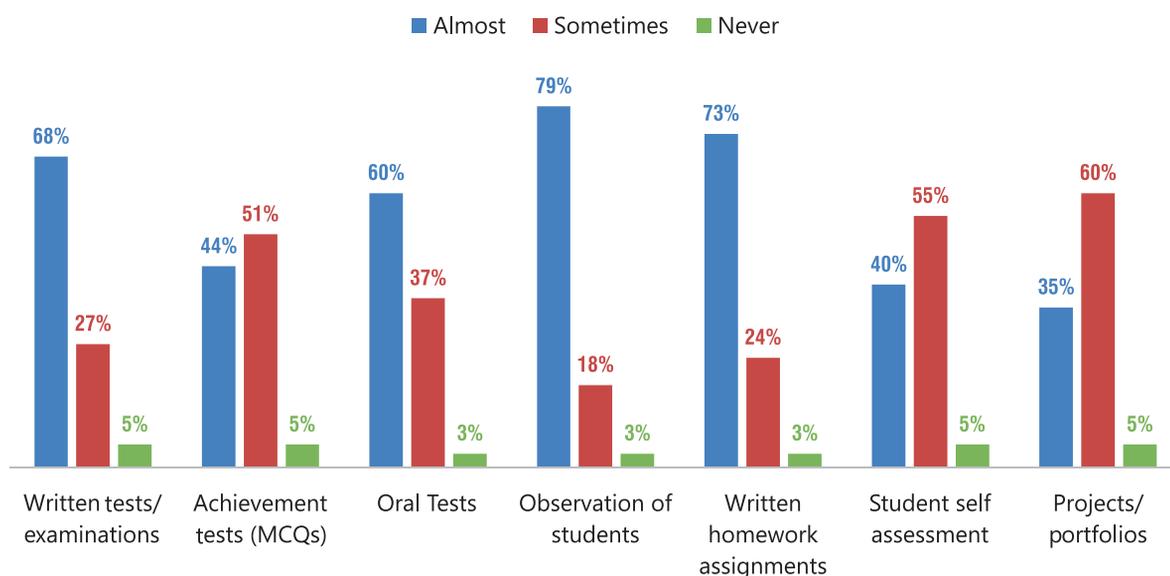


Fig. 3.48: Utilising Assessment Techniques on Students of Class X

Utilising Student Assessment Techniques

In response to assessment techniques used, teachers reported that they tend to deploy varieties of assessment measures in the classroom to facilitate learning outcomes among students (Figure 3.48). 'Almost' 68 per cent of teachers reported of using traditional measure of written tests to assess students, while 27 per cent of teachers 'sometimes' and 5 per cent of them 'never' used tests to assess students in Class X. However, only 44 per cent of teachers 'almost' used achievement tests (MCQs) to assess students, with 51 per cent of teachers 'sometimes' assess students through achievement tests and only 5 per cent of teachers in the sample 'never' utilised MCQs for assessment.

With respect to oral tests, 'almost' 60 per cent of teachers used them for assessment techniques, 37 per cent of teachers used it 'sometimes' and 3 per cent of them 'never' utilised it. Observation of students appeared to be popular assessment techniques among teachers as 79 per cent of teachers reported of utilising this technique as 'almost', whereas 18 per cent of them used it 'sometimes' for making students assessments. Even students performance in the written homework assignments came out to be an evident method for making student assessments. Around 73 per cent of teachers reported that 'almost' most of the times they used written homework assignments as a means of assessments.

However, only 55 per cent of teachers reported of using student self-assessments techniques

'sometimes' to assess Class X students. Only 40 per cent of teachers mentioned that they 'almost' used student self-assessments techniques to assess students and 5 per cent of teachers 'never' used this measure. Formulation of portfolios or projects appeared to be least utilised as a means of students assessments since 60 per cent of teachers reported of deploying this technique only 'sometimes', while 35 per cent of teachers did utilise projects or portfolio creation as 'almost' every time for assessing students. But still 5 per cent of teachers never deployed this technique for student assessment in their classes.

Utilising Different Teaching Methods and Approaches in the Classroom

The data was collected from teachers on how confident they feel while deploying different teaching methods and approaches in the classroom while giving their opinion in three categories—always, sometimes and never (Figure 3.49).

These results bring forth interesting dimensions about teachers perception regarding their capabilities while using these teaching approaches. Almost 45 per cent of teachers reported that they 'never' felt confident in using peer and group learning approach in the classroom. Whereas 48 per cent of teachers reported that were 'sometime' confident to deploy this approach. Interestingly, a large number of teachers, i.e., 62 per cent 'never' felt confident with the problem solving approach in teaching-learning

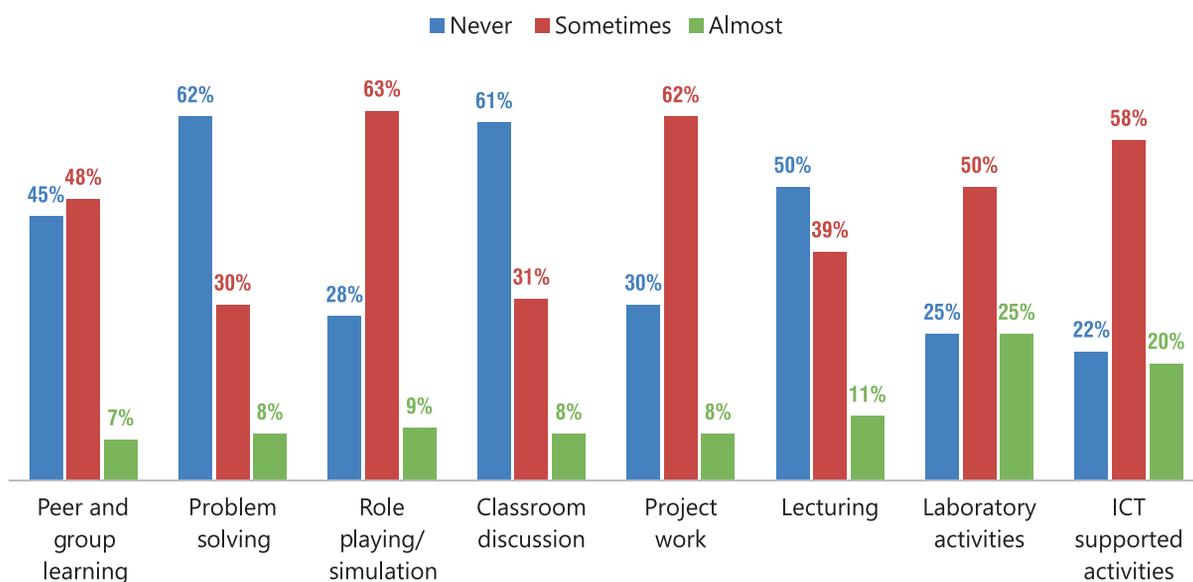


Fig. 3.49: Teachers Confidence in Using Different Teaching Methods and Approaches

process. In case of role playing or simulation, 63 per cent of teachers were confident 'sometimes' to utilise during teaching topics. However, almost 61 per cent of teachers in the sample 'never' felt confident in using discussion as a method for teaching but 62 per cent of teachers were found to be confident 'sometimes' in using project work. While 50 per cent

of teachers reported that they were 'never' confident in utilising lecturing as teaching method. Similarly, teachers also reported that approximately 50 per cent and 58 per cent were 'sometimes' confident in using Laboratory and ICT-supported activities as teaching approach in subjects for the classroom transaction.

Students' Achievement in Mathematics

This chapter describes the achievement of students in mathematics in NAS Class X (Cycle 2). The achievement in mathematics is reported for each of the participating States/Union Territories (UTs) and two National boards. The achievement is reported by student gender, school location, social category and school management.

4.1. STATE-WISE PERFORMANCE OF STUDENTS IN MATHEMATICS

Table 4.1 lists each State/UT wise 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 34 States/UTs.

In NAS Class X (Cycle 2), a total of 34 States/UTs participated along with two National boards (CBSE and ICSE).

Table 4.1 indicates that the average score for 34 States and UTs and national boards is 254 (with a standard error of 0.4). Further, the results reveal substantial differences in mathematics achievement

Table 4.1: Average Mathematics Scores for States/UTs/Boards

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Andaman and Nicobar Islands	243	7.2	↓
Andhra Pradesh	269	1.6	↑
Arunachal Pradesh	238	1.7	↓
Assam	267	0.5	↑
Bihar	256	1.0	↔
Chandigarh	252	2.2	↔
Chhattisgarh	237	0.7	↓
Dadra and Nagar Haveli	236	4.3	↓
Daman and Diu	237	7.9	↓
Delhi	262	0.6	↑

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Goa	244	1.8	↓
Gujarat	246	0.6	↓
Haryana	244	1.1	↓
Himachal Pradesh	235	1.6	↓
Jammu and Kashmir	235	2.7	↓
Jharkhand	248	0.5	↓
Karnataka	263	0.3	↑
Kerala	251	1.1	↓
Lakshdweep	241	12.5	↓
Madhya Pradesh	240	0.3	↓
Maharashtra	254	2.4	↔
Manipur	238	1.6	↓
Meghalaya	232	1.0	↓
Mizoram	245	1.3	↓
Nagaland	241	1.1	↓
Odisha	269	0.4	↑
Puducherry	242	2.3	↓
Punjab	248	0.5	↓
Rajasthan	265	1.0	↑
Sikkim	226	4.4	↓
Tamil Nadu	240	1.0	↓
Telangana	253	1.3	↔
Tripura	236	3.6	↓
Uttarakhand	247	1.8	↓
CBSE	294	3.0	↑
ICSE	294	2.9	↑
National	254	0.4	

between the highest performing state (269 for Andhra Pradesh) and the lowest performing state (226 for Sikkim). Also, while six States/UTs showed average scores significantly above that of the group; 24 States/UTs depicted average scores significantly below that of the overall average and four States/UTs presented average scores that were not significantly different from that of the overall.

4.2. PERCENTILE SCORES IN MATHEMATICS FOR STATES/UTS

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 per cent of students achieve or

surpass: the score at the 90th percentile is the score that 10 per cent of students achieve or surpass. The range between the 25th and 75th percentiles (the inter-quartile range) represents the performance of

the middle 50 per cent of students. Hence, this is a good indicator of the State's degree of homogeneity in terms of the Mathematics achievement of its students.

Table 4.1: Percentile Scores in Mathematics for States/UTs/Boards

States/UTs/Boards	P10	P25	P50	P75	P90	P75 - P25	P90-P10
Andaman and Nicobar Islands	197	216	239	264	300	48	103
Andhra Pradesh	200	227	262	309	354	82	154
Arunachal Pradesh	189	212	236	262	290	50	101
Assam	199	227	262	304	350	77	151
Bihar	189	219	251	290	332	71	143
Chandigarh	202	223	245	277	305	54	103
Chhattisgarh	182	209	234	265	292	56	110
Dadra and Nagar Haveli	203	217	234	261	273	44	70
Daman and Diu	168	201	241	270	284	69	116
Delhi	200	225	256	293	335	68	135
Goa	190	218	243	269	297	51	107
Gujarat	194	218	242	272	300	54	106
Haryana	188	214	240	271	306	57	118
Himachal Pradesh	186	209	232	262	288	53	102
Jammu and Kashmir	184	210	234	261	285	51	101
Jharkhand	186	216	244	280	318	64	132
Karnataka	201	228	261	296	331	68	130
Kerala	201	225	249	278	301	53	100
Lakshdweep	211	211	241	259	259	48	48
Madhya Pradesh	190	213	236	266	293	53	103
Maharashtra	194	221	250	287	321	66	127
Manipur	180	205	232	268	305	63	125
Meghalaya	186	209	231	255	280	46	94
Mizoram	194	219	243	269	300	50	106
Nagaland	188	217	242	271	292	54	104
Odisha	200	227	261	305	355	78	155
Puducherry	187	210	242	271	299	61	112
Punjab	192	217	243	276	312	59	120
Rajasthan	191	224	262	306	349	82	158
Sikkim	183	206	225	247	267	41	84
Tamil Nadu	193	215	236	265	289	50	96
Telangana	197	222	249	281	317	59	120
Tripura	179	204	232	264	295	60	116

States/UTs/Boards	P10	P25	P50	P75	P90	P75 - P25	P90-P10
Uttarakhand	192	215	242	276	309	61	117
CBSE	222	254	293	336	376	82	154
ICSE	223	255	291	341	368	86	145
National	194	221	249	285	326	64	132

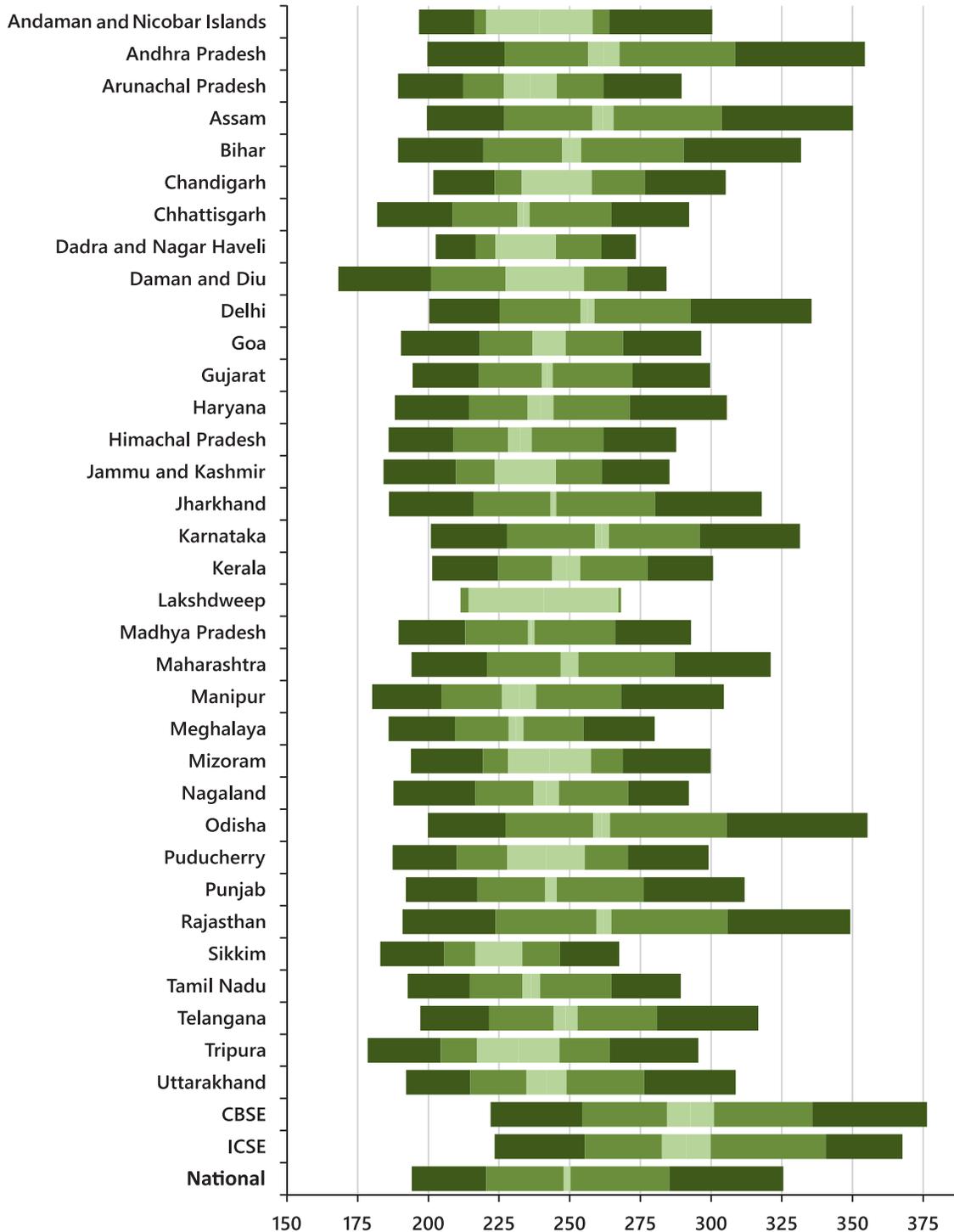


Fig. 4.1: Percentile scores in Mathematics for States/UTs/Boards

The inter-quartile range (i.e., the range between the 75th and 25th percentiles) is highly variable between States/UTs. For example, Sikkim has an inter-quartile range of just 41 while Andhra Pradesh and Rajasthan has a corresponding value of 82. These values suggest that spread of achievement in Mathematics in Sikkim is far more homogeneous as regard to the learning levels than that of Andhra Pradesh and Rajasthan. 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, shows extremes in low and high achievement. The range between these two points, which includes 80 per cent of the population, is highly variable ranging from 84 (Sikkim), Lakshdweep (48) to 158 (Rajasthan).

The percentiles provide additional information when comparing mathematics 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 inter-quartile range of scores may not be similar. For example, there is no significant difference between the median score of Himachal Pradesh, Manipur, Tripura and Chhattisgarh. However, the range of scores between the 25th and 75th percentiles is very different— Himachal Pradesh (53), Mizoram (50), Tamil Nadu (50), Goa (51) and Jammu and Kashmir (51).

4.3. GROUP-WISE PERFORMANCE IN MATHEMATICS

One of the objectives of the study is to find the performance of Class X students across gender, location, social category and school management, for giving specific interventions to improve the health of the system.

Table 4.3 below compares the average performance of different groups based on gender, school location, social category and school management.

Gender

Table 4.3 depicts the average mathematics scores achieved by boys and girls and shows that, the overall performance of girls is lower in terms of average score than boys but difference is not statistically significant. It was observed that the girls performed lower than the boys and the difference in achievement score was statistically significant in 13 States/UTs, i.e., Chandigarh, Bihar, Telangana, Arunachal Pradesh, Andaman and Nicobar Islands, Dadra and Nagar Haveli, Mizoram, Assam, Jharkhand, Odisha, Chhattisgarh, Daman and Diu, Maharashtra. However, in 8 States/UTs like Punjab, Uttarakhand, Meghalaya, Karnataka, Goa, Lakshadweep, Kerala, Tamil Nadu girls performed significantly better than boys. In the remaining States/UTs there was no significant difference between performance of boys and girls.

Table 4.2: Average Mathematics scores by Gender

States/UTs/Boards	Boys' Average Score (Standard Error)	Girls' Average Score (Standard Error)	Significant Difference
Andaman and Nicobar Islands	249(7.6)	239(7.2)	↓
Andhra Pradesh	268(1.8)	270(1.8)	↔
Arunachal Pradesh	246(3.4)	231(1)	↓
Assam	272(0.5)	263(1.2)	↓
Bihar	261(0.8)	251(1.8)	↓
Chandigarh	258(5.2)	246(6.2)	↓
Chhattisgarh	240(0.8)	234(1.1)	↓
Dadra and Nagar Haveli	240(1.2)	233(7.5)	↓
Daman and Diu	245(7.5)	223(12.5)	↓
Delhi	262(1)	260(1.4)	↔
Goa	242(2.7)	246(2.5)	↑
Gujarat	246(0.9)	245(1.7)	↔
Haryana	244(1.1)	243(2.1)	↔

States/UTs/Boards	Boys' Average Score (Standard Error)	Girls' Average Score (Standard Error)	Significant Difference
Himachal Pradesh	235(1.9)	235(2.4)	↔
Jammu and Kashmir	234(3.4)	236(2.7)	↔
Jharkhand	251(0.9)	245(0.4)	↓
Karnataka	261(0.9)	265(0.4)	↑
Kerala	249(1.2)	253(1.8)	↑
Lakshdweep	231(8.7)	252(20.5)	↑
Madhya Pradesh	241(0.6)	239(0.4)	↔
Maharashtra	259(3.5)	248(1.2)	↓
Manipur	239(1.1)	237(2.8)	↔
Meghalaya	229(1.6)	234(0.8)	↑
Mizoram	248(2.2)	243(2.5)	↓
Nagaland	241(2.7)	242(1.2)	↔
Odisha	272(0.7)	265(1)	↓
Puducherry	243(3.5)	240(5.4)	↔
Punjab	246(1.4)	250(1.9)	↑
Rajasthan	266(0.8)	263(1.7)	↔
Sikkim	225(4.3)	227(6.2)	↔
Tamil Nadu	237(1.3)	243(2.1)	↑
Telangana	255(2.9)	251(1)	↓
Tripura	235(1.5)	237(5.4)	↔
Uttarakhand	246(2.3)	251(3.9)	↑
CBSE	289(3.4)	301(3)	↑
ICSE	298(3)	290(3.1)	↓
National	255(0.6)	253(0.3)	↔

Location of Schools

Table 4.4 compares the average mathematics scores achieved by students in rural and urban schools. It is found that overall rural students did slightly lower than urban counterparts. In 6 States/UTs, i.e. Mizoram, Daman and Diu, Bihar, Chhattisgarh, Karnataka and Andhra Pradesh where the rural

students' average performance was significantly better than students of urban schools. The difference between the performances is also significant in 21 States/UTs where rural schools' students performed significantly lower than urban schools' students. In the remaining States/UTs there is no difference in performance of rural and urban students.

Table 4.3: Average Mathematics Scores by Location

States/UTs/Boards	Rural	Urban	Significant Difference
A & N Islands	242(8.2)	249(13.4)	↓
Andhra Pradesh	274(1.7)	262(1.8)	↑

States/UTs/Boards	Rural	Urban	Significant Difference
Arunachal Pradesh	235(1.9)	244(2.4)	↓
Assam	266(0.4)	272(1.5)	↓
Bihar	256(1)	250(2.5)	↑
Chandigarh	243(3.8)	256(3)	↓
Chhattisgarh	238(0.5)	232(2.6)	↑
Dadra and Nagar Haveli	233(3)	246(17)	↓
Daman and Diu	241(21.1)	235(13.1)	↑
Delhi	251(3.5)	263(0.2)	↓
Goa	242(1.4)	248(2.9)	↓
Gujarat	242(0.8)	252(1.5)	↓
Haryana	242(0.9)	249(2)	↓
Himachal Pradesh	234(1.8)	245(6.3)	↓
Jammu and Kashmir	234(1.6)	239(10.6)	↓
Jharkhand	248(0.4)	248(1.3)	↔
Karnataka	266(0.8)	258(0.5)	↑
Kerala	249(1.3)	255(1.3)	↓
Lakshdweep	235(9.7)	250(21.7)	↓
Madhya Pradesh	240(0.3)	241(0.8)	↔
Maharashtra	250(1.1)	258(4.5)	↓
Manipur	237(2.5)	239(4.3)	↔
Meghalaya	229(1.5)	237(2.2)	↓
Mizoram	248(1.6)	243(2)	↑
Nagaland	241(2.9)	242(1.9)	↔
Odisha	269(0.4)	267(1.7)	↔
Puducherry	241(4.7)	242(4.2)	↔
Punjab	246(0.9)	252(1.3)	↓
Rajasthan	264(0.7)	268(2.7)	↓
Sikkim	225(4.4)	242(8.2)	↓
Tamil Nadu	237(1.2)	244(2)	↓
Telangana	246(0.7)	260(2.5)	↓
Tripura	236(4.3)	239(1)	↔
Uttarakhand	248(1.9)	243(1.5)	↓
CBSE	302(1.9)	290(4)	↑
ICSE	305(4.6)	291(3.1)	↑
National	253(0.2)	256(1.2)	↔

Social Category

Table 4.5 compares the average Mathematics 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 of SC, ST and OBC groups performed significantly lower than Others (General) category group while there was no significant difference between SC and ST category students.

In SC category while 4 States/UTs, i.e., Tripura, Meghalaya, Nagaland and Manipur showed average scores significantly above that those of Others (General) category group; 22 States/UTs depicted average scores significantly below that of the overall average score of Others and rest of the States/UTs presented average scores that were not significantly different from that of Others category.

In ST category while 4 States/UTs, i.e., Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Tripura showed average scores significantly above that of the Others group; 18 States/UTs depicted average scores significantly below that of Others (General) and rest of States/UTs presented average scores that were not significantly different from that of the Others.

In OBC category while 8 States/UTs, i.e., Jammu and Kashmir, Jharkhand, Himachal Pradesh, Chandigarh, Nagaland, Manipur, Tripura, Andaman and Nicobar Islands showed average scores significantly above that those of Others (General) category group; 12 States/UTs depicted average scores significantly below that of the Others category and rest of the States/UTs presented average scores that were not significantly different from that of the Others category.

Table 4.4: Average Mathematics Scores by Social Category

States/UTs/Boards	Others	Schedule Caste	Sig.	Schedule Tribe	Sig.	Other Backward Classes	Sig.
Andaman and Nicobar Islands	240(7.3)		↓	248(13.7)	↑	245(6.1)	↑
Andhra Pradesh	285(2.6)	253(2.9)	↓	264(3.3)	↓	268(2.1)	↓
Arunachal Pradesh	236(5.3)	204(13.4)	↓	239(1.3)	↑	235(8.4)	↔
Assam	273(0.9)	266(2)	↓	256(1.5)	↓	266(1)	↓
Bihar	260(2.1)	245(2.7)	↓	257(4.1)	↔	257(1.1)	↔
Chandigarh	251(2.4)	245(3.8)	↓			348(24.6)	↑
Chhattisgarh	237(5.4)	233(1.5)	↔	241(1.7)	↔	235(0.7)	↔
Dadra and Nagar Haveli	240(12.8)			234(4.4)	↓		
Daman and Diu	247(11.2)	249(26.5)	↔	247(24)	↔	228(11.8)	↓
Delhi	265(0.6)	240(3.6)	↓	258(25.9)	↓	267(5.2)	↔
Goa	245(2.8)	218(9.1)	↓	249(6.5)	↔	242(5.1)	↔
Gujarat	256(1.3)	241(2.1)	↓	237(2)	↓	243(0.5)	↓
Haryana	252(1.9)	234(1.9)	↓			243(1.6)	↓
Himachal Pradesh	237(2.9)	230(2.9)	↓	231(8.8)	↓	242(5)	↑
Jammu and Kashmir	236(1.6)	222(15.2)	↓	240(4.3)	↓	241(3.4)	↑
Jharkhand	244(3.1)	238(4.1)	↓	245(1)	↔	251(0.5)	↑
Karnataka	263(1.9)	262(1.5)	↔	265(1.4)	↔	263(0.3)	↔
Kerala	254(1.9)	244(4.4)	↓	234(8.5)	↓	251(0.7)	↔
Lakshdweep				241(12.5)			

States/UTs/Boards	Others	Schedule Caste	Sig.	Schedule Tribe	Sig.	Other Backward Classes	Sig.
Madhya Pradesh	242(1.1)	241(0.7)	↔	229(1.5)	↓	243(0.6)	↔
Maharashtra	262(4.9)	246(0.6)	↓	237(1.7)	↓	251(1.5)	↓
Manipur	221(4.7)	228(14.1)	↑	249(2.6)	↑	236(7.5)	↑
Meghalaya	233(10.2)	244(6.9)	↑	232(0.9)	↔	237(17.6)	↔
Mizoram		312(32.7)		245(1.6)			
Nagaland	246(5.6)	252(32.7)	↑	241(0.9)	↓	259(9.9)	↑
Odisha	276(1.3)	259(3.2)	↓	258(0.2)	↓	274(0.8)	↔
Puducherry	270(3.8)	232(6.1)	↓			240(3)	↓
Punjab	259(0.8)	239(0.9)	↓	204(43.6)	↓	246(2.9)	↓
Rajasthan	275(3.2)	259(2.7)	↓	253(1.5)	↓	267(0.9)	↓
Sikkim	229(4)	216(22.7)	↓	223(5.7)	↓	230(7.8)	↔
Tamil Nadu	248(3.9)	233(2.3)	↓	241(9.4)	↓	242(0.8)	↓
Telangana	277(4)	238(2.3)	↓	245(2.4)	↓	251(1.3)	↓
Tripura	228(4)	237(3.4)	↑	233(2.4)	↑	243(9.3)	↑
Uttarakhand	252(2.2)	242(2.6)	↓	242(10)	↓	248(4.7)	↓
CBSE	301(2.9)	267(8.7)	↓	312(13.6)	↑	287(4.8)	↓
ICSE	296(3.3)	295(4.8)	↔	264(8.7)	↓	290(4.9)	↓
National	262(1.4)	247(0.6)	↓	246(0.3)	↓	255(0.2)	↓

School Management

Table 4.6 compares the average Mathematics scores achieved by students across government schools, government-aided schools and private schools. It can be deciphered that significant difference exists in the average achievement levels of students based on the type of school management. Private Schools significantly outperformed government and government-aided schools.

Government-aided schools performed lower than government schools in 5 States/UTs, i.e.,

Uttarakhand, Rajasthan, Bihar, Assam, Madhya Pradesh. The performance of students in government-aided schools was better than government schools in 12 States/UTs while in rest of the states the difference in performance between the two was not significant.

Private schools performed lower than government schools in 3 States/UTs, i.e., Uttarakhand, Rajasthan, Karnataka. The performance of students in private schools was better than that of government schools in 24 states while in rest of the states the performance between the two was comparable.

Table 4.5: Average Mathematics scores by School Management

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Andaman and Nicobar Islands	242(7.4)			249(7.9)	↑
Andhra Pradesh	252(3.2)	262(2.5)	↑	282(2.2)	↑
Arunachal Pradesh	230(0.9)	269(6.6)	↑	252(5.3)	↑
Assam	265(0.6)	256(3.9)	↓	287(0.2)	↑
Bihar	256(0.9)	244(2.9)	↓	272(3.8)	↑

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Chandigarh	252(2.3)	253(8.1)	↔		
Chhattisgarh	236(1.1)	231(5.1)	↔	238(1.5)	↔
Dadra and Nagar Haveli	234(4.8)	255(21.5)	↑	243(8.1)	↑
Daman and Diu	219(18.4)	258(10.7)	↑	267(23.4)	↑
Delhi	249(2)	256(6.5)	↑	287(2.6)	↑
Goa	230(4.6)	247(2.2)	↑	272(25.5)	↑
Gujarat	237(3.4)	240(1.1)	↔	260(2.1)	↑
Haryana	236(0.8)	239(3.2)	↔	257(1.7)	↑
Himachal Pradesh	233(1.5)			254(5.7)	↑
Jammu and Kashmir	229(2.2)	246(13.3)	↑	247(5.9)	↑
Jharkhand	248(0.6)	246(4.5)	↔	250(1.1)	↔
Karnataka	265(1.4)	265(1.5)	↔	258(0.6)	↓
Kerala	248(1.6)	251(2.4)	↔	257(4.2)	↑
Lakshdweep	241(12.5)				
Madhya Pradesh	240(0.3)	234(4)	↓	240(1.3)	↔
Maharashtra	250(4.8)	246(0.9)	↔	284(11)	↑
Manipur	229(3.1)	228(8.1)	↔	243(3.3)	↑
Meghalaya	235(5)	230(1.3)	↔	243(4.2)	↑
Mizoram	242(2.4)	250(2.7)	↑	256(4.4)	↑
Nagaland	235(3.4)			244(2.8)	↑
Odisha	268(0.5)	279(3)	↑	281(6.3)	↑
Puducherry	230(5)	255(6.9)	↑	247(5.7)	↑
Punjab	241(1)	252(1.4)	↑	258(1.1)	↑
Rajasthan	268(1.1)	244(12.9)	↓	262(1.7)	↓
Sikkim	226(4.5)	226(27.9)	↔		
Tamil Nadu	233(0.6)	238(2.8)	↑	248(1.8)	↑
Telangana	241(1)	240(9.6)	↔	265(2.9)	↑
Tripura	236(3.6)				
Uttarakhand	249(2.6)	243(3.1)	↓	242(0.9)	↓
CBSE	252(16.6)			295(2.9)	↑
ICSE				294(2.9)	
National	252(0.3)	249(0.7)	↓	263(1.7)	↑

4.4. OVERVIEW OF THE MATHEMATICS TESTS

The mathematics tests administered to Class X students consisted of three test booklets, individually

containing 60 items pertaining to various themes like Algebra, Trigonometry, Geometry, Statistics and Mensuration. The items were designed to test a range of relevant cognitive processes classified as

COGNITIVE PROCESSES FOR MATHEMATICS LITERACY

Remembering (Skill 1)

In items testing using 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 concepts in straightforward tasks.

Understanding (Skill 2)

In items testing using this process, students are expected to use concepts, principles, facts, etc. learned in class, in a new or less familiar situation. In particular, students are expected to apply their abilities to conceptual non-complex problem.

Applying (Skill 3)

In items testing using this process, students are expected to solve complex problems set in familiar situations by way of simple application of the concepts learned.

abilities to 'remember', 'understand' and 'apply' as defined below.

What Majority of Students Can do in Mathematics

The prime objective of this chapter is to highlight what the students can perform at different level of content domain on mathematics items. Before providing exemplifiers of the items tested in mathematics, this section gives a brief synopsis of content areas on which above three skills among learners were tested:

- Algebra
- Geometry
- Mensuration
- Trigonometry
- Coordinate Geometry
- Number System
- Statistics

Performance of Class X Students on the Various Content Areas in Mathematics

The overall average performance of Class X students in mathematics was around a mean of 254 out of 500 with a standard error of 0.4. In the content area of 'Algebra' the mean performance of students was similar to overall performance, i.e., 254. In the content areas of 'Geometry' and 'Mensuration' the mean performance of students revolved around the score of 251 which was significantly below the overall average performance of students in mathematics. Similarly, in the content areas of 'Trigonometry' and

'Number System' the mean performance of students was 252, which was significantly below the overall average score in mathematics. In the content areas of 'Statistics' and 'Coordinate Geometry' while the mean score of students was 250 but again students performed significantly below the overall average in the mathematics score.

Contents	Mean	SE	Sig.
Mathematics	254	0.4	
Algebra	254	0.2	↔
Geometry	251	0.6	↓
Mensuration	251	0.2	↓
Trigonometry	252	0.2	↓
Coordinate Geometry	250	0.3	↓
Number System	252	1.0	↓
Statistics	250	0.6	↓

4.5. 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: 1

This item required students to compute the value of constant c , using the quadratic equation. In this item, 19.8 per cent of student's chose the correct answer as (4). Remaining 80.2 per cent students either selected wrong answers or gave multiple responses or did not attempt.

Skill: Skill 3 item**Content Domain:** Algebra**Item 45:** If $ax^2 + bx + c = 0$ has equal roots, then c is equal to

	% Answers
1. $\frac{-b}{2a}$	1. 30.0%
2. $\frac{b}{2a}$	2. 25.1%
3. $\frac{-b^2}{4a}$	3. 19.5%
4. $\frac{b^2}{4a}$	4. 19.8%
	Multiple response 0.7%
	Not attempted 5.0%

Sample Item: 2

This item required students to find the 30th term of an arithmetic progression using the expression of n th term. While a total of 32 per cent students identified the correct answer as (2). About 68 per cent students selected either wrong answers or gave multiple responses or did not attempt.

Skill: Skill 2 item**Content Domain:** Algebra**Item 33:** If the n th term of an A.P. is $(3n + 1)$, then its 30th term is

	% Answers
1. 31	1. 25.8%
2. 91	2. 32.0%
3. 90	3. 27.8%
4. 94	4. 8.9%
	Multiple response 0.6%
	Not attempted 4.9%

Sample Item: 3

This item required students to apply the congruency property and find the relations corresponding the same. While a total of 56.5 per cent students identified the correct answer as (4). About 43.5 per cent students selected either incorrect answers or gave multiple responses or did not attempt.

Skill: Skill 1 item**Content Domain:** Geometry**Item 17:** If $\Delta ABC \cong \Delta PQR$, then which of the following is true?

1. $B \leftrightarrow R$
2. $C \leftrightarrow Q$
3. $A \leftrightarrow R$
4. $A \leftrightarrow P$

% Answers

1. 11.1%
2. 13.2%
3. 15.8%
4. **56.5%**

Multiple response 0.6%

Not attempted 2.8%

Sample Item: 4

These item required students to find the value of cot theta based on the value of Tan use theta symbol. About 71.1 per cent students in the sample were able to select the correct answer (1), whereas the remaining 28.9 per cent students selected either incorrect answers or gave multiple responses or did not attempt.

Skill: Skill 1 item**Content Domain:** Algebra**Item 11:** If $\tan \theta = \frac{3}{4}$, then $\cot \theta$ is equal to

1. $\frac{4}{3}$
2. $\frac{3}{7}$
3. $\frac{4}{7}$
4. $\frac{7}{4}$

% Answers

1. **71.1%**
2. 11.4%
3. 9.2%
4. 5.5%

Multiple response 0.6%

Not attempted 2.2%

Performance on the sample items reproduced here varied across the country. Table 4.7 shows the proportion of students in each state or union territory responding correctly to each item.

Table 4.6: Performance on Sample Items in States/UTs/Boards

States/UTs/Boards	Q45	Q33	Q21	Q17	Q11
Andaman and Nicobar Islands	20.00%	25.70%	52.00%	57.80%	74.30%
Andhra Pradesh	24.10%	41.70%	53.40%	63.70%	76.10%
Arunachal Pradesh	16.90%	24.40%	48.30%	49.60%	65.60%
Assam	28.90%	32.80%	58.40%	54.40%	76.10%
Bihar	16.00%	35.00%	53.30%	44.80%	69.40%
Chandigarh	19.20%	31.90%	57.90%	59.80%	77.70%
Chhattisgarh	15.10%	24.00%	49.20%	53.60%	72.70%
Dadra and Nagar Haveli	17.90%	23.90%	42.70%	59.50%	59.80%
Daman and Diu	16.70%	40.80%	53.70%	66.70%	74.60%
Delhi	19.90%	35.30%	52.70%	64.00%	80.50%
Goa	15.80%	23.50%	59.20%	69.80%	73.30%
Gujarat	19.10%	29.20%	48.50%	64.00%	62.30%
Haryana	16.40%	26.30%	50.40%	46.80%	68.60%
Himachal Pradesh	15.70%	20.60%	48.10%	50.40%	67.50%
Jammu and Kashmir	14.10%	25.30%	37.10%	42.30%	59.20%
Jharkhand	14.40%	25.50%	52.90%	50.90%	67.20%
Karnataka	27.00%	46.10%	40.70%	70.20%	84.00%
Kerala	19.90%	43.70%	36.80%	53.90%	49.40%
Lakshadweep	18.20%	24.00%	45.20%	50.00%	64.00%
Madhya Pradesh	15.40%	22.80%	52.40%	54.10%	74.20%
Maharashtra	15.50%	36.50%	45.20%	69.40%	71.00%
Manipur	18.60%	28.80%	48.70%	55.30%	68.30%
Meghalaya	19.40%	24.00%	46.90%	48.40%	68.50%
Mizoram	19.10%	26.60%	52.20%	50.10%	71.40%
Nagaland	18.00%	23.50%	52.00%	54.90%	70.40%
Odisha	21.90%	38.50%	50.30%	52.80%	67.10%
Puducherry	26.60%	34.70%	53.80%	58.40%	62.10%
Punjab	19.60%	27.50%	53.60%	58.40%	70.90%
Rajasthan	24.80%	34.00%	52.70%	60.50%	74.60%
Sikkim	11.80%	18.00%	46.10%	44.20%	72.60%
Tamil Nadu	26.40%	34.60%	53.00%	51.20%	70.30%

States/UTs/Boards	Q45	Q33	Q21	Q17	Q11
Telangana	19.60%	32.50%	45.70%	56.50%	73.40%
Tripura	22.80%	24.00%	44.00%	38.90%	67.80%
Uttarakhand	19.90%	31.60%	52.90%	54.80%	76.30%
CBSE	29.7%	50.4%	65.2%	76.2%	87.6%
ICSE	41.0%	55.5%	42.7%	77.2%	88.1%
National	19.8%	32.0%	49.6%	56.5%	71.1%

4.6. SKILL-WISE PERFORMANCE

Table 4.8 summarises the state-wise performance of students in the three cognitive processes, i.e., Remembering, Understanding and Applying (Skill 1, Skill 2, Skill 3).

Table 4.7: State-wise Performance of Students in the Three Skills

States/UTs/Boards	Skill 1 (Correct Average score in Per cent)	Skill 2 (Correct Average score in Per cent)	Skill 3 (Correct Average score in Per cent)
Andaman and Nicobar Islands	36.5	33.9	31.5
Andhra Pradesh	43.5	40.6	36.8
Arunachal Pradesh	30.4	29.3	27.2
Assam	43.4	38.5	34.9
Bihar	39.8	35.7	32.4
Chandigarh	39.1	35.6	32.1
Chhattisgarh	32.7	30.1	27.1
Dadra and Nagar Haveli	28.4	27.9	26.1
Daman and Diu	34.2	31.9	29.6
Delhi	40.5	37.4	34.7
Goa	34.7	32.4	31.5
Gujarat	32	32.6	29.8
Haryana	32.9	31.5	28.7
Himachal Pradesh	31.2	29.3	27.3
Jammu and Kashmir	29.8	28.2	25.3
Jharkhand	34.3	32.1	29.6
Karnataka	42	37.6	33.6
Kerala	34.5	33.5	29.8
Lakshadweep	28.9	29.4	28.1
Madhya Pradesh	32.3	30.3	27.8
Maharashtra	35	33.4	30.7

States/UTs/Boards	Skill 1 (Correct Average score in Per cent)	Skill 2 (Correct Average score in Per cent)	Skill 3 (Correct Average score in Per cent)
Manipur	33.4	31	28.7
Meghalaya	29.5	28.4	25
Mizoram	33.1	32.1	29.9
Nagaland	31.6	28.8	28.6
Odisha	40.1	38.4	35
Puducherry	31.6	31.4	30.6
Punjab	35.3	32.8	30.1
Rajasthan	41.7	38.2	33.6
Sikkim	28.2	27.8	26.6
Tamil Nadu	30.3	31	30.4
Telangana	36.2	33.8	30.9
Tripura	32.2	30.4	28.1
Uttarakhand	37.5	34.5	31.2
CBSE	56.0	51.3	48.2
ICSE	54.5	50.8	45.4
National	36.1	33.9	30.9

4.7. PROFICIENCY LEVELS

Proficiency levels provide a convenient way to describe profiles of student achievement. Children whose results are located within a particular level of proficiency are expected to understand the competencies and skills associated with that and lower levels. In NAS Class X Cycle 2 student's

performance in mathematics was gauged using 5 proficiency levels based on the numeric scores achieved in the assessment.

Classification of Students based on Proficiency Level

Figure 4.2 depicts the distribution of average Mathematics scores achieved by students into

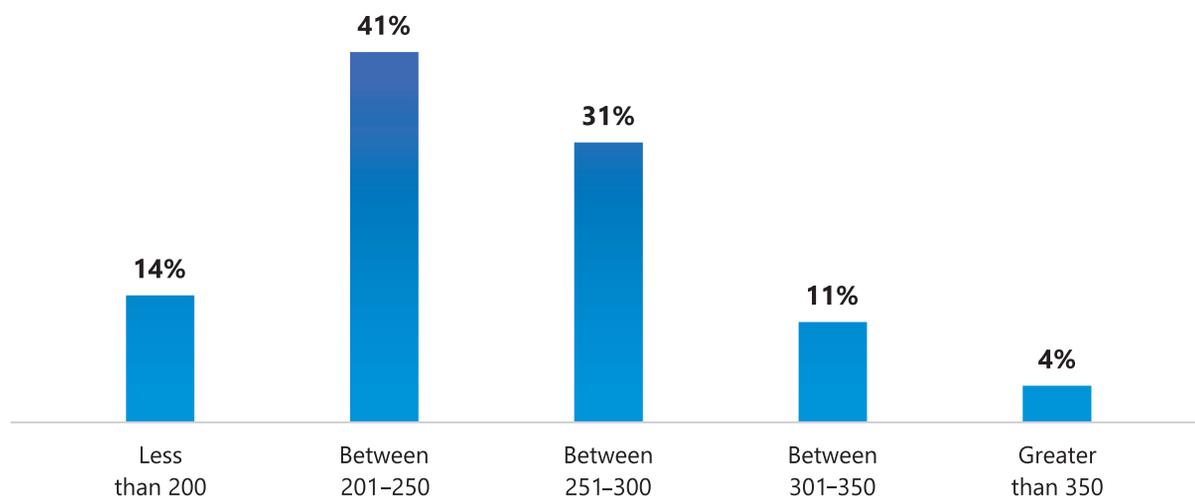


Fig. 4.2: Proficiency Level in Mathematics

five proficiency levels. Each level comprises the percentage of students and a range of mean score for that level. It can be observed that maximum number of student's, i.e., 41 per cent lied between proficiency level of 201 to 250, whereas only 14 per cent students belonged to a lower proficiency level of less than 200.

Distribution of Students Performing less than 200

Figure 4.2 classifies the students who belong to proficiency level of less than 200 based on four different parameter, namely Gender, Area, School Management and Category.

- **Gender:** It was observed that percentage of males (48%) was slightly less than those of females (52%) in this category.
- **Location:** It was observed that majority of students who belonged in performance level of less than 200 belonged to schools in rural areas, i.e., 74 per cent while only 26 per cent of students belonged to urban areas.
- **School Management:** A large majority of students (61%) who performed in performance

level of less than 200 studied in government schools while 20 per cent students in this level belongs to government-aided and private schools each.

- **Social Groups:** The distribution of students was skewed favouring OBC category students which comprised 42 per cent of the population while SC, ST and others (General) were 19%, 19% and 20 per cent respectively.

Distribution of Students based on Score Range

Table 4.10 depicts the distribution of student's performance using absolute scores into four groups, i.e., 0–35 per cent, 36–50 per cent, 51–75 per cent, 75–100 per cent. The percentage of students in 0–35 per cent was 60.74 which was much greater than those in other percentage levels like for 36–50 per cent where it was 21.4, for 51–75 per cent where it was 15.47 and for 75–100 per cent it was 2.66, respectively. There was a huge variation in the performance of students across States. In States like Nagaland, Manipur, Goa, Bihar, Chattisgarh, Madhya Pradesh and Dadra and Nagar Haveli majority of the students belong in the range of 0–35 per cent.

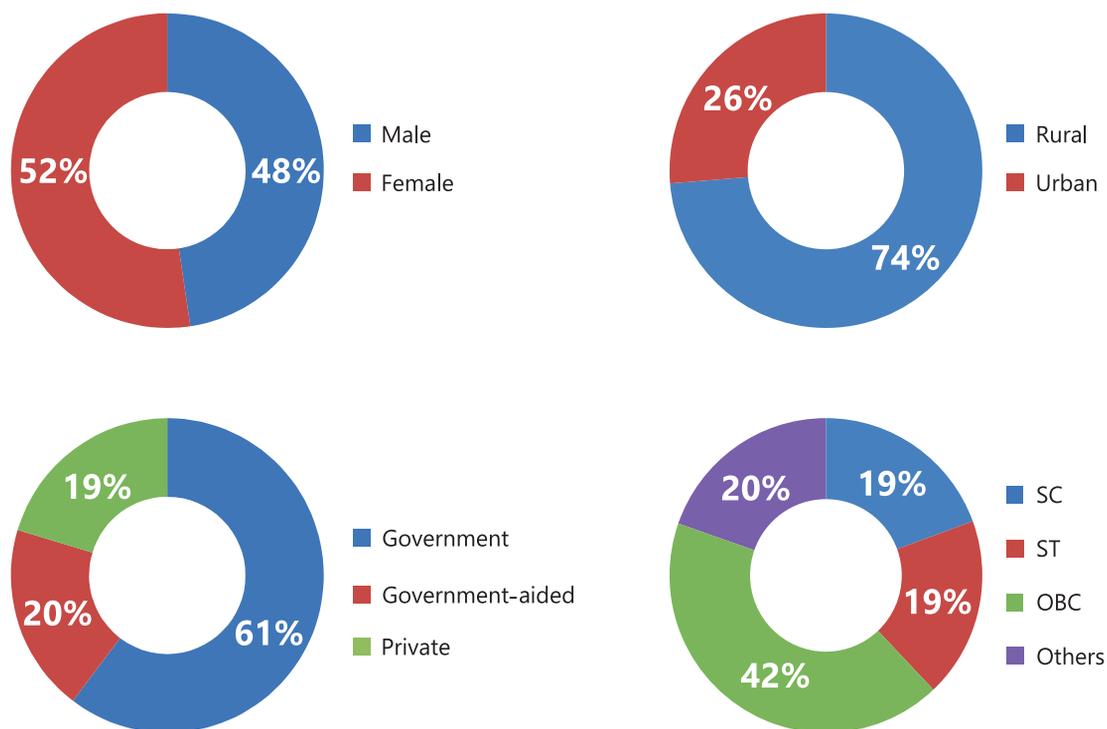


Fig. 4.3: Characteristics of Students Performing below the Mean Score of 250 by Gender, Location, School Management and Social Groups

Table 4.8: Students' Performance using Absolute Scores

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Andaman and Nicobar Islands	69	17	12	3
Andhra Pradesh	52	22	20	7
Arunachal Pradesh	82	12	5	1
Assam	53	24	17	6
Bihar	60	21	15	4
Chandigarh	64	21	12	3
Chhattisgarh	76	16	7	1
Dadra and Nagar Haveli	85	12	2	
Daman and Diu	71	21	8	1
Delhi	58	23	14	5
Goa	69	23	6	1
Gujarat	74	17	7	1
Haryana	73	18	8	1
Himachal Pradesh	80	16	4	0
Jammu and Kashmir	82	15	3	0
Jharkhand	70	20	10	1
Karnataka	53	27	18	2
Kerala	67	27	6	0
Lakshadweep	85	15		
Madhya Pradesh	77	16	5	1
Maharashtra	67	23	9	1
Manipur	72	19	8	1
Meghalaya	85	13	2	0
Mizoram	71	23	5	1
Nagaland	77	18	4	1
Odisha	59	20	15	6
Puducherry	76	18	5	1
Punjab	70	18	10	2
Rajasthan	54	24	18	5
Sikkim	86	12	2	0

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Tamil Nadu	77	18	5	0
Telangana	67	20	10	2
Tripura	75	14	9	3
Uttarakhand	64	22	13	2
CBSE	28	23	30	18
ICSE	27	27	32	14
National	67	20	11	2

4.8. CONCLUSION

The average achievement of students in Mathematics varies across the States and UTs of India. There is visible difference between performance in high scoring States/UTs, such as Odisha (269), Andhra Pradesh (269), Assam (267) and Rajasthan (265), and low scoring States, such as Sikkim (226), Meghalaya (232), Himachal Pradesh (235) and Jammu and Kashmir (235).

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.

Nearly 83 per cent of the students belong to a proficiency level of 201–350 however, a smaller percentage of students (4%) did belong to high proficiency levels (greater than 350) as well. A detailed analysis of students belonging to 0–200 performance level is also carried out based on gender, location, school management and social groups.

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.

Information about what Class X students at various cognitive skills domain of mathematics was also tested. It was found that on a national level students possess greater Remembering Skill (Skill 1) in comparison to Applying (Skill 2) and Understanding (Skill 3).

Students' Achievement in Science

This chapter summarises the achievement of Class X students in science. The overall achievement in science domain for each of the participating States, Union Territories and Boards is reported here, along with the information on differences in achievement by student gender, school location, social category and school management. This chapter also maps the proficiency levels of Class X students in science; characteristics of students scoring below the average score in science and also demonstrate the wide range of ability in domain of science.

5.1. STATE-WISE PERFORMANCE OF STUDENTS IN SCIENCE

This section shows the distribution of students' achievement in science for the 36 participating States, UTs and Boards. Table 5.1 lists average

achievement score of each States/UT/Board on a scale ranging 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, the table also indicate whether of State/UT/Board average score is significantly different from the overall average of 36 States/UTs and Boards or not.

Table 5.1 indicates that the average score for 36 States, UTs and Boards was 253 (with a standard error of 0.2). Further, results reveal substantial differences in science achievement between the highest performing States/ UTs (271 for Andhra Pradesh) and the lowest performing States/UTs (227 for Dadra and Nagar Haveli). Ten States/UTs, i.e., Chandigarh, Delhi, Rajasthan, Manipur, Assam, Odisha, Andhra Pradesh, Karnataka, Goa and Telangana performed significantly above that of the national average.

Table 5.1: Average Science Scores for States/UTs/Boards

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Andaman and Nicobar Islands	251	5.5	↔
Andhra Pradesh	271	1.0	↑
Arunachal Pradesh	240	1.5	↓
Assam	261	1.0	↑
Bihar	239	0.6	↓
Chandigarh	263	4.2	↑
Chhattisgarh	240	1.2	↓

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Dadra and Nagar Haveli	227	3.8	↓
Daman and Diu	243	11.4	↓
Delhi	267	1.5	↑
Goa	258	1.7	↑
Gujarat	246	1.8	↓
Haryana	241	0.7	↓
Himachal Pradesh	243	2.6	↓
Jammu and Kashmir	241	1.4	↓
Jharkhand	238	1.4	↓
Karnataka	261	0.8	↑
Kerala	251	1.4	↔
Lakshadweep	238	8.8	↓
Madhya Pradesh	238	0.4	↓
Maharashtra	250	0.6	↓
Manipur	263	3.2	↑
Meghalaya	237	2.7	↓
Mizoram	238	2.8	↓
Nagaland	246	3.3	↓
Odisha	256	0.6	↑
Puducherry	246	1.5	↓
Punjab	254	1.2	↔
Rajasthan	264	0.9	↑
Sikkim	252	3.1	↔
Tamil Nadu	246	1.3	↓
Telangana	260	1.0	↑
Tripura	239	1.2	↓
Uttarakhand	244	1.0	↓
CBSE	306	4.3	↑
ICSE	308	2.4	↑
National	253	0.2	

↔ The State's average score is not significantly different from that of the National.

↑ The State's average score is significantly above that of the National.

↓ The State's average score is significantly below that of the National.

Almost 20 States/UTs, namely Jammu and Kashmir, Nagaland, Mizoram, Tripura, Meghalaya, Jharkhand, Himachal Pradesh, Uttarakhand, Haryana, Bihar, Chhattisgarh, Madhya Pradesh, Gujarat, Tamil Nadu, Daman and Diu, Puducherry, Arunachal Pradesh, Maharashtra, Lakshadweep, Dadra and Nagar Haveli

depicted average scores that were significantly below that of the overall average. Four States/UTs of Punjab, Sikkim, Kerala and Andaman and Nicobar Islands demonstrated average scores that were not significantly different from that of the national score.

5.2. PERCENTILE SCORES IN SCIENCE FOR STATES/UTs/BOARDS

The percentile scores assist to develop a better understanding about students, of low and high ability, by locating the scores gained by students at different parts of ability distribution as reported at different percentiles. This section of the NAS

report percentile Table 5.2 and Figure 5.1 illustrating 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 shows that 75 per cent of students achieve or surpass, while the score at the 90th percentile is the score that 10 per cent of students achieve or surpass. The range between the 25th and 75th percentile (the inter-quartile range) represents the performance of the middle 50 per cent of students. Therefore, both inter-quartile range and range between 90th percentile and 10th percentile is a good indicator of reflecting the degree of homogeneity in achievement of students across States/UTs.

Table 5.1: Percentile Scores in Science for States/UTs/Boards

States/UTs/Boards	P10	P25	P50	P75	P90	P 75–P 25	P 90–P 10
Andaman and Nicobar Islands	197	222	251	278	306	56	109
Andhra Pradesh	207	235	269	304	341	69	134
Arunachal Pradesh	176	208	240	273	305	65	129
Assam	197	226	257	294	332	68	135
Bihar	177	206	239	269	304	63	127
Chandigarh	201	232	262	291	323	59	122
Chhattisgarh	182	210	240	268	300	58	118
Dadra and Nagar Haveli	179	203	224	257	276	54	97
Daman and Diu	196	216	240	268	294	52	98
Delhi	203	230	263	303	338	73	135
Goa	200	225	259	292	316	67	116
Gujarat	191	218	247	274	302	56	111
Haryana	181	211	242	270	301	59	120
Himachal Pradesh	186	214	243	271	298	57	112
Jammu and Kashmir	179	210	242	272	302	62	123
Jharkhand	172	205	238	272	306	67	134
Karnataka	200	229	260	295	323	66	123
Kerala	197	223	251	280	305	57	108
Lakshadweep	184	210	228	272	304	62	120
Madhya Pradesh	182	208	238	266	295	58	113
Maharashtra	191	219	250	281	311	62	120
Manipur	201	229	259	302	331	73	130
Meghalaya	185	209	237	266	290	57	105
Mizoram	181	211	239	264	292	53	111
Nagaland	200	225	247	269	290	44	90
Odisha	194	222	253	288	326	66	132
Puducherry	186	215	246	273	310	58	124
Punjab	192	220	252	285	319	65	127

States/UTs/Boards	P10	P25	P50	P75	P90	P 75–P 25	P 90–P 10
Rajasthan	194	226	261	302	343	76	149
Sikkim	191	222	251	283	313	61	122
Tamil Nadu	195	220	247	273	298	53	103
Telangana	199	226	257	290	327	64	128
Tripura	175	212	245	266	296	54	121
Uttarakhand	183	213	244	273	304	60	121
CBSE	232	260	307	348	383	88	151
ICSE	231	270	316	345	369	75	138
National	191	220	251	284	318	64	127

Note: Ranges may not agree due to rounding.

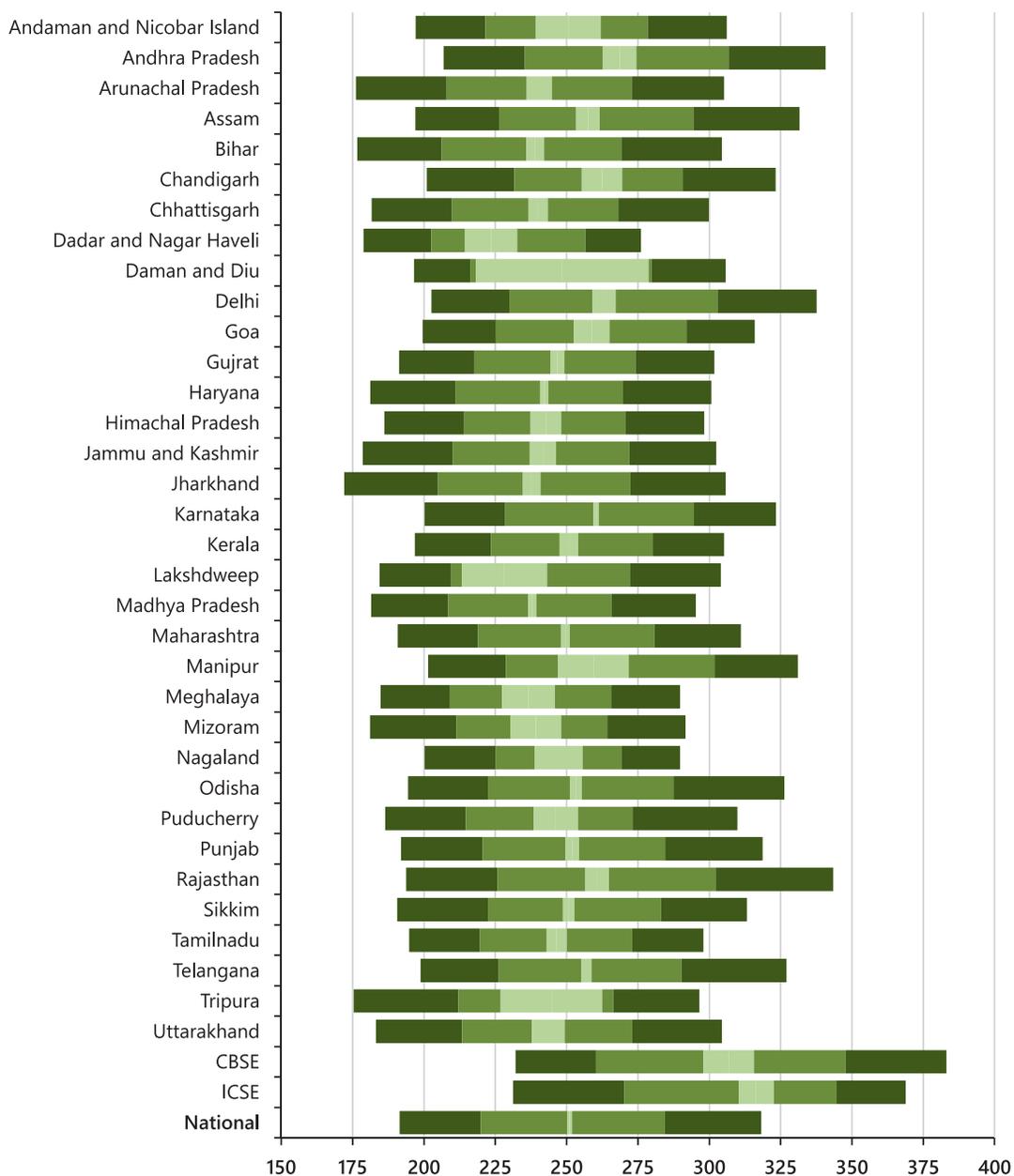


Fig. 5.1: Percentile Scores in Science for States/UTs/Boards

It is evident from Figure 5.1 that the range between the 90th and 10th percentiles between States/UTs varies more than the inter-quartile range (i.e., the range between the 75th and 25th percentiles). For instance, Nagaland has an inter-quartile range of 44 while Rajasthan has corresponding value of 76. The percentiles provide additional information when comparing science performance amongst States. For instance, 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 Madhya Pradesh, Jharkhand, Bihar and Mizoram (238–239). However, the range of scores between the 75th and 25th percentiles is very different: Mizoram (53), Madhya Pradesh (58), Bihar (63) and Jharkhand (67). This implies that while the average achievement is quite similar in the States, Jharkhand (67) has more heterogeneous achievement with regard to the learning levels of Class X students than the State of Mizoram (53). Further, 50th percentile of States/UTs, such as Telangana (257), Goa (259), Assam (257), Rajasthan (261), Karnataka (260) and Manipur (259) is far better than 75th percentile of

States and UTs, such as Dadra and Nagar Haveli (257), Mizoram (264), Meghalaya (266), Tripura (266) and Lakshadweep (272).

5.3. GROUP-WISE PERFORMANCE IN SCIENCE

In this section, analysis results comparing the average performance of different groups in science based on gender, school location, social category and school management type are presented.

Gender

The results in Table 5.3 reflect that there was no significant difference in the achievement scores between boys and girls. However, it is reported that in nine States/UTs, namely, Daman and Diu, Kerala, Andaman and Nicobar Islands, Andhra Pradesh, Goa, Meghalaya, Lakshadweep, Punjab and Tamil Nadu, girls outperformed boys significantly. Whereas in Arunachal Pradesh, Dadra and Nagar Haveli, Manipur and Tripura girls performed significantly less than boys in science. In the remaining States/UTs there was no significant difference in the performance of boys and girls.

Table 5.2: Average Science Scores by Gender

States/UTs/Boards	Boys' Average (Standard Error)	Girls' Average (Standard Error)	Significant Difference
Andaman and Nicobar Islands	248(10.7)	254(3.6)	↑
Andhra Pradesh	269(1.2)	274(1.2)	↑
Arunachal Pradesh	242(3.2)	236(5)	↓
Assam	260(0.7)	261(1.6)	↔
Bihar	241(1.6)	237(0.8)	↔
Chandigarh	261(8.1)	265(6.4)	↔
Chhattisgarh	242(1.8)	239(1.2)	↔
Dadra and Nagar Haveli	240(7.9)	212(7.2)	↓
Daman and Diu	239(13.8)	247(10.3)	↑
Delhi	269(2.2)	265(2.8)	↔
Goa	256(3)	262(2.1)	↑
Gujarat	246(1)	246(3)	↔
Haryana	240(1.1)	242(1.7)	↔
Himachal Pradesh	242(3.6)	245(3.4)	↔
Jammu and Kashmir	240(3.4)	242(3.3)	↔
Jharkhand	238(1.7)	237(1.7)	↔
Karnataka	262(1.2)	260(0.5)	↔
Kerala	247(0.8)	257(3.5)	↑

States/UTs/Boards	Boys' Average (Standard Error)	Girls' Average (Standard Error)	Significant Difference
Lakshadweep	209(21)	249(12.2)	↑
Madhya Pradesh	238(0.4)	239(0.4)	↔
Maharashtra	248(0.5)	252(1.3)	↔
Manipur	267(6.6)	260(2.5)	↓
Meghalaya	234(3.5)	240(4.2)	↑
Mizoram	236(4.4)	239(3.4)	↔
Nagaland	247(2.1)	245(6.1)	↔
Odisha	257(1.2)	256(0.3)	↔
Puducherry	245(4)	246(3.4)	↔
Punjab	247(1.7)	261(2)	↑
Rajasthan	262(1.6)	266(1.4)	↔
Sikkim	253(4.5)	251(4.2)	↔
Tamil Nadu	243(2)	249(0.7)	↑
Telangana	258(1.6)	262(0.6)	↔
Tripura	243(4.4)	234(3.6)	↓
Uttarakhand	243(1.4)	245(1.7)	↔
CBSE	301(7.7)	313(4.3)	↑
ICSE	310(2.6)	306(2)	↔
National	252(0.2)	253(0.2)	↔

↔ 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.

Location of Schools

Overall, students in rural schools performed lower than the students in urban schools. However, there persist huge inter-state variations in the performance of students studying in urban and rural areas. In 6 States and UTs, i.e, Karnataka, Daman and Diu, Dadra and Nagar Haveli, Himachal Pradesh, Lakshadweep

and Tripura, the rural students' average performance was significantly better than students' of urban schools. However, in another 15 States and UTs, students in rural schools in science performed significantly lower than urban students. Moreover, results in the remaining States/UTs have found no significant difference in the performance of rural and urban students in science.

Table 5.3: Average Science Scores by Location

States/UTs/Boards	Rural Average (Standard Error)	Urban Average (Standard Error)	Significant Difference
Andaman and Nicobar Islands	247(7.6)	259(4.6)	↓
Andhra Pradesh	270(1.3)	273(3.2)	↔
Arunachal Pradesh	238(2.5)	243(3.5)	↓
Assam	259(1.2)	269(1.9)	↓
Bihar	239(0.3)	241(3.4)	↔
Chandigarh	260(6)	263(6.5)	↔

States/UTs/Boards	Rural Average (Standard Error)	Urban Average (Standard Error)	Significant Difference
Chhattisgarh	240(1.4)	241(2.3)	↔
Dadra and Nagar Haveli	230(7.9)	216(15.5)	↑
Daman and Diu	250(13.6)	234(12.4)	↑
Delhi	245(4)	271(1.7)	↓
Goa	256(1.8)	267(5.2)	↓
Gujarat	244(1.4)	250(2.5)	↓
Haryana	242(1.3)	240(2.8)	↔
Himachal Pradesh	244(2.6)	236(6.4)	↑
Jammu and Kashmir	240(1.5)	245(4.3)	↓
Jharkhand	236(1.3)	247(3.9)	↓
Karnataka	264(0.6)	258(1.2)	↑
Kerala	251(1.1)	254(5.9)	↔
Lakshadweep	245(12.2)	205(14.7)	↑
Madhya Pradesh	237(0.8)	240(0.9)	↔
Maharashtra	248(0.8)	253(0.9)	↓
Manipur	263(2.4)	266(6.2)	↔
Meghalaya	233(2)	247(4.3)	↓
Mizoram	231(3.5)	243(4.3)	↓
Nagaland	246(3.8)	246(3.4)	↔
Odisha	256(0.5)	256(2.3)	↔
Puducherry	236(3.2)	250(2.1)	↓
Punjab	252(1.1)	256(3.6)	↔
Rajasthan	264(0.6)	263(2.6)	↔
Sikkim	251(3.4)	269(13.7)	↓
Tamil Nadu	247(1)	245(2.2)	↔
Telangana	255(1.5)	266(1.5)	↓
Tripura	240(2.2)	234(6.1)	↑
Uttarakhand	243(1.5)	248(3.9)	↓
CBSE	307(3.8)	306(5.5)	↔
ICSE	314(4.1)	306(3.8)	↑
National	251(0.2)	256(0.4)	↓

↔ 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.

Social Category

In this sub-section, we are comparing average science scores achieved by students in different social categories, which show that there is significant variation between the average achievement of students belonging to categories of SC and Others, ST and Others and OBC and Others. The first classification of achievement performance among SC and Others in science reflected that overall 'SC' category students significantly performed lower than 'Others' category. In respect to inter-state variations as depicted in the Table 5.5 below, four States/UTs, namely Rajasthan, Arunachal Pradesh, Meghalaya and Nagaland 'SC' students have significantly outperformed 'Others' category students in science. Whereas in majority, 22 States/UTs i.e; Andaman and Nicobar Islands, Jammu and Kashmir, Bihar, Chhattisgarh, Assam, Jharkhand, Himachal Pradesh, Puducherry, Sikkim, Haryana, Uttarakhand, Kerala, Gujarat, Tamil Nadu, Chandigarh, Maharashtra, Odisha, Manipur, Punjab, Telangana, Delhi and Andhra Pradesh students belong to 'SC' category performed significantly lower than 'Other' category students. In the remaining eight States/UTs, there was no significant difference between the performances of two categories of students.

In the second classification based on social categories, overall students belonging to ST categories tend to perform significantly lower from

students belonging to Other category. This pattern is visible in 16 States/UTs i.e., Andhra Pradesh, Assam, Bihar, Daman and Diu, Gujarat, Haryana, Jammu and Kashmir, Kerala, Maharashtra, Nagaland, Odisha, Punjab, Sikkim, Telangana, Tripura and Uttarakhand. Whereas in five States/UTs of Arunachal Pradesh, Goa, Andaman and Nicobar Islands, Chhattishgarh, and Himachal Pradesh, STs students performed significantly better in Science than 'Other' students. In remaining nine States/UTs no significant difference in the average scores of 'Others' and STs in Science.

In comparing the overall average score of students belonging to 'OBCs' and 'Others' category, 'OBC' categories tend to perform significantly lower than 'Others' category in Science. In 10 States/UTs, such as Assam, Goa, Maharashtra, Nagaland, Puducherry, Punjab, Sikkim, Tamil Nadu, Telangana, Uttarakhand 'OBC' category students have performed lower than 'Others' category students. However, in States/UTs like Arunachal Pradesh, A & N Islands, Chandigarh, Chhattishgarh, Dadra and Nagar Haveli, Daman & Diu, Delhi and Meghalaya OBCs students have significantly outperformed better than other students. In remaining 13 States/UTs of Andhra Pradesh, Bihar, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Kerala, Madhya Pradesh, Manipur, Rajasthan, Odisha and Tripura there was no significant difference between the average scores of OBCs and Others' students in Science.

Table 5.4: Average Science Scores by Social Category

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Andaman and Nicobar Islands	246(8.3)	214(52.9)	↓	274(9.4)	↑	257(10.6)	↑
Andhra Pradesh	275(3.7)	264(2)	↓	256(7.2)	↓	274(1.3)	↔
Arunachal Pradesh	231(7)	270(19.5)	↑	240(0.9)	↑	307(14.1)	↑
Assam	265(0.8)	261(2.7)	↓	252(2.2)	↓	259(1.1)	↓
Bihar	243(1.5)	230(2.2)	↓	238(4.7)	↓	240(1.1)	↔
Chandigarh	267(4.2)	244(14.3)	↓			296(10)	↑
Chhattisgarh	235(4)	240(2.1)	↓	242(1.9)	↑	240(1.5)	↑
Dadra and Nagar Haveli	224(18.8)			227(9.6)	↔	231(24.4)	↑
Daman and Diu	237(12.1)			223(39.3)	↓	248(12.3)	↑

* Sig. - Significant Difference.

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Delhi	268(2.1)	257(1.7)	↓			273(3.5)	↑
Goa	259(2.5)	255(16.8)	↔	268(7.5)	↑	249(4.8)	↓
Gujarat	251(1.3)	242(5.6)	↓	240(3.3)	↓	246(1.4)	
Haryana	245(1.1)	236(1.9)	↓	191(15)	↓	242(1.6)	↔
Himachal Pradesh	245(2.2)	236(3)	↓	252(9.6)	↑	247(8.1)	↔
Jammu and Kashmir	245(2.8)	228(6.1)	↓	231(9.1)	↓	241(6.5)	↔
Jharkhand	240(4)	234(4.2)	↓	240(2.3)	↔	237(1.2)	↔
Karnataka	262(2.7)	261(2.8)	↔	264(2.4)	↔	261(0.7)	↔
Kerala	254(2.3)	242(2.6)	↓	226(5.2)	↓	253(1.4)	↔
Lakshadweep				238(8.8)			
Madhya Pradesh	237(1)	236(1.1)	↔	236(2.2)	↔	240(0.7)	↔
Maharashtra	253(1.2)	247(1.6)	↓	246(3.4)	↓	249(1.2)	↓
Manipur	266(6.5)	249(13.6)	↓	262(2.9)	↔	266(7.9)	↔
Meghalaya	234(12.7)	239(10.7)	↑	237(3.6)	↔	257(15.6)	↑
Mizoram	238(22.4)	242(35.8)	↔	238(2.1)	↔		
Nagaland	251(6.9)	264(18.7)	↑	246(3.1)	↓	222(20.6)	↓
Odisha	263(1.8)	248(2.3)	↓	253(1.6)	↓	259(1.1)	↔
Puducherry	246(3.1)	226(4.9)	↓			251(3.2)	↓
Punjab	261(0.6)	248(2.4)	↓	244(11.4)	↓	249(2.7)	↓
Rajasthan	262(3.2)	271(2.1)	↑	260(1.6)	↔	263(1.9)	↔
Sikkim	270(5.5)	224(11.9)	↓	254(4.1)	↓	252(2.2)	↓
Tamil Nadu	256(4.8)	241(1.6)	↓	249(7.3)	↔	248(1.4)	↓
Telangana	275(2.5)	257(1.9)	↓	262(0.7)	↓	255(1.3)	↓
Tripura	243(3.9)	238(3.6)	↔	237(5.7)	↓	242(4.2)	↔
Uttarakhand	253(2.1)	238(1.8)	↓	229(14.5)	↓	236(2.4)	↓
CBSE	307(4)	280(8.8)	↓	322(11.4)	↑	308(6.7)	↔
ICSE	309(3.1)	321(13.9)	↑	336(24.2)	↑	300(5.9)	↓
National	257(0.4)	249(0.5)	↓	248(5)	↓	253(0.4)	↓

* Sig. - Significant Difference.

School Management

This survey also revealed the average science scores achieved by students in Class X across various school managements— government, government-aided and private. The results reflect interesting variations when comparing the achievement results nationally and inter-state across various school managements. At national level, while there was no overall significant difference in science scores of students from government and government-aided schools but privately managed schools, performed significantly better than the government schools in science for Class X.

In respect to the inter-state variation in science scores across government and government-aided schools revealed that in nine States/UTs, i.e., Jammu and Kashmir, Chandigarh, Delhi, Arunachal Pradesh, Jharkhand, Gujarat, Dadra and Nagar Haveli, Andhra Pradesh and Odisha students from government-aided schools performed significantly better than government school students. While in the majority of 15 states/UTs of Punjab, Uttarakhand, Haryana, Rajasthan, Bihar, Sikkim, Manipur, Mizoram, Meghalaya, Chhattisgarh, Madhya Pradesh, Daman

and Diu, Maharashtra, Karnataka and Andaman and Nicobar Islands students in government-aided schools scored significantly lower than government schools in science. In six states/UTs of Assam, Telangana, Goa, Kerala, Tamil Nadu and Puducherry there was no significant difference in scores of students from government and government-aided schools.

The comparison of average science scores between private and government schools depicted students in 17 States/UTs of Jammu and Kashmir, Delhi, Arunachal Pradesh, Jharkhand, Gujarat, Andhra Pradesh, Telangana, Uttarakhand, Maharashtra, Andaman and Nicobar Islands, Assam, Odisha, Goa, Dadra and Nagar Haveli, Punjab, Haryana and Himachal Pradesh of private schools performed significantly better than government schools. Private schools in the five States/UTs of Rajasthan, Bihar, Manipur, Meghalaya and Karnataka scored significantly lower in science than government schools. In eight states of Tamil Nadu, Nagaland, Mizoram, Daman and Diu, Chhattisgarh, Madhya Pradesh, Kerala and Puducherry, there is no significant difference in students' achievement from different school managements.

Table 5.5: Average Science Scores by School Management

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Andaman and Nicobar Islands	243(7)	225(39.4)	↓	288(6.1)	↑
Andhra Pradesh	255(2.4)	271(1.5)	↑	276(3)	↑
Arunachal Pradesh	230(3.6)	271(13.8)	↑	257(2.6)	↑
Assam	260(0.7)	256(3.2)	↔	272(2)	↑
Bihar	240(0.7)	223(7.1)	↓	234(4.6)	↓
Chandigarh	262(4.9)	274(12.7)	↑		
Chhattisgarh	241(1.5)	227(3.8)	↓	239(2.6)	↔
Dadra and Nagar Haveli	225(5.3)	235(14.2)	↑	231(24.4)	↑
Daman and Diu	249(9.6)	226(19.3)	↓	252(24.2)	↔
Delhi	251(1.3)	257(2.9)	↑	303(3.4)	↑
Goa	260(4.4)	258(2.2)	↔	269(7.9)	↑
Gujarat	239(4.8)	243(1.6)	↑	254(1.9)	↑

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Haryana	240(1.7)	221(11.2)	↓	244(1.1)	↑
Himachal Pradesh	240(2.1)			264(8.9)	↑
Jammu and Kashmir	235(1.9)	260(11)	↑	251(3.9)	↑
Jharkhand	236(1.6)	252(3.2)	↑	242(2.3)	↑
Karnataka	265(1.3)	259(1.5)	↓	257(1.1)	↓
Kerala	253(2.1)	250(1.4)	↔	257(9)	↔
Lakshadweep	238(8.8)				
Madhya Pradesh	239(0.9)	227(3.8)	↓	237(0.7)	↔
Maharashtra	256(7.7)	247(0.6)	↓	262(2.3)	↑
Manipur	270(4.2)	236(6.9)	↓	263(3.2)	↓
Meghalaya	248(4.5)	236(2.7)	↓	242(5.7)	↓
Mizoram	239(2.8)	229(7.6)	↓	242(4.9)	↔
Nagaland	244(7.8)			247(1.6)	↔
Odisha	256(0.7)	264(2.6)	↑	263(5.4)	↑
Puducherry	244(4.9)	241(16.5)	↔	248(3.9)	↔
Punjab	250(1.5)	239(4.1)	↓	261(1.5)	↑
Rajasthan	273(1)	231(23.4)	↓	255(1.2)	↓
Sikkim	252(3.3)	237(28.6)	↓		
Tamil Nadu	245(1.9)	245(3.7)	↔	248(1.3)	↔
Telangana	251(1.6)	253(8.5)	↔	269(0.7)	↑
Tripura	239(1.2)				
Uttarakhand	244(1.6)	234(4.1)	↓	248(2.2)	↑
CBSE	267(14.8)	300(27.6)	↑	307(4.2)	↑
ICSE				308(2.4)	
National	251(0.4)	250(0.4)	↔	259(0.4)	↑

Overview of the Science Tests

The science tests used in NAS X consisted of three test booklets, each containing 60 multiple choice items. The items were chosen keeping in view the whole range of the content. Seventeen out of the sixty items were common across all test forms and served as 'anchors', so that all 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 43 unique items in each test form.

The items were designed to test a range of relevant cognitive processes or 'skills', classified as remembering, understanding and applying as defined below.

COGNITIVE PROCESSES FOR SCIENCE

Remembering (Skill 1)

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

Understanding (Skill 2)

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

Applying (Skill 3)

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.

What Majority of Students Can do in Science

The prime objective of this chapter is to highlight what the students can perform at different level of content domain on science items. Before providing exemplifiers of the items tested in Science, this section gives a brief synopsis of content areas on which above three skills among learners were tested:

- Food
- How Things Work
- Material
- Moving Things
- Natural Phenomena
- Natural Resources
- The Living World

Performance of Class X Students on the Various Content Areas in Science

The overall average performance of Class X students in science was around a mean of 253 out of 500 with a standard error (SE) of 0.20. In the content areas of 'food' and 'Moving things' the mean performance of students revolved around the score of 251 which was significantly below the overall average performance of students in science. Similarly, in

the content areas of 'How things work', 'Natural phenomena', 'Natural resources' and 'The living world' the mean performance of students was 250, which was significantly below the overall average score in science. In the last content area of 'Material' while the mean score of students was '252', but again students performed significantly below the overall average in the science score.

Contents	Mean	SE	Sig.
Science	253	0.20	
Food	251	0.37	↓
How Things Work	250	0.53	↓
Material	252	0.19	↓
Moving Things	251	0.32	↓
Natural Phenomena	250	0.15	↓
Natural Resources	250	0.30	↓
The Living World	250	0.36	↓

5.4. SAMPLE ITEMS

Listed below are some of the items that were used in the science tests. Arranged in no order of difficulty, statistics show how students responded to the items and these can be located on the item map.

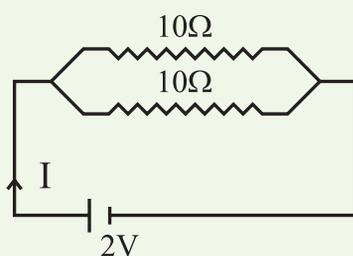
Sample Item 1

The item required students to use the information for computing the current produced in the circuit. Only 18.2 per cent of students in the sample were able to answer the correct response (4), while the chart shows that 81.8 per cent of students have selected either the wrong responses or given multiple responses or not attempted. In respect to inter-state variation, 14 States/UTs i.e., Telangana, Odisha, Gujarat, Manipur, Andaman and Nicobar Islands, Lakshadweep, Daman and Diu, Uttarakhand, Andhra Pradesh, Delhi, Assam, Rajasthan and Chandigarh more than 18 per cent of students selected the correct response where as more than 20 States/UTs, i.e., Dadra and Nagar Haveli, Nagaland, Chhattisgarh, Goa, Madhya Pradesh, Himachal Pradesh, Sikkim, Kerala, Tamil Nadu, Jammu and Kashmir, Haryana, Bihar, Tripura, Meghalaya, Karnataka, Mizoram, Maharashtra, Punjab, Arunachal Pradesh and Puducherry had students less than 18 per cent who answered this question correctly.

Skill: Skill 3 item

Content Domain: Physics

58. The current I in the circuit shown in the figure is



1. 0.1A
2. 0.2A
3. 0.3A
4. 0.4A

% Answers

- | | |
|------------------------|--------------|
| 1. | 20.2% |
| 2. | 38.0% |
| 3. | 17.9% |
| 4. | 18.2% |
| Multiple response 0.7% | |
| Not attempted 5.0% | |

Sample Item 2

The item required students to find out the understanding about the concept of retina and formation of images. Approximately 31.7 per cent of students in the sample were able to select the correct answer (2). The chart shows the way remaining 67.3 per cent of students responded either the wrong responses or given multiple responses or not attempted. However, 18 States/UTs, i.e., Daman and Diu, Maharashtra, Arunachal Pradesh, Bihar, Rajasthan, Nagaland, Andaman and Nicobar Islands, Jammu and Kashmir, Sikkim, Telangana, Karnataka, Odisha, Andhra Pradesh, Delhi, Mizoram, Lakshadweep, Kerala and Goa performed significantly better than average number of students performed correctly this question.

Skill: Skill 2 item

Content Domain: Physics

13. The image of an object formed by your eye lens on the retina is

1. erect and real
2. inverted and real
3. erect and virtual
4. inverted and virtual.

% Answers

- | | |
|------------------------|--------------|
| 1. | 33.1% |
| 2. | 31.7% |
| 3. | 21.7% |
| 4. | 10.9% |
| Multiple response 0.6% | |
| Not attempted 2.1% | |

Sample Item 3

The item required students understanding about the nitrogen gas, its nature and uses. Approximately 53.4 per cent of students in the sample were able to select the correct answer (2). The chart shows the way remaining 46.6 per cent of students responded either the wrong responses or given multiple responses or not attempted. However, 14 States/UTs, i.e., Chhattisgarh, Jharkhand, Andaman and Nicobar Islands, Assam, Karnataka, Maharashtra, Haryana, Punjab, Rajasthan, Andhra Pradesh, Chandigarh, Uttarakhand, Delhi and Goa more than 53 per cent of students responded correctly to the question investigating basic properties of nitrogen gas.

Skill: Skill 2 item

Content Domain: Chemistry

17. Packets of potato chips are filled with nitrogen gas in order to avoid

1. Rusting	
2. Rancidity	% Answers
3. Reduction	1. 11.3%
4. Decomposition	2. 53.4%
	3. 19.0%
	4. 14.1%
	Multiple response 0.6%
	Not attempted 1.6%

Sample Item 4

The item required students to recall the unit of work. Almost 61.5 per cent of students could respond to answer it correctly (1), while the chart shows that 38.5 per cent of students selected either the wrong responses or gave multiple responses or did not attempt.

Skill: Skill 1 item

Content Domain: Physics

8. The unit of work is

1. joule	
2. newton	% Answers
3. newton/meter	1. 61.5%
4. watt	2. 12.0%
	3. 11.5%
	4. 12.4%
	Multiple response 0.6%
	Not attempted 1.9%

Sample Item 5

The item is to assess the understanding about the biological concept relating to mouth fluids and food composition. Almost 71 per cent of students in the sample were able to answer the question correctly (3). The Table depicts the way remaining 29 per cent of students responded either the wrong responses or given multiple responses or not attempted. However, 18 States/UTs, i.e., Gujarat, Maharashtra, Himachal Pradesh, Punjab, Manipur, Uttarakhand, Karnataka, Chandigarh, Nagaland, Rajasthan, Kerala, Chhattisgarh, Sikkim, Assam, Telangana, Andhra Pradesh, Delhi and Goa had more than 71 per cent of its students responded correctly to this question. Whereas, remaining 16 States/UTs of Odisha, Mizoram, Bihar, Arunachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Lakshadweep, Tripura, Meghalaya, Jharkhand, Tamil Nadu, Haryana, Daman and Diu, Dadra and Nagar Haveli, Puducherry and Andaman and Nicobar Islands had students less than 71 per cent of students responding to this question correctly.

Skill: Skill 2 item

Content Domain: Biology

23. The fluid secreted in our mouth that mixes with food making it slippery and easy to swallow is

1. gastric juice
2. hormones
3. saliva
4. bile

	% Answers
1.	11.1%
2.	10.0%
3.	71.0%
4.	5.6%
Multiple response	0.6%
Not attempted	1.7%

Performance on the sample items reproduced here varied across the country. Table 5.6 shows the proportion of students in each State/UT responding correctly to each item.

Table 5.6: Performance on Sample Items in States/UTs/Boards

States/UTs/Boards	Q58	Q13	Q17	Q8	Q23
Andaman and Nicobar Islands	20.70%	35.90%	55.60%	66.20%	69.80%
Andhra Pradesh	24.10%	40.30%	67.80%	52.00%	81.30%
Arunachal Pradesh	17.90%	34.20%	43.70%	66.20%	60.30%
Assam	24.50%	28.30%	59.10%	80.30%	78.30%
Bihar	15.60%	34.40%	49.10%	57.70%	60.20%
Chandigarh	28.40%	31.50%	67.80%	69.70%	77.10%
Chhattisgarh	13.40%	22.00%	55.20%	55.90%	77.70%
Dadra and Nagar Haveli	12.20%	18.20%	33.30%	45.50%	68.90%
Daman and Diu	21.70%	32.50%	20.30%	50.60%	68.10%
Delhi	24.40%	40.40%	75.20%	77.10%	82.60%
Goa	13.60%	52.30%	79.70%	72.20%	83.50%
Gujarat	19.70%	20.80%	42.50%	62.10%	72.40%
Haryana	14.90%	27.90%	60.20%	58.70%	68.00%
Himachal Pradesh	14.00%	28.10%	42.50%	59.20%	73.20%
Jammu and Kashmir	14.70%	36.40%	46.70%	61.00%	61.20%

States/UTs/Boards	Q58	Q13	Q17	Q8	Q23
Jharkhand	18.50%	29.30%	55.50%	59.50%	66.20%
Karnataka	15.90%	37.90%	59.10%	68.50%	76.70%
Kerala	14.40%	48.50%	34.90%	44.60%	77.70%
Lakshadweep	20.80%	45.20%	33.30%	32.30%	62.50%
Madhya Pradesh	13.80%	24.50%	53.50%	63.40%	62.10%
Maharashtra	16.80%	33.10%	60.10%	56.90%	73.10%
Manipur	20.50%	29.90%	52.80%	78.10%	74.20%
Meghalaya	15.80%	27.80%	38.30%	69.80%	65.50%
Mizoram	16.10%	41.70%	43.30%	69.50%	58.50%
Nagaland	13.30%	35.80%	34.50%	58.20%	77.30%
Odisha	19.30%	37.90%	46.40%	49.10%	56.70%
Puducherry	18.00%	31.10%	37.80%	42.50%	69.20%
Punjab	17.30%	24.30%	60.50%	69.00%	73.40%
Rajasthan	28.30%	34.80%	62.60%	75.90%	77.50%
Sikkim	14.20%	37.60%	54.30%	75.90%	78.20%
Tamil Nadu	14.60%	26.70%	42.70%	48.20%	67.40%
Telangana	18.60%	37.70%	44.40%	49.70%	79.70%
Tripura	15.70%	21.40%	44.00%	69.00%	64.30%
Uttarakhand	23.10%	26.20%	68.10%	70.10%	74.20%
CBSE	44.2%	63.7%	82.5%	84.8%	86.5%
ICSE	56.0%	69.3%	50.3%	83.8%	90.0%
National	18.2%	31.7%	53.4%	61.5%	71.0%

5.5. SKILL-WISE PERFORMANCE

In this sub-section, analysis of students' performance in various States pertaining to skills, such as remembering, understanding and applying of

scientific concepts (Skill 1, Skill 2, Skill 3). Table 5.7 summarises the State wise performance of students in the three cognitive processes, i.e., Remembering, Understanding and Applying (Skill 1, Skill 2, Skill 3)

Table 5.7: State-wise Performance of Students in the Three Skills

States/UTs/Boards	Skill 1 (Correct Average score in Per cent)	Skill 2 (Correct Average score in Per cent)	Skill 3 (Correct Average score in Per cent)
Andaman and Nicobar Islands	40	34	36
Andhra Pradesh	43	40	41
Arunachal Pradesh	37	32	33
Assam	42	36	37
Bihar	35	29	31

States/UTs/Boards	Skill 1 (Correct Average score in Per cent)	Skill 2 (Correct Average score in Per cent)	Skill 3 (Correct Average score in Per cent)
Chandigarh	43	36	37
Chhattisgarh	36	30	32
Dadra and Nagar Haveli	33	28	32
Daman and Diu	34	30	34
Delhi	43	38	38
Goa	44	37	36
Gujarat	36	30	34
Haryana	35	30	30
Himachal Pradesh	35	29	30
Jammu and Kashmir	33	30	30
Jharkhand	35	30	31
Karnataka	42	36	38
Kerala	38	33	34
Lakshadweep	35	30	31
Madhya Pradesh	35	29	31
Maharashtra	37	33	34
Manipur	38	35	35
Meghalaya	33	29	31
Mizoram	34	31	34
Nagaland	36	31	33
Odisha	40	33	35
Puducherry	37	32	34
Punjab	38	34	34
Rajasthan	43	36	37
Sikkim	38	33	35
Tamil Nadu	38	31	34
Telangana	40	36	37
Tripura	36	30	33
Uttarakhand	38	32	33
CBSE	56	51	48
ICSE	56	53	52
National	38	33	34

Proficiency Levels

Proficiency scores are used to measure learners' competency in the science content which directly or indirectly assess the target skills. Proficiency levels provide a convenient way to describe profiles of student achievement. Children whose results are located within a particular level of proficiency are expected to understand the competencies and skills associated with that and lower levels. In NAS Class X Cycle 2 Student's performance in Science was gauged using five proficiency levels based on the numeric scores achieved in the assessment.

Figure 5.2 shows the division of average science scores achieved by students into five proficiency levels. Each level comprises the percentage of students and a mean score for that level of proficiency. It can be observed that maximum number of students, i.e., 36 per cent lied between proficiency levels of 201 to 250. Approximately 33 per cent of students belonged to higher proficiency levels of 251 to 300. Another 15 per cent of students fall under the category of lower proficiency levels of below 200. And 3 per cent of students belonged to a higher proficiency level of more than 350.

Distribution of Students Performing less than 200

In this section classification of students relating to performance in the proficiency band of less than 200 are analysed relating to following parameters:

- **Gender:** It was observed that 51 per cent of males and 49 per cent females of students performed below the score of 200 in science achievement tests.

- **Location:** The graph revealed that majority of students performing in the proficiency band of less than 200 were studying in schools located in rural areas, i.e., 75 per cent and remaining 25 per cent of students in the same proficiency score studied in schools located in urban areas.
- **School Management:** Around 60 per cent of students belonging to government schools were found scoring less than the score of 200 in the achievement tests for science. Additionally, 21 per cent of students in private schools and 19 per cent of students in government-aided schools performed below the 200 score in Class X science achievement tests.
- **Social Groups:** Information was gathered relating to social composition of students falling under the proficiency score of less than 200 which revealed that the distribution of students were skewed in favour of students belonging to OBC category constituting 43 per cent of the students performing at this level. While students belonging to SCs, STs and Others category constituted 19 per cent, 18 per cent and 20 per cent of those performing within the proficiency band of less than 200 score in science.

Distribution of Students based on Score Range

Table 5.9 shows the range of students' ability to correctly answer across States/UTs in science in four ranges. It shows the proportion of students who answered 0 to 35 per cent of questions correctly, 36

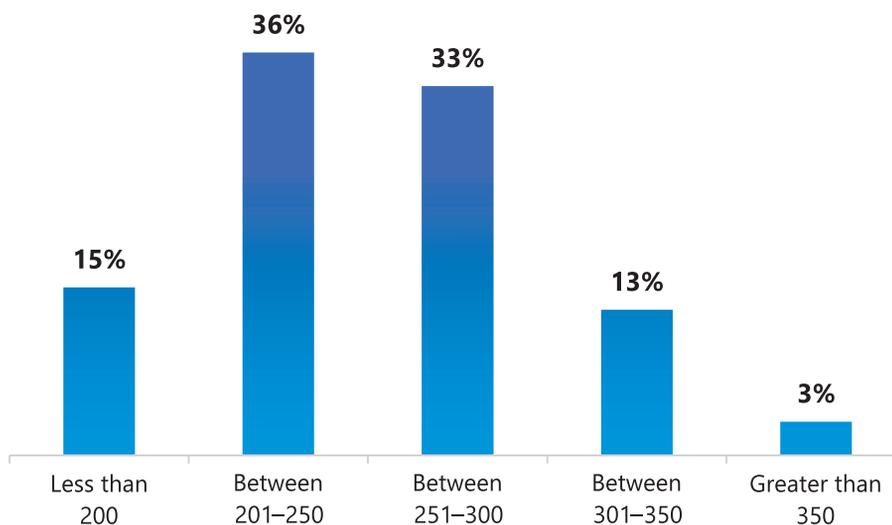


Fig. 5.2: Proficiency Levels in Science

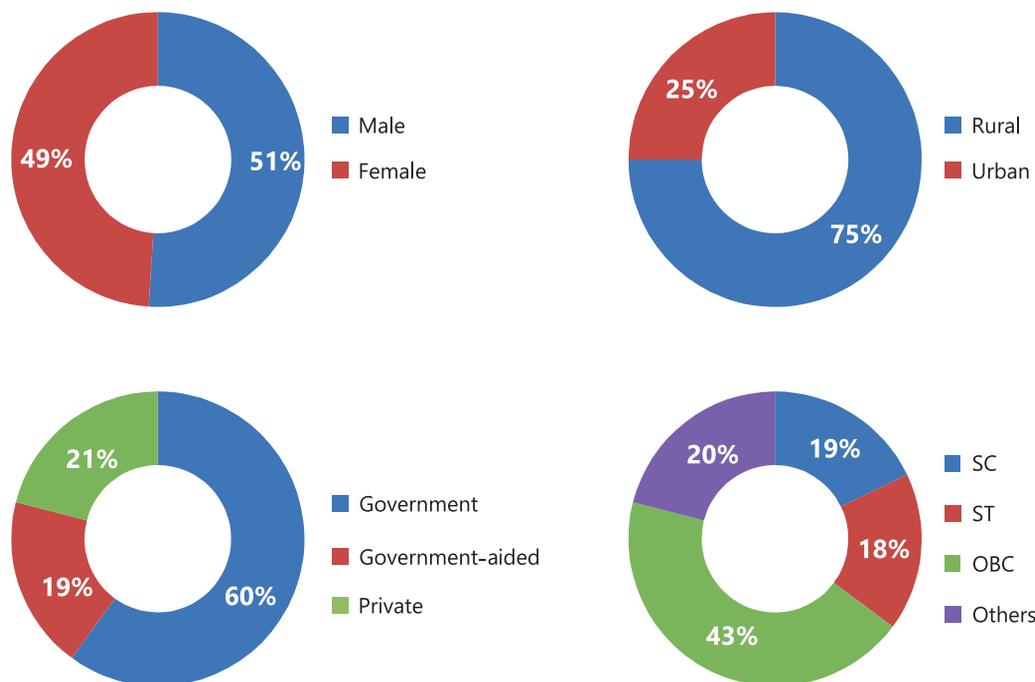


Fig. 5.3: Characteristics of Students Performing below the Mean Score of 250 by Gender, Location, School Management and Social Groups

per cent to 50 per cent of questions correctly, 51 per cent to 75 per cent of questions correctly and the proportion of students who answered more than 75 per cent of questions correctly. At national level, majority of students, i.e., 62.2 per cent answered

correctly in the range of 0 to 35 per cent of questions. Majority of States tend to perform in this range in science. A small percentage of students 0.7 performed in the range of 76 per cent to 100 per cent in science.

Table 5.8: Students' Performance using Absolute Scores

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Andaman and Nicobar Islands	59.4	28.5	10.6	1.6
Andhra Pradesh	42.4	33.7	21.9	2
Arunachal Pradesh	66.7	24.6	8.1	0.7
Assam	52.8	30.8	15	1.4
Bihar	71.9	19.4	8.3	0.3
Chandigarh	49.5	33.7	16.4	0.4
Chhattisgarh	70.2	22.4	6.9	0.4
Dadra and Nagar Haveli	80.3	18.6	1.1	
Daman and Diu	67.1	31.4	1.4	
Delhi	48.5	31.8	17	2.6
Goa	45.8	40	13.7	0.5
Gujarat	68.4	26.4	5	0.1
Haryana	71.3	22.1	6.2	0.4
Himachal Pradesh	75	21.9	3	0
Jammu and Kashmir	72.4	20.2	7.1	0.3

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Jharkhand	70.1	22.6	7.1	0.2
Karnataka	47.8	36.3	15.8	0.1
Kerala	58.4	35.7	5.7	0.2
Lakshadweep	72	25.3	2.7	
Madhya Pradesh	74.7	20.6	4.1	0.6
Maharashtra	60.9	30	8.6	0.5
Manipur	55.7	33	10.7	0.6
Meghalaya	76.1	21.1	2.8	0
Mizoram	69.6	26.1	4.3	
Nagaland	64.9	32	3	0
Odisha	61.1	26	12	1
Puducherry	64.7	29	5.9	0.4
Punjab	59.8	29.1	10.2	0.9
Rajasthan	52.3	27.5	18.3	1.9
Sikkim	59.8	32.6	7.5	0.1
Tamil Nadu	63.6	32.3	4.1	0.1
Telangana	52.7	33.9	12.7	0.8
Tripura	68.2	24.2	6.9	0.8
Uttarakhand	64.3	27.2	8.2	0.2
CBSE	22.9	27.9	39.5	9.8
ICSE	16.7	24.8	50.5	8.0
National	62.2	27.3	9.8	0.7

Conclusion

The average achievement of students in science varies greatly across the States and UTs of India. There is a highly significant difference between performances in high scoring States/UTs, such as Chandigarh, Delhi, Rajasthan, Manipur, Assam, Odisha, Andhra Pradesh, Karnataka, Goa and Telangana.

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 no significant differences were found in the average achievement of girls and boys. However, significant difference was observed between the achievement level of rural and urban students across States/UTs although exceptions were found in case of some States/UTs like Andhra

Pradesh, Bihar, Chandigarh, Kerala and Madhya Pradesh. 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.

This survey also observed significant difference in the achievement level of students studying in different categories of school management. While there was no overall significant difference in science scores of students from government and government-aided schools, but privately managed schools performed significantly better than the government schools in science for Class X.

Moreover, majority of students in science were found to score between 201 to 250 on the scale of 500 whereas 60 per cent of students from the government schools across the States/UTs performed below the score of 200 in science.

Students' Achievement in Social Science

This chapter summarises two important aspects of the achievement of students in social science under National Achievement Survey (NAS) for Class X. In the first section, the overall achievement in the social science domain is reported for each participating State/UT and Board. In addition, information about differences in achievement by gender, school location, social category and school management type is provided. The objective of second part of the chapter, is to present students performance levels in the domain of social science subject to various aspects of content areas and skills mapped in items testing these contents.

6.1. STATE-WISE PERFORMANCE OF STUDENTS IN SOCIAL SCIENCE

This section shows the distribution of students' achievement in social science for the 36 participating States/UTs and Boards. Table 6.1 lists average achievement score of States/UTs on a scale of 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 also indicate whether a State's or UT's average score is significantly different from the overall average of 36 States/UTs and Boards or not.

Table 6.1: Average Social Science Scores for States/UTs/Boards

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Andaman and Nicobar Islands	254	4.1	↔
Andhra Pradesh	260	1.3	↑
Arunachal Pradesh	252	2.2	↔
Assam	255	1.1	↔
Bihar	243	1.2	↓
Chandigarh	253	3.5	↔
Chhattisgarh	241	0.2	↓
Dadra and Nagar Haveli	254	4.6	↔
Daman and Diu	237	5.9	↓
Delhi	273	1.7	↑
Goa	265	1.8	↑

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Gujarat	247	0.6	↓
Haryana	245	0.9	↓
Himachal Pradesh	248	1.9	↓
Jammu and Kashmir	229	1.6	↓
Jharkhand	244	1.3	↓
Karnataka	270	0.6	↑
Kerala	256	1.3	↔
Lakshadweep	255	8.6	↑
Madhya Pradesh	237	0.5	↓
Maharashtra	254	1.0	↔
Manipur	240	1.6	↓
Meghalaya	238	1.5	↓
Mizoram	236	1.4	↓
Nagaland	268	1.5	↑
Odisha	247	1.4	↓
Puducherry	238	3.6	↓
Punjab	247	0.9	↓
Rajasthan	267	0.8	↑
Sikkim	259	2.9	↑
Tamil Nadu	250	1.0	↓
Telangana	249	0.4	↓
Tripura	236	2.0	↓
Uttarakhand	254	0.7	↔
CBSE	292	4.6	↑
ICSE	285	2.1	↑
National	254	0.2	

↔ The State's average score is not significantly different than that of the National.

↑ The State's average score is significantly above than that of the National.

↓ The State's average score is significantly below than that of the National.

Table 6.1 indicates that the average score was 254 (with a standard error of 0.2). The table revealed variations in social science achievement across high achieving States/UTs, such as 273 for Delhi, 270 for Karnataka and 268 for Nagaland and the low performing States/UTs are 229 for Jammu and Kashmir, 237 for Daman and Diu, 238 for Meghalaya, Madhya Pradesh and Tripura. Eight States/UTs—Sikkim, Andhra Pradesh, Goa, Nagaland, Rajasthan, Karnataka, Lakshadweep and Delhi, showed average

scores significantly above that of the group with mean scores ranging 255 to 273. There were 18 States/UTs depicted the average scores significantly ranging from 229 to 250, which are below that of the national average. Eight States/UTs—Arunachal Pradesh, Andaman and Nicobar Islands, Uttarakhand, Maharashtra, Assam, Chandigarh, Dadra and Nagar Haveli and Kerala reported the scores from 252 to 305 that were not significantly different from that of the overall average scores in social science.

6.2. PERCENTILE SCORES IN SOCIAL SCIENCE FOR STATES/UTS

The percentile scores assist to develop a better understanding about students, of low and high ability, by locating the scores gained by students at different parts of ability distribution as reported at different percentiles. This section illustrates the range of achievement within and across the States/UTs by students at key percentiles. For example, the score at the 25th percentile is the score which

75 per cent of students achieve or surpass, whereas the score at the 90th percentile is the score that 10 per cent of students achieve or surpass (Table 6.2).

The range between the 25th and 75th percentile (the inter-quartile range) represents the performance of the middle 50 per cent of students. Therefore, both inter-quartile range and range between 90th percentile and 10th percentile is a good indicator of reflecting the degree of homogeneity in achievement of students across States/UTs (Figure 6.1).

Table 6.2: Percentile Scores in Social Science for States/UTs/Boards

States/UTs/Boards	P10	P25	Mean	P75	P90	Range P75–P25	Range P90–P10
Andaman and Nicobar Islands	196	218	256	288	320	70	124
Andhra Pradesh	198	224	259	294	327	70	129
Arunachal Pradesh	185	213	244	289	332	76	147
Assam	193	223	256	289	318	66	125
Bihar	174	205	240	281	318	76	144
Chandigarh	191	219	247	289	327	70	136
Chhattisgarh	184	211	239	272	299	61	115
Dadra and Nagar Haveli	197	219	257	282	310	63	113
Daman and Diu	206	219	239	259	277	40	71
Delhi	210	240	274	306	337	66	127
Goa	204	231	269	298	321	67	117
Gujarat	191	218	246	278	302	60	111
Haryana	186	213	244	278	308	65	122
Himachal Pradesh	191	219	248	279	303	60	112
Jammu and Kashmir	161	195	227	266	298	71	137
Jharkhand	175	206	241	282	320	76	145
Karnataka	203	233	272	307	334	74	131
Kerala	199	225	258	288	314	63	115
Lakshadweep	183	200	219	342	342	142	159
Madhya Pradesh	181	208	235	267	293	59	112
Maharashtra	194	223	255	286	316	63	122
Manipur	162	204	243	279	318	75	156
Meghalaya	184	210	237	267	293	57	109
Mizoram	182	207	235	266	287	59	105
Nagaland	212	234	267	298	330	64	118
Odisha	189	217	246	279	305	62	116
Puducherry	182	208	237	269	292	61	110
Punjab	189	218	245	277	307	59	118
Rajasthan	195	228	269	307	340	79	145
Sikkim	204	230	259	291	318	61	114

States/UTs/Boards	P10	P25	Mean	P75	P90	Range P75–P25	Range P90–P10
Tamil Nadu	194	222	251	280	304	58	110
Telangana	190	218	248	280	309	62	119
Tripura	175	204	234	269	299	65	124
Uttarakhand	192	222	255	285	314	63	122
CBSE	216	258	297	333	362	75	146
ICSE	223	254	290	322	348	68	125
National	191	221	253	288	321	67	130

Note: Ranges may not agree due to rounding.

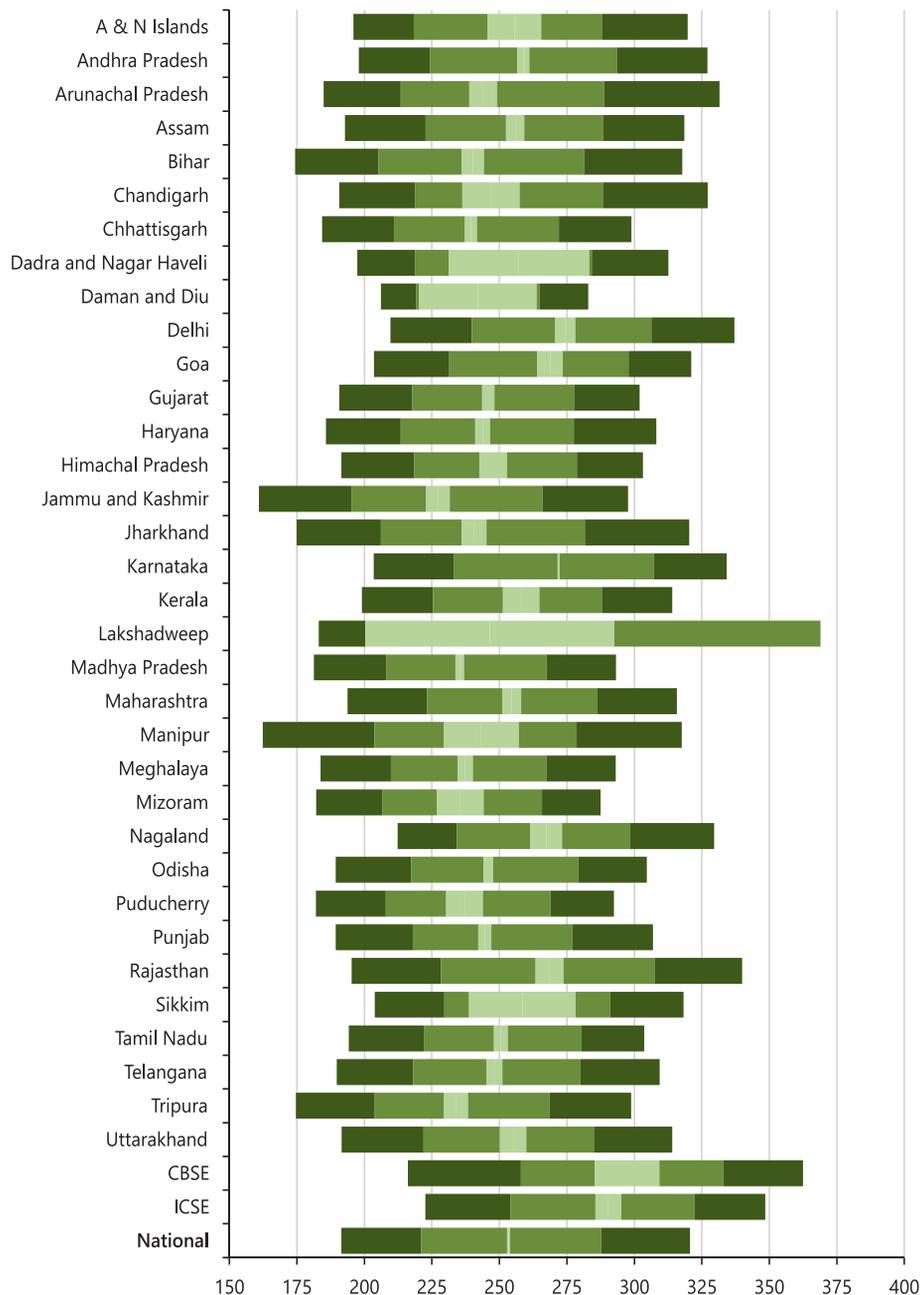


Fig. 6.1: Percentile Scores in Social Science for States/UTs/Boards

The inter-quartile range (i.e., the range between the 75th and 25th percentiles) between States/UTs is highly variable. For example, States/UTs like Daman and Diu, Meghalaya and Mizoram has an inter-quartile range of just 40, 57 and 59, respectively, while Karnataka, Rajasthan and Lakshadweep has a corresponding value of 74, 79 and 142, respectively. The values suggest that the Class X population in Daman and Diu, Mizoram and Meghalaya is far more homogenous as regard to the learning levels than that of Karnataka, Rajasthan and Lakshadweep. In most States, the range of performance for middle group is between 60 to 75 scale-score points.

Further, the performances of States and UTs at the 10th and 90th percentiles, respectively, show extremes in low and high achievement. The range between these two points, which includes 90 per cent of the population, is highly variable ranging from 71 for Daman and Diu to 159 for Lakshadweep.

The percentiles provide additional information when comparing performance amongst States/UTs. 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 many not be similar. For example, there is no

significant difference between the median score of Himachal Pradesh and Telangana (248). However, the range of Scores between the 25th and 75th for these three States is very different— Himachal Pradesh (60) and Telangana (62). This indicates that the average achievement is very similar in two States.

6.3. GROUP-WISE PERFORMANCE IN SOCIAL SCIENCE

In this section, analyses are brought forth, which compare the average performance of different groups in social science based on gender, school location, social category and school management.

Gender

This section compares the average social science scores achieved by the boys and girls. It shows that overall, there was no significant difference in the performance of boys and girls in social science. Similarly observed that in 18 States/UTs, there was no significant difference in performance of boys and girls. Girls performed significantly better in terms of average achievement in 11 States/UTs. In five States/UTs, girls scored significantly lower than the boys in social science (Table 6.3).

Table 6.3: Average Social Science Scores by Gender

States/UTs/Boardss	Boys' Average (Standard Error)	Girls' Average (Standard Error)	Significant Difference
Andaman and Nicobar Islands	254(4.7)	254(5.1)	↔
Andhra Pradesh	256(1.4)	263(1.9)	↑
Arunachal Pradesh	244(4.7)	258(3.9)	↑
Assam	258(0.6)	253(1.8)	↓
Bihar	242(1.2)	245(1.3)	↔
Chandigarh	255(5.5)	252(6.1)	↔
Chhattisgarh	242(1.5)	240(1.3)	↔
Dadra and Nagar Haveli	256(1.0)	251(8.6)	↓
Daman and Diu	235(11.0)	238(5.6)	↑
Delhi	267(0.9)	279(3.0)	↑
Goa	258(2.5)	271(3.2)	↑
Gujarat	244(0.5)	250(1.3)	↑
Haryana	243(2.0)	248(1.4)	↑
Himachal Pradesh	249(2.5)	246(2.5)	↔

States/UTs/Boardss	Boys' Average (Standard Error)	Girls' Average (Standard Error)	Significant Difference
Jammu and Kashmir	232(2.0)	227(2.7)	↔
Jharkhand	245(1.3)	243(2.3)	↔
Karnataka	270(0.6)	270(1.2)	↔
Kerala	255(1.7)	257(1.3)	↔
Lakshadweep	266(11.1)	192(26.0)	↓
Madhya Pradesh	237(1.1)	237(0.5)	↔
Maharashtra	256(1.1)	252(1.5)	↓
Manipur	239(3.3)	242(5.2)	↔
Meghalaya	243(4.2)	235(1.2)	↓
Mizoram	227(3.9)	243(4.3)	↑
Nagaland	271(3.6)	264(2.9)	↑
Odisha	245(1.2)	248(1.5)	↔
Puducherry	235(2.7)	239(4.8)	↔
Punjab	243(0.9)	252(1.1)	↑
Rajasthan	269(1.2)	265(1.2)	↔
Sikkim	258(2.0)	261(5.3)	↔
Tamil Nadu	249(0.9)	251(1.4)	↔
Telangana	247(1.3)	252(0.9)	↑
Tripura	233(1.8)	237(3.2)	↔
Uttarakhand	254(1.7)	254(1.8)	↔
CBSE	299(5.4)	286(7.2)	↓
ICSE	277(1.9)	294(4.2)	↑
National	254(0.4)	254(0.4)	↔

↔ 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.

Location of Schools

Table 6.4 reveals that students in rural schools performed significantly lower than students in urban schools. In 14 States/UTs of Jammu and Kashmir, Himachal Pradesh, Delhi, Arunachal Pradesh, Nagaland, Tripura, Meghalaya, Jharkhand, Gujarat, Daman and Diu, Chandigarh, Goa, Kerala, Andaman and Nicobar Islands, students in rural schools performed lower than urban areas.

A significant difference was also observed in eight States/UTs of Punjab, Haryana, Sikkim, Manipur, Mizoram, Dadra and Nagar Haveli, Karnataka and Lakshadweep, where students in rural schools performed better than their urban counterparts. While in remaining 12 States/UTs of Assam, Madhya Pradesh, Uttarakhand, Rajasthan, Bihar, Maharashtra, Odisha, Chhattisgarh, Andhra Pradesh, Tamil Nadu, Puducherry and Telangana there was no significant difference in average performance of students in social science studying either in rural or urban schools.

Table 6.4: Average Social Science Scores by Location

States/UTs/Boardss	Rural Average (Standard Error)	Urban Average (Standard Error)	Significant Difference
Andaman and Nicobar Islands	251(4.6)	269(7.9)	↓
Andhra Pradesh	261(1.6)	258(1.3)	↔
Arunachal Pradesh	249(2.7)	258(4.0)	↓
Assam	255(1.0)	253(2.5)	↔
Bihar	243(1.2)	243(2.6)	↔
Chandigarh	249(5.4)	255(5.8)	↓
Chhattisgarh	241(0.5)	241(1.8)	↔
Dadra and Nagar Haveli	256(2.9)	242(24.0)	↑
Daman and Diu	233(8.8)	246(13.8)	↓
Delhi	255(3.7)	275(1.6)	↓
Goa	262(3.3)	273(5.5)	↓
Gujarat	244(0.7)	251(1.3)	↓
Haryana	247(0.7)	242(1.7)	↑
Himachal Pradesh	246(2.3)	260(8.3)	↓
Jammu and Kashmir	224(1.8)	254(3.5)	↓
Jharkhand	243(1.5)	250(2.0)	↓
Karnataka	273(1.1)	266(0.9)	↑
Kerala	254(1.7)	263(3.0)	↓
Lakshadweep	279(21.4)	224(18.9)	↑
Madhya Pradesh	238(0.4)	236(0.9)	↔
Maharashtra	253(1.2)	256(1.4)	↔
Manipur	246(2.0)	226(5.2)	↑
Meghalaya	237(1.3)	240(4.4)	↓
Mizoram	239(3.8)	233(3.7)	↑
Nagaland	265(2.7)	270(2.7)	↓
Odisha	247(1.3)	246(2.3)	↔
Puducherry	238(3.4)	238(6.3)	↔
Punjab	248(1.2)	244(1.0)	↑
Rajasthan	268(0.6)	266(1.5)	↔
Sikkim	260(2.7)	241(14.1)	↑
Tamil Nadu	249(1.3)	251(1.1)	↔
Telangana	249(1.0)	249(1.1)	↔
Tripura	233(2.7)	249(2.7)	↓

States/UTs/Boardss	Rural Average (Standard Error)	Urban Average (Standard Error)	Significant Difference
Uttarakhand	253(1.3)	256(3.1)	↔
CBSE	290(5.8)	294(6.3)	↔
ICSE	274(5.9)	292(4.2)	↓
National	253(0.2)	256(0.3)	↓

↔ 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.

Social Category

This sub-section presents a comparative analysis of average social science scores achieved by students belonging to different social categories. It shows that there was a significant difference between the achievement levels of students in SC, ST, OBC and other categories. Wherein, students from SC, ST and OBC category performed significantly lower than other students.

While Students in 'SC' category scored lower than Others students in majority of 20 States/UTs, but there were six States/UTs which demonstrated reverse trend of SCs performing better than Others

students. Similarly, in majority of 19 States/UTs ST performed significantly lower than Others, but in six States/UTs, STs outperformed than Others in Social Science achievement Scores.

In comparing the performance of achievement Scores of OBC and Others' category students revealed that in 18 States/UTs there persisted significant lower performance in OBCs than Others. However, results of six States/UTs revealed better performance of OBCs than Others in social science scores. In the remaining 8 States/UTs there was no significant difference between the performance of OBCs and Others (Table 6.5).

Table 6.5: Average Social Science Scores by Social Category

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Andaman and Nicobar Islands	265(5.7)	–	–	225(7.6)	↓	248(6.1)	↓
Andhra Pradesh	265(1.6)	263(2.7)	↔	234(5.5)	↓	259(1.4)	↓
Arunachal Pradesh	242(5)	248(13.1)	↑	254(2)	↑	256(9.8)	↑
Assam	257(2.5)	249(2.9)	↓	250(2.3)	↓	257(1.5)	↔
Bihar	251(3.3)	243(2.2)	↓	229(4)	↓	242(1.1)	↓
Chandigarh	259(4.2)	244(5.5)	↓	259(26.4)	↔	230(5.5)	↓
Chhattisgarh	248(2.3)	235(1.7)	↓	241(1.5)	↓	242(1)	↓
Dadra and Nagar Haveli	270(23.9)	257(23.3)	↓	255(4.1)	↓	204(18.3)	↓
Daman and Diu	238(11.9)	236(30.2)	↔	266(19.1)	↑	234(3.4)	↔
Delhi	275(2.2)	264(3)	↓	260(15.9)	↓	276(3.6)	↔
Goa	271(2.7)	264(20)	↓	262(4.5)	↓	252(2.4)	↓
Gujarat	248(2)	248(3.5)	↔	248(1.5)	↔	246(0.5)	↔
Haryana	250(2.1)	242(1.2)	↓	–	–	245(1.7)	↓
Himachal Pradesh	254(3.5)	242(2.8)	↓	248(5.4)	↓	242(4.8)	↓

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Jammu and Kashmir	232(2.1)	210(6.2)	↓	211(5.7)	↓	241(5.6)	↑
Jharkhand	255(5.1)	232(6)	↓	249(3.7)	↓	241(0.8)	↓
Karnataka	277(2.5)	267(1.2)	↓	268(3.7)	↓	270(0.9)	↓
Kerala	257(2.5)	250(2.7)	↓	230(4.9)	↓	257(1.3)	↔
Lakshadweep	–	–	–	255(8.6)	–	–	–
Madhya Pradesh	232(2)	237(1)	↑	236(1.5)	↔	239(1.1)	↑
Maharashtra	258(1.4)	251(1)	↓	243(1.2)	↓	253(1)	↓
Manipur	236(7.5)	260(6.9)	↑	256(3.6)	↑	226(2.6)	↓
Meghalaya	233(8)	247(13.7)	↑	238(1.2)	↑	227(38.3)	↓
Mizoram	–	254(39.6)	–	236(1.3)	–	–	–
Nagaland	259(8.3)	289(7.1)	↑	268(1.6)	↑	267(14.5)	↑
Odisha	251(3)	246(1.8)	↓	247(1.1)	↓	246(1.5)	↓
Puducherry	235(4.7)	238(10.4)	↔	–	–	238(4)	↔
Punjab	253(1.1)	238(1.3)	↓	–	–	249(1.3)	↓
Rajasthan	272(2.2)	266(1)	↓	264(1.2)	↓	267(1)	↓
Sikkim	248(4.6)	178(20.8)	↓	263(3.8)	↑	259(4.3)	↑
Tamil Nadu	252(2.4)	246(1.9)	↓	247(6.5)	↔	251(1.3)	↔
Telangana	249(1.4)	250(3.3)	↔	241(2.6)	↓	250(1.5)	↔
Tripura	235(1.8)	244(1.2)	↑	227(2.2)	↓	242(5.3)	↑
Uttarakhand	262(0.6)	246(2.5)	↓	240(6.2)	↓	247(3.6)	↓
CBSE	294(6.7)	309(11.1)	↑	286(10.9)	↓	288(3.6)	↔
ICSE	282(3.1)	287(23)	↑	262(11.3)	↓	295(3.7)	↑
National	258(0.4)	251(0.5)	↓	248(0.8)	↓	255(0.2)	↓

↔ No significant difference (Sig.) between the average performance of SC/ST/OBC students and Others students.

↑ SC/ST/OBC students' average performance is significantly higher than that of Others students.

↓ SC/ST/OBC students' average performance is significantly lower than that of Others students.

School Management

This survey also revealed average social science scores achieved by students in Class X across various school managements— government, government-aided and private. There was a significant difference in Scores of student from government, government-aided schools and private schools. While in 14 States/UTs government-aided schools performed better than the government schools but in 10 States/UTs government-aided schools were significantly lower than the government schools in social sciences. In

remaining six States/UTs there was no significant difference in Scores of students from government and government-aided schools.

Further, there was significant difference in scores of government and private schools. Private schools in majority of 22 States/UTs outperformed than the government schools. In only 5 States/UTs private schools performed significantly lower than government schools and in remaining three States/UTs there was no significant difference between the average scores of private and government schools (Table 6.6).

Table 6.6: Average Social Science Scores by School Management

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Andaman and Nicobar Islands	246(3.1)	326(29.5)	↑	305(12.6)	↑
Andhra Pradesh	251(6.6)	262(0.9)	↑	260(0.9)	↑
Arunachal Pradesh	243(2.2)	257(6.8)	↑	283(5.3)	↑
Assam	254(1.3)	254(4.7)	↔	264(3.7)	↑
Bihar	244(1.2)	229(4.0)	↓	240(4.2)	↓
Chandigarh	253(3.7)	250(12.7)	↔	–	–
Chhattisgarh	241(0.3)	248(3.5)	↑	241(0.8)	↔
Dadra and Nagar Haveli	252(5.2)	266(9.4)	↑	265(10.7)	↑
Daman and Diu	239(11.2)	249(13.7)	↑	224(8.0)	↓
Delhi	262(2.2)	267(3.5)	↓	300(1.5)	↑
Goa	240(3.5)	272(2)	↑	297(10.2)	↑
Gujarat	246(3.1)	244(0.7)	↔	252(1.4)	↑
Haryana	241(0.7)	243(3.9)	↔	252(1.3)	↑
Himachal Pradesh	246(2.2)	–	–	259(6.7)	↑
Jammu and Kashmir	219(1.4)	231(20.7)	↑	248(3.4)	↑
Jharkhand	242(2.4)	252(3.7)	↑	250(3.6)	↑
Karnataka	274(1.2)	270(1.4)	↓	265(0.8)	↓
Kerala	258(4.0)	255(1.7)	↔	255(2.6)	↔
Lakshadweep	255(8.6)	–	–	–	–
Madhya Pradesh	239(0.2)	229(5.3)	↓	235(1.3)	↓
Maharashtra	254(3.8)	253(0.8)	↔	259(2.5)	↑
Manipur	227(5.2)	220(9.2)	↓	251(3.1)	↑
Meghalaya	226(11.8)	237(3.2)	↑	249(5.4)	↑
Mizoram	236(3.1)	214(10.3)	↓	246(9.4)	↑
Nagaland	251(7.2)	–	–	273(1.3)	↑
Odisha	246(1.5)	261(4.3)	↑	258(2.9)	↑
Puducherry	237(5.9)	232(14.0)	↓	240(5.2)	↔
Punjab	244(0.9)	239(6.5)	↓	251(1.4)	↑
Rajasthan	271(1.1)	255(14.7)	↓	264(0.8)	↓
Sikkim	259(2.9)	268(10.7)	↑	–	–
Tamil Nadu	245(2.3)	252(1.0)	↑	254(0.8)	↑
Telangana	247(1.2)	252(9.7)	↑	251(0.9)	↑
Tripura	236(2.0)	–	–	–	–

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Uttarakhand	254(0.5)	245(3.5)	↓	259(2.3)	↑
CBSE	265(12.3)	–	–	293(4.7)	↑
ICSE	–	–	–	285(2.1)	–
National	251(0.3)	255(0.5)	↑	259(0.4)	↑

↔ No significant difference between the average performance of government-aided/private students and government students.

↑ Government-aided/private students' average performance is significantly higher than that of government students.

↓ Government-aided/private students' average performance is significantly lower than that of government students.

Overview of the Social Science Tests

The social science tests administered to Class X students consisted of two test booklets, each containing 60 multiple choice items. The items were chosen keeping in view a whole range of the content. Around 20 out of the 60 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 20 unique items, thus amounting to a total of 120 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 remembering, understanding and applying as defined below.

What Majority of Students Can do in Social Science

The prime objective of this chapter is to highlight what the students can perform at different level of content domain on social science items. Before providing exemplifiers of the items tested in social science, this section gives a brief synopsis of content areas on which above three skills among learners were tested:

- Economics
- Geography
- History
- Political Science

Performance of Class X Students on the Various Content Areas in Social Science

The overall average performance of Class X students in social science was around a mean of 254 out of 500 with a standard error (SE) of 0.20. In the content area of 'Economics' the mean performance of students revolved around the score of 254 which was similar with overall performance of students in social science. In the content areas of 'Geography', 'History' and 'Political Science' the mean performance of students was 252, which was significantly below the overall average score in social science.

Contents	Mean	SE
Social Science	254	0.2
Economics	254	0.3
Geography	252	0.2
History	252	0.2
Political Science	252	0.1

6.4. SAMPLE ITEMS

Listed below are some of the items that were used in the social science tests. Arranged in no order of difficulty statistics show how students responded to the items and these can be located on the item map.

COGNITIVE PROCESSES FOR SOCIAL SCIENCE		
Remembering (Skill 1) Recognising or recalling knowledge from memory.	Understanding (Skill 2) Constructing meaning from different types of functions be they written or graphic messages.	Applying (Skill 3) Carrying out or using a procedure through executing, or implementing.

Sample Item 1

The item required students recall the knowledge on the list of subjects in the Union List in India. Only 19.9 per cent of students in the sample were able to give the correct response (4), while the result shows that 80.1 per cent of students responded either incorrectly (1, 2 and 3) or gave multiple responses or did not attempt. In 16 States/UTs more than 20 per cent of students gave the correct answer while, remaining 18 States/UTs had proportion of students below the national average of 19.9 per cent of students who gave correct response.

Skill: Skill 1 item

Content Domain: Political Science

15. The legislative powers for the Union List in India does not include

1. Foreign affairs
2. Banking
3. Defense
4. Police

% Answers

1.	43.6%
2.	19.5%
3.	14.6%
4.	19.9%
Multiple response 0.5%	
Not attempted 1.9%	

Sample Item 2

The item required students to construct meaning of educational achievement date of rural population of a State. Around 30.1 per cent of students in the sample were able to select the correct answer (1). The result shows the remaining 69.9 per cent gave either the wrong responses (2, 3 and 4) or gave multiple responses or did not attempt.

Skill: Skill 2 item

Content Domain: Economics

20. Observe the table regarding hypothetical data of educational achievement of rural population of a State is given below. Choose one option and fill in the blanks.

Educational Achievement of Rural Population of a State		
Category	Male (%)	Female (%)
Literacy rate for rural population	54	21
Literacy rate for children in age group 10–14 years	69	41
Percentage of rural children aged 10–14 attending school	64	34

_____ of rural girls are not attending school

1. 66%
2. 64%
3. 54%
4. 34%

% Answers

1.	30.1%
2.	15.4%
3.	14.6%
4.	35.5%
Multiple response 0.5%	
Not attempted 3.8%	

Sample Item 3

The item required students to construct what constitutes money in an economy. Around 47.4 per cent of students in the sample were able to answer the correct response (4). The result shows the remaining 52.6 per cent of students gave either the wrong responses (1, 2 and 3) or gave multiple responses or did not attempt.

Skill: Skill 2 item

Content Domain: Economics

36. Which of the following is NOT money?

	% Answers
1. Currency Notes	1. 11.2%
2. Deposits	2. 29.9%
3. Coins	3. 8.8%
4. Credit Card	4. 47.4%
	Multiple response 0.6%
	Not attempted 2.1%

Sample Item 4

The item required students to recall knowledge relating to usage of deposits in banking system. Around 60.5% of students in the sample were able to answer correctly (4). The result shows the remaining 39.5% of students responded either incorrectly (1, 2 and 3) or gave multiple responses or did not attempt.

Skill: Skill 1 item

Content Domain: Economics

11. Which of the following Statement is incorrect?

	% Answers
1. People make deposits in bank	1. 10.7%
2. People takes loans from banks	2. 9.10%
3. People receives interests from banks	3. 17.20%
4. People repay loans without interest	4. 60.50%
	Multiple response 0.8%
	Not attempted 1.7%

Sample Item 5

The item required students to recall knowledge relating to usage of deposits in banking system. Around 79.6 per cent of students in the sample were able to answer correctly (3). The table shows the remaining 20.4 per cent of students responded either incorrectly (1, 2 and 4) or gave multiple responses or did not attempt.

Skill: Skill 1 item

Content Domain: Political Science

7. India is an example of which of the following system?

	% Answers
1. Monarchy	1. 8.40%
2. Autocracy	2. 5.80%
3. Democracy	3. 79.60%
4. Anarchy	4. 4.30%
	Multiple response 0.5%
	Not attempted 1.4%

Performance of the sample items reproduced here varied across the country. Table 6.7 shows the proportion of students in its States/UTs responding correctly to each item.

Table 6.7: Performance on Sample Items in States/UTs/Boards

States/UTs/Boards	Q15	Q20	Q36	Q11	Q07
Andaman and Nicobar Islands	25.8%	33.8%	44.5%	60.3%	79.3%
Andhra Pradesh	26.0%	36.2%	51.3%	58.6%	82.6%
Arunachal Pradesh	31.8%	29.2%	43.9%	60.5%	83.1%
Assam	25.2%	32.1%	63.8%	52.2%	84.2%
Bihar	20.2%	28.2%	36.1%	55.5%	73.7%
Chandigarh	18.1%	31.5%	46.8%	62.9%	80.7%
Chhattisgarh	13.6%	25.9%	41.0%	70.8%	77.6%
Dadra and Nagar Haveli	14.0%	32.3%	37.2%	53.0%	84.9%
Daman and Diu	11.3%	26.3%	32.3%	54.2%	87.5%
Delhi	21.6%	34.0%	43.5%	69.6%	86.3%
Goa	17.9%	26.1%	50.5%	72.5%	88.2%
Gujarat	18.3%	29.0%	40.9%	49.8%	84.6%
Haryana	17.5%	27.5%	47.5%	60.3%	71.5%
Himachal Pradesh	10.6%	28.1%	39.8%	64.6%	77.3%
Jammu and Kashmir	29.3%	27.0%	38.8%	42.1%	74.2%
Jharkhand	20.1%	27.3%	41.9%	63.0%	76.2%
Karnataka	23.8%	33.3%	44.3%	63.2%	87.2%
Kerala	15.7%	31.0%	67.6%	68.2%	84.4%
Lakshadweep	24.1%	48.3%	42.9%	61.9%	62.1%
Madhya Pradesh	12.5%	26.5%	44.2%	61.3%	71.9%
Maharashtra	19.4%	31.1%	61.4%	64.7%	83.9%
Manipur	32.1%	28.4%	49.5%	61.5%	85.7%
Meghalaya	14.8%	27.6%	30.5%	52.6%	75.6%
Mizoram	16.6%	30.2%	42.2%	55.5%	82.4%
Nagaland	24.7%	31.9%	49.9%	68.5%	83.9%
Odisha	16.6%	31.0%	38.4%	69.4%	71.5%
Puducherry	17.6%	30.3%	45.4%	55.3%	87.0%
Punjab	19.1%	30.6%	55.7%	53.2%	74.7%
Rajasthan	30.6%	36.3%	50.3%	67.3%	79.5%
Sikkim	29.7%	25.7%	42.5%	68.1%	88.1%
Tamil Nadu	15.7%	27.0%	59.8%	50.2%	89.1%
Telangana	17.8%	33.5%	45.0%	54.3%	78.1%
Tripura	22.7%	26.3%	30.7%	52.1%	80.2%

States/UTs/Boards	Q15	Q20	Q36	Q11	Q07
Uttarakhand	20.1%	26.7%	51.2%	71.3%	79.2%
CBSE	40.2%	49.7%	48.4%	78.9%	92.2%
ICSE	35.6%	53.8%	61.6%	81.9%	92.7%
National	19.9%	30.1%	47.4%	60.5%	79.6%

6.6. SKILL-WISE PERFORMANCE

This sub-section deals with, analysis of students' performance in various States pertaining to skills, such as remembering, understanding and application of social science concepts (Skill 1, Skill 2, Skill 3). Overall, the average score of students performing in questions conferring to remembering skills was 41 per cent. However, there were 15 States/UTs of Maharashtra, Andaman and Nicobar Islands, Kerala, Tamil Nadu, Sikkim, Manipur, Assam, Chandigarh, Uttarakhand, Andhra Pradesh, Goa, Nagaland, Rajasthan, Karnataka and Delhi performed above the national average in the questions relating to remembering skills whereas 19 States/UTs tend to perform below the national average in questions testing the remembering skills.

With respect to second skill of understanding, overall the mean score was 40 per cent. However, within these huge inter-State disparities remain with

majority of 21 States/UTs performed significantly below the overall average in questions based on understanding skills. The score ranged from 34 to 29 in the States performing below the national average. There were 13 States/UTs, which had an average score ranging from 41 per cent to 46 performed better than national average in the question pertaining to understanding skills.

Finally, questions relating to third skill of applying had an average performance of 37 per cent score with 18 States and UTs performing below the national average in the questions relating to third skills in social science. In these States, the average performance ranged between the score of 33 per cent to 37 per cent. However, results found that there were 16 States and UTs performed above the national average in questions testing the application skills of students in social science with score ranging from 38 per cent to 46 per cent (Table 6.8).

Table 6.8: State-wise Performance of Students in the Three Skills

States/UTs/Boards	Skill 1 (Average score in Percent Correct)	Skill 2 (Average score in Percent Correct)	Skill 3 (Average score in Percent Correct)
Andaman and Nicobar Islands	42	41	38
Andhra Pradesh	44	43	41
Arunachal Pradesh	40	39	38
Assam	43	42	37
Bihar	38	38	35
Chandigarh	44	43	41
Chhattisgarh	40	39	36
Dadra and Nagar Haveli	37	36	33
Daman and Diu	34	35	34
Delhi	49	46	46
Goa	45	43	40
Gujarat	40	38	36
Haryana	40	40	36
Himachal Pradesh	40	39	38
Jammu and Kashmir	34	35	33
Jharkhand	41	40	36

States/UTs/Boards	Skill 1 (Average score in Percent Correct)	Skill 2 (Average score in Percent Correct)	Skill 3 (Average score in Percent Correct)
Karnataka	48	44	42
Kerala	42	43	37
Lakshadweep	37	40	37
Madhya Pradesh	38	38	34
Maharashtra	42	40	39
Manipur	43	41	39
Meghalaya	38	37	36
Mizoram	36	36	34
Nagaland	46	43	41
Odisha	39	38	34
Puducherry	39	37	36
Punjab	39	39	34
Rajasthan	47	46	42
Sikkim	43	42	42
Tamil Nadu	42	38	36
Telangana	41	40	38
Tripura	36	37	34
Uttarakhand	44	42	39
CBSE	55	53	52
ICSE	53	51	48
Total	41	40	37

6.7 PROFICIENCY LEVELS

Proficiency Scores are used to measure learners' competency in the social science content, which directly or indirectly assess the target skills. Proficiency levels provide a convenient way to describe profiles of student achievement. Children whose results are located within a particular level of proficiency are expected to understand the competencies and skills associated with that and lower levels. In NAS Class X Cycle 2 student's performance in social science was gauged using six proficiency levels based on the numeric scores achieved in the assessment.

Figure 6.2 divides the average social science scores achieved by students into five proficiency levels. Each level comprises the percentage of students and a mean score for that level of proficiency. It can be observed that maximum number of students, i.e., 37 per cent lied between proficiency levels of 201 to 250. Approximately 33 per cent of students belonged

to proficiency levels of 251 to 300. Another 13 per cent of students fall under the category of lower proficiency levels of below 301 to 350. Around 2 per cent of students fell the highest proficiency levels of greater than 350. Remaining 15 per cent students lied in lowest proficiency level of below 200.

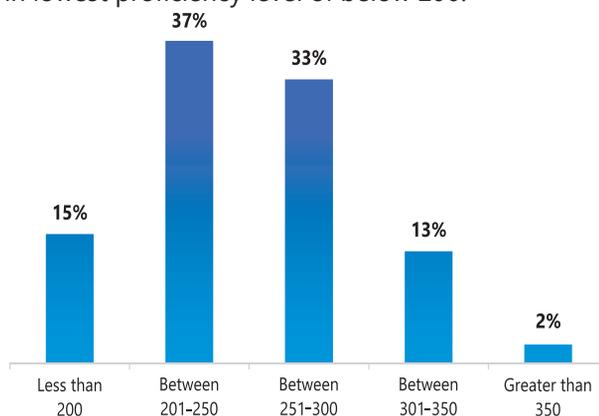


Fig. 6.2: Proficiency Level in Social Science

Distribution of Students Performing Less than 200

In this section classification of students relating to performance in the proficiency band of less than 250 are analysed (Figure 6.3) relating to following parameters:

- **Gender:** It was observed that equal percentage of males and females, i.e., 50 per cent of students performed below the score of 200 in social science achievement tests.
- **Location:** The graph revealed that majority of students performing in the proficiency band of less than 200 were studying in schools located in rural areas, i.e., 75 per cent and remaining 25 per cent of students in the same proficiency score studied in schools located in urban areas.
- **Social Groups:** Information was gathered relating to social composition of students falling under the proficiency score of less than 200 which revealed that the distribution of students were skewed in favour of students belonging to OBC category constituting 44 per cent of students performing at this level. While students belonging to SC, ST and others category constituted 18 per cent, 18 per cent

and 20 per cent of those performing within the proficiency band of less than 200 score in social science.

- **School Management:** Around 62 per cent of students belonging to government schools were found scoring less than the score of 200 in the achievement tests for social science. Additionally, 20 per cent of students in private schools performed below the proficiency band of 200 and 18 per cent of students in government-aided schools performed within this band.

Distribution of Students based on Score Range

This sub-section shows the range of students' ability in correct answers across States/UTs in social science. Table 6.9 shows the proportion of students answering correctly in four ranges. It shows the proportion of students who answered 0 to 35 per cent of questions correctly, 36 per cent to 50 per cent of questions correctly, 51 per cent to 75 per cent of questions correctly and the proportion of students who answered more than 75 per cent of questions correctly. At national level, majority of students, i.e., 43. per cent answered correctly in the range of 0 to 35 per cent of questions. Majority of States tend to

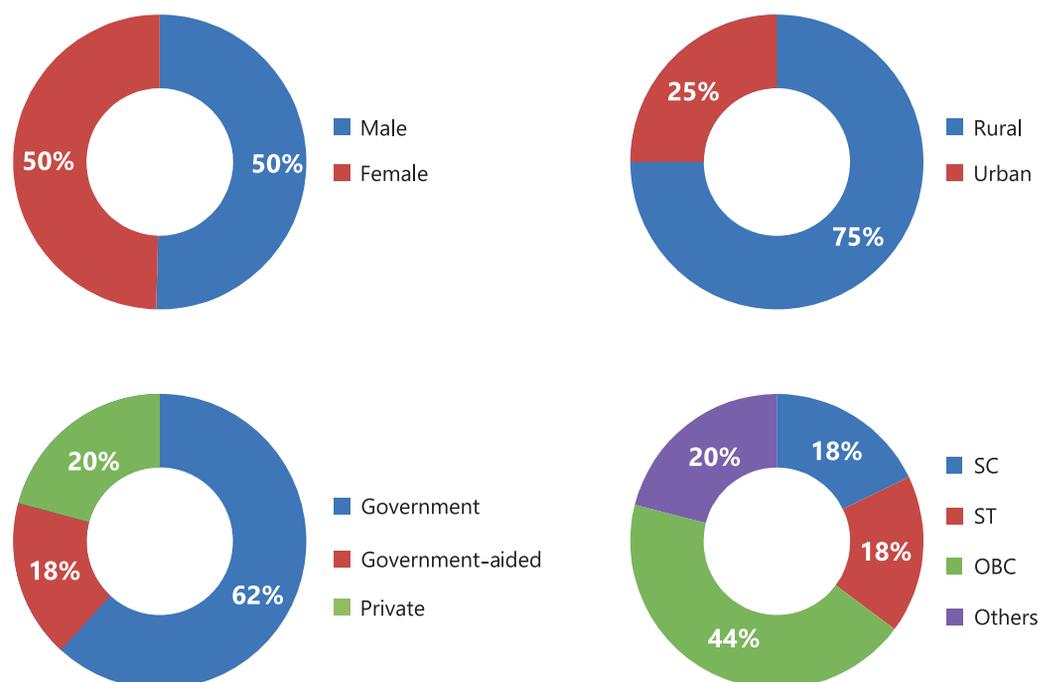


Fig. 6.3: Characteristics of Students Performing below the Mean Score of 250 by Gender, Location, School Management and Social Groups

perform in this range of social science. In the range of 36 per cent to 50 per cent of questions being answered correctly, 38 per cent of students could do that. Whereas another 17 per cent of students answered 51 per cent to 75 per cent of questions correctly and only a small proportion of about 1 per cent of students could answer questions correctly in the range of 76 per cent to 100 per cent.

Table 6.9: Students' Performance using Absolute Scores

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Andaman and Nicobar Islands	46.11	32.38	19.88	1.64
Andhra Pradesh	35.35	37.14	25.92	1.58
Arunachal Pradesh	48.73	32.18	17.76	1.33
Assam	38.83	41.87	19.02	0.28
Bihar	54.46	29.07	15.59	0.89
Chandigarh	35.17	41.82	21.27	1.74
Chhattisgarh	48.61	38.11	13.04	0.23
Dadra and Nagar Haveli	55.73	38.17	6.11	–
Daman and Diu	63.73	33.33	2.94	–
Delhi	25.00	40.60	31.17	3.24
Goa	29.61	45.54	24.45	0.40
Gujarat	47.03	40.90	12.04	0.03
Haryana	46.96	36.81	15.79	0.44
Himachal Pradesh	44.56	43.26	12.12	0.06
Jammu and Kashmir	63.03	26.29	10.41	0.27
Jharkhand	47.11	33.43	18.76	0.70
Karnataka	29.17	38.94	30.6	1.29
Kerala	34.84	46.61	18.43	0.12
Lakshadweep	45.07	46.48	8.45	
Madhya Pradesh	52.81	37.43	9.67	0.09
Maharashtra	39.01	42.63	17.99	0.38
Manipur	39.97	36.46	22.59	0.97
Meghalaya	51.44	36.71	11.78	0.08
Mizoram	58.64	32.71	8.33	0.31
Nagaland	29.47	42.76	27.46	0.31
Odisha	48.82	39.43	11.72	0.03
Puducherry	50.46	39.72	9.63	0.20
Punjab	47.39	38.40	13.42	0.80
Rajasthan	32.57	34.76	30.10	2.56
Sikkim	30.95	47.76	21.20	0.09
Tamil Nadu	41.03	47.70	11.22	0.05

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Telangana	45.01	38.82	15.76	0.41
Tripura	53.39	35.20	11.13	0.27
Uttarakhand	36.33	41.59	21.62	0.46
CBSE	16.26	27.77	46.90	9.07
ICSE	14.58	32.85	50.15	2.42
Total	43.43	38.44	17.46	0.67

6.8. 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 performances in high scoring States/UTs, such as Delhi (273), Karnataka (270), Rajasthan (267) and in low scoring States/UTs, such as Jammu and Kashmir (229), Tripura (236), Daman and Diu (237), Madhya Pradesh (237) and Meghalaya (238).

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 there was a significant difference in the average achievement of girls and boys where former tend to perform significantly better than the latter in social science. Moreover, significant difference was also observed between the achievement level of rural and urban students although exceptions were found in some States/UTs,

such as Punjab, Haryana, Sikkim, Manipur, Mizoram, Dadra and Nagar Haveli, Karnataka and Lakshadweep where students in rural schools performed better than their urban counterparts. Also, the survey did find that students from the Others category outperformed their peers in the SC, ST and OBC categories by a statistically significant margin.

This survey also observed significant difference in the achievement level of students studying in different categories of school management. Government-aided and private schools were found to perform significantly better than the government schools in social science in Class X NAS. Moreover, majority of students, i.e., 37 per cent of sample in social science were found to score between 201 to 250. It was observed that 62 per cent of students belonging to government schools were scoring less than the proficiency score of 200 in the achievement tests for social science. At the National level, 43 per cent of students' ability to answer correctly lay in the lowest range of 0 to 35 per cent of questions in social sciences.

Students' Achievement in English

The English language tests used in the National Achievement Survey (NAS) comprised two categories of items, viz., those testing 'Reading Comprehension' and those testing 'language-specific elements', such as vocabulary and grammar. This chapter focusses on student achievement in the English language domain. The overall achievement in the English language domain is reported for each of the participating states and union territories along with the participating boards. In addition, information about differences in achievement by student gender, school location, social category

and school management is also presented in this chapter.

7.1. STATE-WISE PERFORMANCE OF STUDENTS IN ENGLISH

Table 7.1 shows the distribution of student achievement for the 27 participating States, seven UTs and two Boards. Finally, the table indicates whether average score of a State is significantly different from the overall average score of 34 States/UTs or not. The National average score and standard error is also presented in the Table 7.1.

Table 7.1: Average English Scores for States/UTs/Boards

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Andaman and Nicobar Islands	251	2.4	↔
Andhra Pradesh	274	0.9	↑
Arunachal Pradesh	269	1.8	↑
Assam	263	0.7	↑
Bihar	230	0.8	↓
Chandigarh	253	2.7	↔
Chhattisgarh	231	0.2	↓
Dadra and Nagar Haveli	236	2.2	↓
Daman and Diu	257	8.1	↑
Delhi	259	1.2	↑
Goa	297	1.8	↑
Gujarat	240	0.6	↓

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Haryana	239	0.9	↓
Himachal Pradesh	242	2.0	↓
Jammu and Kashmir	252	1.8	↔
Jharkhand	238	0.5	↓
Karnataka	269	0.4	↑
Kerala	263	0.8	↑
Lakshadweep	228	9.5	↓
Madhya Pradesh	229	0.4	↓
Maharashtra	254	0.3	↔
Manipur	267	1.9	↑
Meghalaya	261	1.3	↑
Mizoram	277	3.6	↑
Nagaland	306	0.6	↑
Odisha	254	0.2	↔
Puducherry	255	5.0	↑
Punjab	252	0.6	↔
Rajasthan	253	0.7	↔
Sikkim	273	2.1	↑
Tamil Nadu	249	0.3	↓
Telangana	264	0.6	↑
Tripura	235	1.8	↓
Uttarakhand	242	0.6	↓
CBSE	318	1.0	↑
ICSE	351	1.9	↑
National	253	0.1	

↔ 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 34 States and UTs was 253 (with a standard error of 0.1). Further, the results reveal substantial differences in English language achievement between the highest performing state (306 for Nagaland) and the lowest performing state (229 for Madhya Pradesh). Also, while 15 States/UTs showed average scores significantly above that of the national; 12 States/UTs depicted average scores significantly below that of the national average and 7 States/UTs presented average scores that were not significantly different

from that of the overall. CBSE and ICSE boards showed average scores significantly above that of the national.

7.2. PERCENTILE SCORES IN ENGLISH FOR STATES/UTs

Table 7.2 and Figure 7.1 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 per cent of students achieve or surpass: the score at the 90th percentile is the score that 10 per cent of students achieve or surpass. The range between the 25th and 75th percentiles (the inter-quartile

range) represents the performance of the middle 50 per cent of students. Hence, this is a good indicator of the state's degree of homogeneity in terms of the English language achievement of its students.

Table 7.2: Percentile Scores in Reading for States/UTs/Boards

State/UTs/Boards	P10	P25	P50	P75	P90	P75–P25	P90–P10
Andaman and Nicobar Islands	206	224	236	267	329	43	123
Andhra Pradesh	210	234	268	313	346	79	136
Arunachal Pradesh	195	229	264	315	346	86	151
Assam	200	225	256	297	337	72	137
Bihar	184	205	227	251	281	46	97
Chandigarh	207	228	250	272	304	44	97
Chhattisgarh	186	207	228	253	280	46	94
Dadra and Nagar Haveli	193	212	229	256	292	44	99
Daman and Diu	205	228	248	284	330	56	125
Delhi	198	221	248	289	338	68	140
Goa	227	258	294	335	370	77	143
Gujarat	196	214	236	258	288	44	92
Haryana	190	212	235	262	295	50	105
Himachal Pradesh	194	215	238	264	295	49	101
Jammu and Kashmir	193	219	246	282	322	63	129
Jharkhand	186	207	232	261	301	54	115
Karnataka	208	233	262	302	340	69	132
Kerala	211	233	258	291	326	58	115
Lakshadweep	183	206	230	252	264	46	81
Madhya Pradesh	185	206	228	250	274	44	89
Maharashtra	198	222	247	280	325	58	127
Manipur	193	228	261	312	349	84	156
Meghalaya	205	229	253	289	330	60	125
Mizoram	219	246	274	307	340	61	121
Nagaland	236	271	308	342	372	71	136
Odisha	198	221	248	283	322	62	124
Puducherry	198	217	246	289	323	72	125
Punjab	197	219	245	279	324	60	127
Rajasthan	193	220	247	285	326	65	133
Sikkim	218	243	273	303	326	60	108
Tamil Nadu	201	220	243	274	310	54	109
Telangana	203	227	256	300	335	73	132
Tripura	183	204	229	256	300	52	117
Uttarakhand	197	218	239	264	293	46	96

State/UTs/Boards	P10	P25	P50	P75	P90	P75-P25	P90-P10
CBSE	230	270	317	371	413	101	183
ICSE	279	320	355	395	419	75	140
National	196	219	246	282	326	63	130

Note: Ranges may not agree due to rounding.

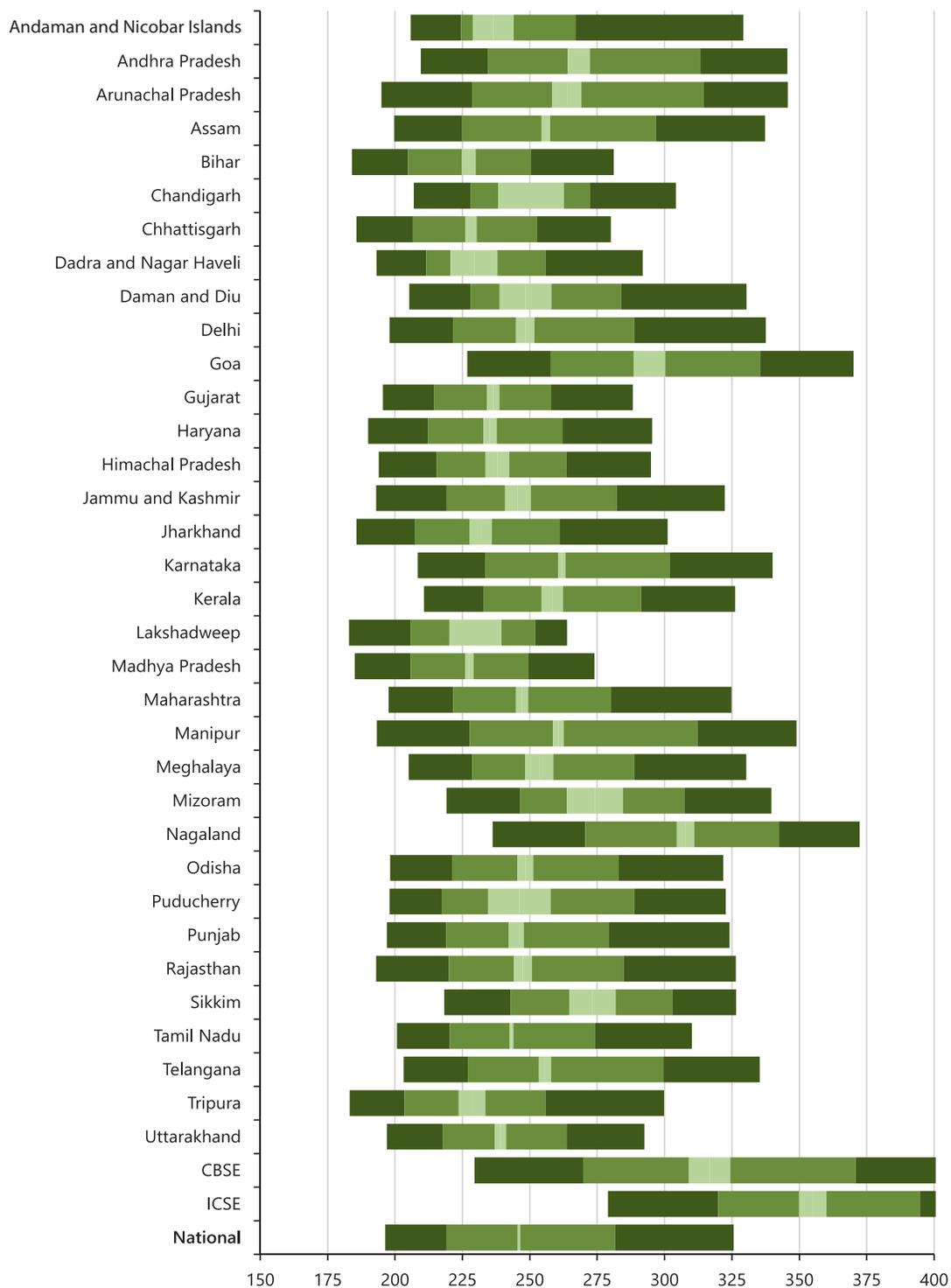


Fig. 7.1: Percentile scores in English for States/UTs/Boards

The inter-quartile range (i.e., the range between the 75th and 25th percentiles) is highly variable between States/UTs. For example, Andaman and Nicobar Islands has an inter-quartile range of just 43 while Arunachal Pradesh has a corresponding value of 86. These values suggest that the achievement in English subject of Class X population in Andaman and Nicobar is far more homogeneous as regard to the learning levels than that of Arunachal Pradesh. In most states, the inter-quartile range of performance for the middle group was between 55 and 75 scale-score points.

Performance at the 10th and 90th percentiles respectively shows extremes in low and high achievement. The range between these two points, which includes 80 per cent of the population, is highly variable ranging from 81 (Lakshadweep) to 156 (Manipur).

The percentiles provide additional information when comparing English 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 Delhi, Maharashtra, Punjab, Odisha and Daman and

Diu (246–248). However, the range of scores between the 25th and 75th percentiles is very different: Delhi (68), Maharashtra (58), Daman and Diu (56) and Odisha (62). This indicates that while the average achievement is very similar in the states, Delhi has a more heterogeneous group of Class X students than Maharashtra.

7.3. GROUP-WISE PERFORMANCE IN ENGLISH

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

Gender

Table 7.3 compares the average English language 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 15 States/UTs like, Himachal Pradesh, Punjab, Manipur, Chandigarh and Rajasthan. However, in seven States/UTs like Tripura, Assam, Odisha, Delhi, Goa, Daman and Diu and Lakshadweep girls performed significantly lower than the boys. In the remaining States/UTs there was no significant difference in performance of boys and girls.

Table 7.3: Average English Scores by Gender

States/UTs/Boards	Boys	Girls	Sig.
Andaman and Nicobar Islands	245(3.5)	257(2.6)	↑
Andhra Pradesh	274(1.4)	273(0.7)	↔
Arunachal Pradesh	269(1.8)	268(2.4)	↔
Assam	265(1.0)	261(0.8)	↓
Bihar	230(1.7)	230(0.4)	↔
Chandigarh	248(4.5)	256(2.7)	↑
Chhattisgarh	231(0.9)	231(0.5)	↔
Dadra and Nagar Haveli	234(4.4)	239(10.4)	↑
Daman and Diu	258(6.0)	255(11.8)	↓
Delhi	260(1.6)	257(1.1)	↓
Goa	299(1.8)	296(2.8)	↓
Gujarat	239(0.7)	242(1.1)	↑
Haryana	239(1.0)	240(1.1)	↔
Himachal Pradesh	238(2.2)	246(2.8)	↑
Jammu and Kashmir	252(3.0)	252(2.4)	↔

States/UTs/Boards	Boys	Girls	Sig.
Jharkhand	237(1.0)	239(0.6)	↔
Karnataka	266(0.4)	272(0.5)	↑
Kerala	255(1.0)	271(1.5)	↑
Lakshadweep	226(5.6)	229(13.7)	↓
Madhya Pradesh	229(0.7)	229(0.3)	↔
Maharashtra	251(0.5)	257(0.5)	↑
Manipur	259(3.0)	275(2.9)	↑
Meghalaya	259(1.1)	262(1.9)	↑
Mizoram	275(4.6)	279(3.5)	↑
Nagaland	305(1.3)	307(0.9)	↔
Odisha	255(0.4)	253(0.7)	↓
Puducherry	255(4.9)	255(5.7)	↔
Punjab	249(0.8)	256(0.4)	↑
Rajasthan	251(0.7)	257(0.8)	↑
Sikkim	272(4.7)	273(2.3)	↔
Tamil Nadu	246(0.5)	253(0.3)	↑
Telangana	260(1.8)	267(0.5)	↑
Tripura	238(2.1)	232(2.5)	↓
Uttarakhand	243(1.0)	241(0.6)	↔
CBSE	303(2.2)	340(1.5)	↑
ICSE	344(2.3)	357(2.6)	↑
National	251(0.1)	255(0.1)	↑

↔ 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.

Location of Schools

Table 7.4 compares the average English language scores achieved by students in rural and urban schools and found that the overall students in rural schools did significantly lower than urban counterparts besides Manipur, Chhattisgarh and Lakshadweep, where the rural students' average performance was significantly better than students of urban schools. The difference between the

performances is particularly significant in 23 States/UTs like Jammu and Kashmir, Arunachal Pradesh, Delhi, Himachal Pradesh, etc., where rural schools students performed significantly lower than urban schools. In the remaining States/UTs there is no significant difference in performance of urban and rural students. In the State of Chhattisgarh and Manipur the performance of rural schools is better than the urban school.

Table 7.4: Average English Scores by Location

States/UTs/Boards	Rural	Urban	Sig.
Andaman and Nicobar Islands	238(4.1)	285(3.5)	↓
Andhra Pradesh	269(1.0)	282(1.1)	↓
Arunachal Pradesh	263(1.8)	279(2.4)	↓
Assam	261(0.6)	272(2.2)	↓
Bihar	230(0.9)	229(1.3)	↔
Chandigarh	252(3.8)	253(4.0)	↔
Chhattisgarh	232(0.3)	227(1.1)	↑
Dadra and Nagar Haveli	234(3.5)	246(14.6)	↓
Daman and Diu	243(6.6)	276(10.7)	↓
Delhi	233(3.4)	263(1.7)	↓
Goa	294(1.8)	306(2.6)	↓
Gujarat	236(0.6)	245(0.7)	↓
Haryana	239(1.2)	239(0.7)	↔
Himachal Pradesh	239(1.7)	260(6.8)	↓
Jammu and Kashmir	246(1.9)	271(5.8)	↓
Jharkhand	237(0.6)	243(1.8)	↓
Karnataka	267(0.6)	270(0.7)	↔
Kerala	260(1.0)	274(2.0)	↓
Lakshadweep	235(12.8)	195(17.1)	↑
Madhya Pradesh	228(0.4)	231(1.0)	↔
Maharashtra	248(0.5)	262(0.4)	↓
Manipur	272(1.6)	250(4.2)	↑
Meghalaya	252(1.7)	287(2.9)	↓
Mizoram	275(4.0)	280(3.6)	↓
Nagaland	304(0.3)	308(1.0)	↓
Odisha	254(0.3)	256(1.0)	↔
Puducherry	242(8.8)	265(2.8)	↓
Punjab	248(0.5)	260(0.9)	↓
Rajasthan	253(1.0)	254(0.3)	↔
Sikkim	273(2.3)	271(4.6)	↔
Tamil Nadu	248(0.9)	252(0.7)	↓
Telangana	247(0.7)	283(1.0)	↓
Tripura	233(2.3)	242(2.6)	↓

States/UTs/Boards	Rural	Urban	Sig.
Uttarakhand	242(0.4)	245(2.3)	↓
CBSE	305(1.8)	325(2.0)	↓
ICSE	332(6.5)	355(1.6)	↓
National	249(0.1)	262(0.2)	↓

↔ 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.

Social Category

Table 7.5 compares the average English language scores achieved by students across social categories and shows that significant difference was detected in the average achievement levels of students in the SC, ST and OBC categories. Students from SC, ST and OBC category group significantly performed lower than Other group, while there was no significant difference between SC and ST category students. On an average, students in the Other category achieved significantly higher scores than those of SC/ST and OBC.

In SC category while five States/UTs, i.e., Chandigarh, Arunachal Pradesh, Tripura, Daman and Diu and Dadra and Nagar Haveli showed average scores significantly above that those of Others (General) category group; 24 States/UTs depicted average scores significantly below that of the overall

average and rest of the States/UTs presented average scores that were not significantly different from that of the overall.

In ST category while six States/UTs, i.e., Delhi, Uttarakhand, Arunachal Pradesh, Nagaland, Manipur and Mizoram having average scores significantly above that of the group; 20 States/UTs depicted average scores significantly below that of others (General) and rest of States/UTs presented average scores that were not significantly different from that of the overall.

In OBC category while three States/UTs, i.e., Chandigarh, Delhi, Daman and Diu showed average scores significantly above those of others (General) category group; 22 States/UTs depicted average scores significantly below that of the overall average and rest of the States/UTs presented average scores that were not significantly different from that of the overall.

Table 7.5: Average English Scores by Social Category

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Andaman and Nicobar Islands	257(4.0)	–	–	227(5.6)	↓	257(6.7)	↔
Andhra Pradesh	292(1.4)	262(1.8)	↓	249(2.7)	↓	272(0.8)	↓
Arunachal Pradesh	245(2.7)	255(6.9)	↑	274(1.9)	↑	280(7.2)	↓
Assam	266(1.0)	250(2.3)	↓	261(1.6)	↓	263(1.0)	↔
Bihar	238(1.3)	222(1.8)	↓	227(1.3)	↓	229(0.5)	↓
Chandigarh	250(3.9)	255(2.6)	↑	–	–	288(7.7)	↑
Chhattisgarh	233(4.1)	230(1.4)	↔	236(1.1)	↔	228(0.8)	↓
Dadra and Nagar Haveli	249(7.6)	297(15.2)	↑	232(2.9)	↓	–	–
Daman and Diu	240(4.4)	275(16.9)	↑	219(10.5)	↓	266(10.0)	↑
Delhi	261(1.7)	242(1.6)	↓	284(15.9)	↑	266(1.6)	↑
Goa	301(2.0)	263(10.3)	↓	289(4.0)	↓	295(2.1)	↓
Gujarat	254(0.5)	238(1.2)	↓	232(0.3)	↓	234(1.4)	↓
Haryana	245(0.9)	230(1.4)	↓	–	–	242(0.9)	↔

* Sig. - Significant Difference

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Himachal Pradesh	247(2.1)	238(4.0)	↓	247(4.0)	↔	238(4.6)	↓
Jammu and Kashmir	262(2.4)	242(4.8)	↓	229(6.1)	↓	241(3.9)	↓
Jharkhand	241(3.2)	239(2.1)	↔	239(1.2)	↔	237(0.9)	↓
Karnataka	298(1.5)	263(1.0)	↓	262(1.7)	↓	267(0.8)	↓
Kerala	277(1.1)	251(3.3)	↓	228(7.5)	↓	262(0.6)	↓
Lakshadweep	–	–	–	228(9.5)	–	–	–
Madhya Pradesh	235(1.0)	225(1.8)	↓	221(0.8)	↓	231(0.7)	↔
Maharashtra	262(0.8)	247(1.1)	↓	241(0.8)	↓	251(0.4)	↓
Manipur	271(1.8)	243(4.4)	↓	308(1.7)	↑	244(4.5)	↓
Meghalaya	274(3.8)	244(9.6)	↓	260(1.4)	↓	–	–
Mizoram	268(23.4)	–	–	277(3.5)	↑	–	–
Nagaland	302(4.9)	289(10.8)	↓	307(0.7)	↑	287(7.3)	↓
Odisha	266(0.5)	248(0.8)	↓	248(0.7)	↓	255(0.7)	↓
Puducherry	270(15.9)	245(2.9)	↓	–	–	256(5.4)	↓
Punjab	265(0.5)	239(1.5)	↓	240(16.3)	↓	254(1.2)	↓
Rajasthan	264(0.7)	256(1.6)	↓	243(2.1)	↓	252(0.6)	↓
Sikkim	275(3.9)	253(3.1)	↓	271(3.7)	↔	276(1.9)	↔
Tamil Nadu	262(2.6)	238(0.8)	↓	234(4.7)	↓	253(0.3)	↓
Telangana	290(2.2)	245(1.4)	↓	251(1.8)	↓	263(0.4)	↓
Tripura	243(2.7)	255(4.1)	↑	222(4.2)	↓	229(2.8)	↓
Uttarakhand	247(1.6)	236(1.5)	↓	260(5.2)	↑	238(1.5)	↓
CBSE	332(1.9)	312(5.8)	↓	392(23.0)	↑	292(3.0)	↓
ICSE	358(2.3)	346(9.3)	↓	292(7.5)	↓	335(1.6)	↓
National	264(0.2)	246(0.1)	↓	245(0.5)	↓	252(0.1)	↓

↔ No significant difference between the average performance of SC/ST/OBC students and Others students.

↑ SC/ST/OBC students' average performance is significantly higher than that of Others students.

↓ SC/ST/OBC students' average performance is significantly lower than that of Others students.

School Management

Table 7.6 compares the average English language scores achieved by students of by government schools, government-aided schools and private schools. It can be deciphered that significant difference exists in the average achievement levels of students based on the type of school management.

Private schools significantly outperformed government and government-aided schools.

Government-aided schools performed lower than government schools in six States/UTs. The performance of students in government-aided schools was better than that of government schools in 17 States/UTs while in rest of the States and UTs

the performance between the government and government-aided schools was similar.

Private schools performed lower than government schools in Rajasthan. The performance

of students in private schools was better than that of government schools in 24 States/UTs while in rest of the States/UTs the performance between the two was similar.

Table 7.6: Average English Scores by School Management

States/UTs/Boards	Government	Government-aided	Sig.	Private	Sig.
Andaman and Nicobar Islands	235(3.4)	–	–	328(3.2)	↑
Andhra Pradesh	245(2.7)	260(1.3)	↑	295(0.9)	↑
Arunachal Pradesh	246(1.2)	314(3.8)	↑	322(4.9)	↑
Assam	260(0.7)	253(1.8)	↓	293(1.8)	↑
Bihar	230(0.8)	227(2.3)	↔	232(2.2)	↔
Chandigarh	252(2.8)	266(11.3)	↑	–	–
Chhattisgarh	231(0.2)	236(2.8)	↑	227(1.2)	↔
Dadra and Nagar Haveli	233(3.3)	222(17.4)	↓	297(10.0)	↑
Daman and Diu	248(8.6)	279(15.1)	↑	255(8.0)	↑
Delhi	238(1.4)	264(1.9)	↑	313(1.2)	↓
Goa	265(3.8)	305(1.6)	↑	300(27.3)	↑
Gujarat	231(1.1)	235(0.8)	↑	252(1.0)	↑
Haryana	233(1.1)	236(2.3)	↔	248(1.0)	↑
Himachal Pradesh	233(1.7)	–	–	277(6.2)	↑
Jammu and Kashmir	241(2.0)	250(11.8)	↑	269(3.3)	↑
Jharkhand	237(0.8)	244(1.5)	↑	239(0.7)	↔
Karnataka	265(0.8)	259(0.5)	↓	285(0.3)	↑
Kerala	252(0.4)	266(1.3)	↑	287(3.4)	↑
Lakshadweep	228(9.5)	–	–	–	–
Madhya Pradesh	229(0.5)	225(2.6)	↑	229(0.7)	↔
Maharashtra	247(2.4)	248(0.3)	↔	289(1.7)	↑
Manipur	259(6.2)	253(5.1)	↓	273(1.7)	↑
Meghalaya	254(7.3)	258(1.5)	↑	280(3.9)	↑
Mizoram	275(3.4)	275(4.8)	↔	292(8.4)	↑
Nagaland	285(1.3)	–	–	314(0.9)	↑
Odisha	253(0.3)	277(3.1)	↑	269(2.4)	↑
Puducherry	230(3.8)	254(6.1)	↑	279(8.8)	↑
Punjab	236(0.4)	244(3.8)	↑	272(0.9)	↑
Rajasthan	262(1.3)	230(13.4)	↓	245(0.8)	↓
Sikkim	273(2.1)	–	–	–	–
Tamil Nadu	235(0.9)	236(0.9)	↔	272(1.1)	↑

States/UTs/Boards	Government	Government-aided	Sig.	Private	Sig.
Telangana	238(0.6)	232(7.8)	↓	291(1.2)	↑
Tripura	235(1.8)	–	–	–	–
Uttarakhand	243(0.6)	241(2.2)	↔	241(2.9)	↔
CBSE	296(7.3)	275(9.2)	↓	319(1.0)	↑
ICSE	–	–	–	351(1.9)	–
National	244(0.2)	250(0.2)	↑	271(0.2)	↑

- ↔ No significant difference between the average performance of Government-aided/Private students and Government students.
 ↑ Government-aided/Private students' average performance is significantly higher than that of Government students.
 ↓ Government-aided/Private students' average performance is significantly lower than that of Government students.

7.4. OVERVIEW OF ENGLISH TEST

The English language tests administered to Class X students consisted of three test booklets, individually containing 60 items subdivided into five reading passages with six multiple choice items, as well as 30 items on language elements. The passages were chosen to represent a range of text types including informational passages, tables, public notices, stories, etc. Two reading passages were common in all three test forms and served as 'anchors', so that all 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 three unique passages, thus adding up to a total of five passages and 30 items in each of the reading comprehension tests used in the survey. The items designed in grammar were unique in each of the test form.

The items were designed to test a range of relevant cognitive processes, classified as abilities to

'locate information', 'grasp ideas and interpret' and 'infer and evaluate' as defined below.

What Majority of Students Can do in English

The prime objective of this chapter is to highlight what the students can perform at different level of content domain on English language items. Before providing exemplifiers of the items tested in English language, this section gives a brief synopsis of content areas on which above three skills among learners were tested:

- Reading Comprehension
- Language Element (Grammar)

Performance of Class X Students on the Various Content Areas in English

The overall average performance of Class X students in English was around a mean of 253 out of 500 with a standard error of 0.1. In the content areas

COGNITIVE PROCESSES FOR MATHEMATICS LITERACY

Locate Information (Skill 1)

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 of information.

Grasp Ideas and Interpret (Skill 2)

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 (Skill 3)

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.

of 'reading comprehension' the mean performance of students was similar with overall performance, i.e., no significant difference between 'reading comprehension' and overall average performance of students in English. In the content area of 'language element' the mean performance of students was 251, which was significantly below the overall average score in English.

Contents	Mean	Standard Error
English	253	0.1
Reading Comprehension	253	0.2
Language Element	251	0.2

7.5. SAMPLE ITEM AND READING PASSAGE

Listed below are the passage and the items that were used in the English language test. Statistics describing how students responded to these items are given and these can also be located on the item map.

Sample Items

Read the chart given below and answer the following questions. A school decided to celebrate Book Week. The chart below shows the schedule of activities planned. Study the chart carefully and answer the questions that follow.

Day	Class/ Activity in school	Venue	Class/Outdoor activities
Monday	Class 1–2: Designing bookmarks	Classrooms	Class 8: Visit to National Library
	Class 3–4: Role play	Hall-1	
	Class 5–6: My favourite book–talk	Library	
Tuesday	Class 3–4: Chain story telling	Auditorium	Class 5–6: Film : The Jungle Book
	Class 7–8: Theatre workshop by Barry John	Hall-1	
Wednesday	Class 1–2: Meet the fairy tale characters	Auditorium	
	Class 3–4: Show and tell	Hall-1	
	Class 5–6: Poetry recitation	Hall-2	
	Class 7–8: Designing a bookcover-by Santosh Rai	Art room	
Thursday	Class 7–8: Quiz: conducted by Mandeep Kaur	Hall-2	Class 3–4: Visit to National Book Trust
	Class 9–10: Meet the author–Ruskin Bond	Library	
Friday	Class 5–6: Book reading by students	Classrooms	

Sample Item: 1

This item required students to grasp ideas and interpret the text to make an inference about. While only 29.7 per cent students in the sample were able to select the correct answer (3), the chart shows how the remaining 70.3 per cent gave either wrong responses or multiple responses or did not attempt the item.

Skill: Skill 2 item**Content Domain:** Reading Comprehension

ITEM 19: The school has invited ----- experts for different events.	
1. Two	% Answers
2. Six	1. 19.9%
3. Four	2. 24.5%
4. Five	3. 29.7%
	4. 21.5%
	Multiple response 0.7%
	Not attempted 3.7%

Sample Item: 2

These item required students to read the chart, comprehend the details and relate the classes to day to day experiences to arrive at correct answer. Around 51 per cent students in the sample were able to select the correct answer (4), whereas the chart shows how the remaining 49 per cent gave either wrong responses or multiple responses or did not attempt the item.

Skill: Skill 1 item**Content Domain:** Reading Comprehension

ITEM 18: Which classes will go to see 'The Jungle Book' and when?	
1. Class 7 and 8, Tuesday	% Answers
2. Class 3 and 4, Wednesday	1. 12.4%
3. Class 9 and 10, Thursday	2. 16.9%
4. Class 5 and 6, Tuesday	3. 16.6%
	4. 51.0%
	Multiple response 0.7%
	Not attempted 2.3%

Sample Item: 3

This item required students to locate the information given in the text to know that the children met Ruskin Bond on Thursday. Only 62.4 per cent students in the sample were able to select the correct answer (3), while the chart shows how the remaining 37.6 per cent gave either wrong responses or multiple responses or did not attempt the item.

Skill: Skill 1 item**Content Domain:** Reading Comprehension

ITEM 17: On which day can the children meet Ruskin Bond?	
1. Monday	% Answers
2. Wednesday	1. 13.3%
3. Thursday	2. 10.8%
4. Friday	3. 62.4%
	4. 10.9%
	Multiple response 0.6%
	Not attempted 2.1%

Performance on the sample items reproduced here (i.e., items 17–19) varied across the country. Table 7.7 shows the proportion of students in each state or union territory responding correctly sample items.

Table 7.7: Performance on Sample Items in States/UTs/Boards

States/UTs/Boards	Item 17	Item 18	Item 19
Andaman and Nicobar Islands	74.5%	63.3%	31.4%
Andhra Pradesh	77.4%	65.4%	39.2%
Arunachal Pradesh	70.3%	60.6%	36.0%
Assam	64.9%	54.0%	29.6%
Bihar	39.4%	29.7%	24.8%
Chandigarh	77.0%	67.3%	28.6%
Chhattisgarh	51.0%	41.5%	24.6%
Dadra and Nagar Haveli	58.0%	51.1%	26.1%
Daman and Diu	70.4%	65.4%	25.9%
Delhi	78.6%	66.0%	40.1%
Goa	90.6%	79.5%	45.9%
Gujarat	59.1%	48.4%	27.8%
Haryana	55.6%	44.5%	24.3%
Himachal Pradesh	62.9%	50.9%	24.2%
Jammu and Kashmir	55.3%	46.4%	28.2%
Jharkhand	46.1%	34.5%	22.8%
Karnataka	74.3%	62.9%	34.7%
Kerala	77.7%	61.5%	36.6%
Lakshadweep	63.3%	36.7%	20.0%
Madhya Pradesh	49.7%	38.5%	23.2%
Maharashtra	68.6%	56.4%	33.8%
Manipur	81.2%	67.3%	34.2%
Meghalaya	69.4%	62.7%	27.4%
Mizoram	78.1%	65.2%	37.5%
Nagaland	84.6%	76.4%	42.3%
Odisha	60.5%	48.5%	30.0%
Puducherry	73.1%	59.1%	33.5%
Punjab	65.0%	55.2%	31.0%
Rajasthan	59.5%	47.9%	28.5%
Sikkim	84.5%	74.3%	32.5%
Tamil Nadu	71.1%	57.6%	27.4%

States/UTs/Boards	Item 17	Item 18	Item 19
Telangana	71.2%	58.3%	34.4%
Tripura	54.8%	43.6%	24.5%
Uttarakhand	59.0%	47.2%	22.8%
CBSE	92.2%	83.8%	60.0%
ICSE	90.8%	84.8%	70.6%
National	62.4%	51.0%	29.7%

7.6. SKILL-WISE PERFORMANCE ANALYSIS OF STUDENTS

Table 7.8 summarises the state wise performance of students in the three cognitive processes, i.e., Ability

to locate information, Ability to grasp ideas and interpret and Ability to infer and evaluate (Skill 1, Skill 2, Skill 3)

Table 7.8: State-wise Performance of Students in the Three Cognitive Processes

States/UTs/Boards	Skill 1 (Correct Average score in Per cent)	Skill 2 (Correct Average score in Per cent)	Skill 3 (Correct Average score in Per cent)
Andaman and Nicobar Islands	51	40	37
Andhra Pradesh	53	43	42
Arunachal Pradesh	54	42	40
Assam	47	36	35
Bihar	35	28	28
Chandigarh	50	40	35
Chhattisgarh	37	30	29
Dadra and Nagar Haveli	39	29	30
Daman and Diu	47	35	34
Delhi	54	42	41
Goa	65	46	50
Gujarat	40	32	31
Haryana	39	30	29
Himachal Pradesh	41	32	30
Jammu and Kashmir	42	34	33
Jharkhand	36	29	29
Karnataka	50	38	40
Kerala	52	39	42
Lakshadweep	44	31	35
Madhya Pradesh	35	29	27
Maharashtra	46	36	36
Manipur	58	45	44

States/UTs/Boards	Skill 1 (Correct Average score in Per cent)	Skill 2 (Correct Average score in Per cent)	Skill 3 (Correct Average score in Per cent)
Meghalaya	50	40	38
Mizoram	54	41	40
Nagaland	64	47	50
Odisha	42	33	34
Puducherry	49	38	36
Punjab	47	37	35
Rajasthan	43	34	35
Sikkim	56	41	41
Tamil Nadu	44	34	31
Telangana	48	39	38
Tripura	38	31	29
Uttarakhand	40	31	30
CBSE	56	51	48
ICSE	56	53	52
National	38	33	34

7.7. PROFICIENCY LEVELS

The goals of a language assessment are two folds attainment of a basic proficiency, and the development of language as an instrument for basic interpersonal communication and later for abstract thought and knowledge acquisition.

Proficiency levels provide a convenient way to describe profiles of student achievement.

Children whose results are located within a particular level of proficiency are expected to

understand the competencies and skills associated with that and lower levels. In NAS Class X Cycle 2, Student's performance in English language was gauged using six proficiency levels based on the numeric scores achieved in the assessment.

Figure 7.2 divides the average English language scores achieved by students into five proficiency levels. Each level comprises the percentage students and a mean score for that level. It can be observed that maximum number of student's, i.e., 44 per cent

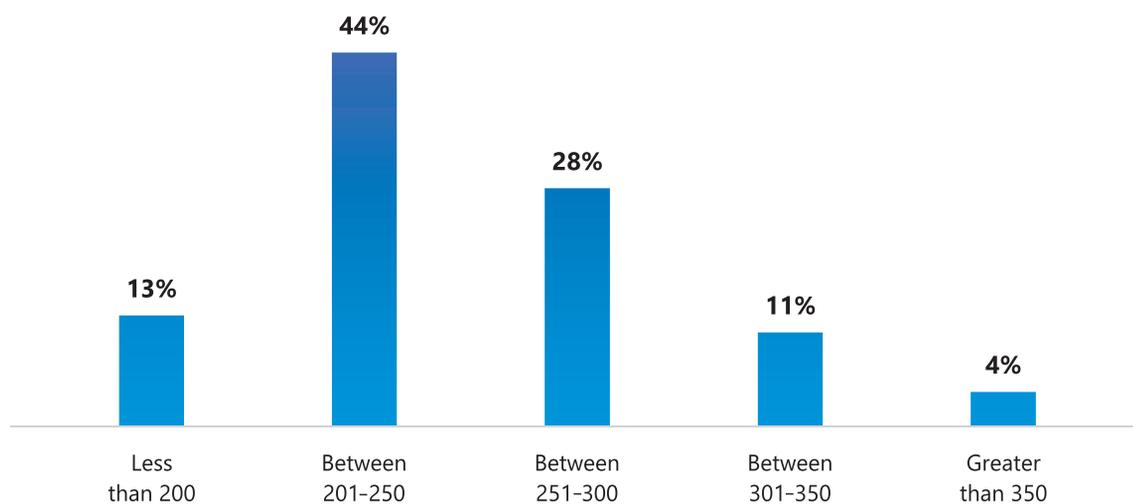


Fig. 7.2: Proficiency Levels in English

lied between proficiency level of 201 to 250 whereas only 13 per cent students belonged to a lower proficiency level of less than 200.

Distribution of Students Performing Less than 200

The percentage of students who performed in proficiency band of less than 200 were analysed using various parameters.

- **Gender:** It was observed that percentage of males (49%) was slightly less than those of females (51%) in this category.
- **Location:** It was observed that majority of students who belong to rural area performance level of less than 200, i.e., 76 per cent while 24 per cent of students belonged to urban areas.
- **School Management:** Majority of students (67%) who performed in performance level of less than 200 studied in government schools while 17 per cent and 16 per cent students in this level belongs to government-aided and private schools, respectively.

- **Social Groups:** The distribution of students was skewed favouring OBC category students which comprised 44 per cent of the population while SC, ST and others (General) were 18 per cent, 19 per cent and 19 per cent, respectively.

Distribution of Students based on Score Range

Table 7.9 summarises the student's performance using absolute scores into four percentage groups, i.e., 0–35 per cent, 36–50 per cent, 51–75 per cent, 76–100 per cent. The percentage of students in 0–35 per cent was 60.74 which was much greater than those in other percentage levels like for 36–50 per cent where it was 21.4, for 51–75 per cent where it was 15.47 and for 76–100 per cent it was 2.66, respectively. There was a huge variation in the performance of students across States. In States like Nagaland, Manipur and Goa majority of the students belong to the range of 51–75 per cent while in States/UTs like Bihar, Chattisgarh, Madhya Pradesh, Dadra and Nagar Haveli majority belonged to 0–35 per cent category.

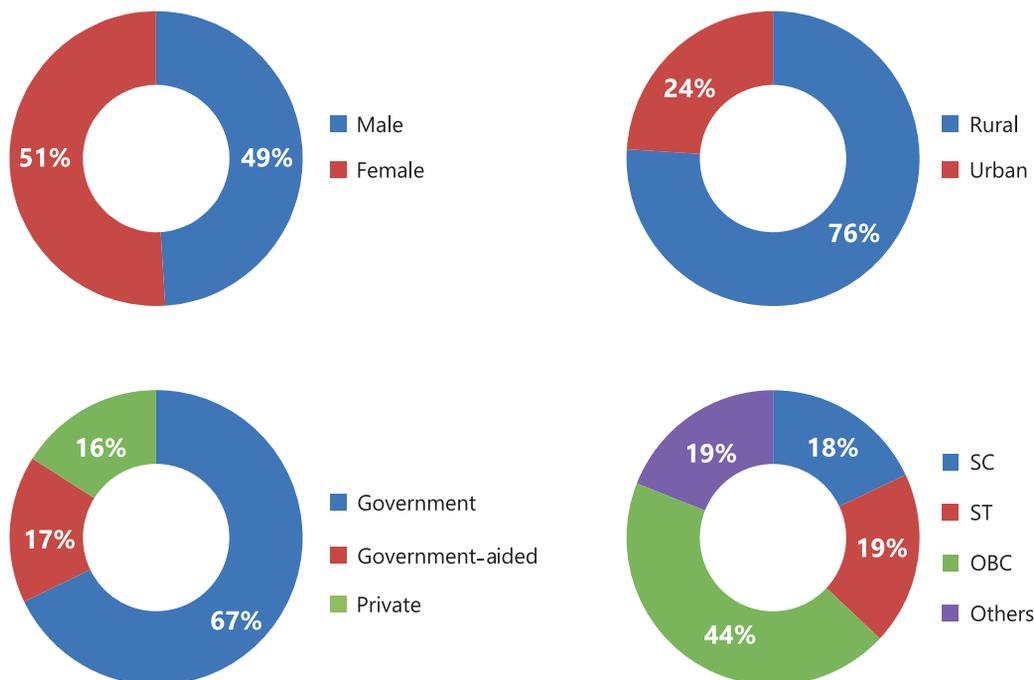


Fig. 7.3: Characteristics of Students Performing below the Mean Score of 250 by Gender, Location, School Management and Social Groups

Table 7.9: Students' Performance using Absolute Scores

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Andaman and Nicobar Islands	52.55	23.72	18.98	4.74
Andhra Pradesh	41.94	24.86	28.98	4.23
Arunachal Pradesh	45.90	21.26	26.71	6.14
Assam	48.73	24.06	22.43	4.77
Bihar	80.23	12.47	6.59	0.71
Chandigarh	48.26	28.82	20.51	2.41
Chhattisgarh	76.69	15.47	7.24	0.60
Dadra and Nagar Haveli	76.49	16.42	7.09	–
Daman and Diu	62.66	23.65	13.28	0.41
Delhi	49.13	23.57	18.62	8.68
Goa	19.89	29.16	40.94	10.01
Gujarat	72.39	19.55	7.31	0.75
Haryana	71.67	18.85	8.92	0.56
Himachal Pradesh	71.12	20.65	7.76	0.46
Jammu and Kashmir	63.49	20.17	14.15	2.19
Jharkhand	71.57	17.64	9.67	1.11
Karnataka	41.14	29.62	25.84	3.41
Kerala	47.60	29.30	20.96	2.14
Lakshadweep	70.37	24.69	4.94	–
Madhya Pradesh	80.01	14.12	5.47	0.41
Maharashtra	56.64	25.29	15.37	2.70
Manipur	30.66	24.79	35.79	8.76
Meghalaya	45.96	25.72	24.79	3.53
Mizoram	35.82	31.77	27.52	4.89
Nagaland	16.52	23.11	46.73	13.65
Odisha	60.09	21.84	16.39	1.68
Puducherry	52.82	25.85	18.89	2.44
Punjab	59.32	21.42	15.81	3.46
Rajasthan	54.81	23.41	18.96	2.82
Sikkim	36.97	36.73	24.10	2.20
Tamil Nadu	62.83	22.27	13.56	1.34
Telangana	55.65	22.30	19.70	2.35
Tripura	74.19	14.40	9.20	2.21
Uttarakhand	68.15	21.68	9.75	0.42

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
CBSE	14.13	21.86	41.98	22.02
ICSE	7.18	7.68	37.76	47.38
National	60.74	21.14	15.47	2.66

7.8. CONCLUSION

There is a highly significant difference between performance in high scoring States/UTs, such as Nagaland (306), Goa (297) and Mizoram (277) and low scoring States, such as Bihar (230) and Madhya Pradesh (229).

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.

The performance of students across social groups shows that students from the General Category outperformed their peers in the SC, ST and OBC categories by a statistically significant margin.

Students' Achievements in Modern Indian Language (MIL)

The Modern Indian Language (MIL) tests used in the National Achievement Survey (NAS) comprised two types of items— reading comprehension and language-specific elements, such as vocabulary and grammar, etc. These tests were administered in 20 languages. The reading comprehension passages were translated from the base language, i.e., Hindi to make them comparable. The language specific items, were unique in each language, hence student's achievement in the reading comprehension has been reported.

The overall achievement in the reading comprehension domain is reported for each of the participating States, UTs and Boards in this

report. In addition, information about differences in achievement by gender, school location, social category and school management is also provided.

8.1. STATE-WISE PERFORMANCE OF STUDENTS IN READING COMPREHENSION

Table 8.1 shows the distribution of student achievement for the 33 participating States/UTs/Boards. Finally, the table indicates whether average score of a State is significantly different from the overall average score of 31 States/UTs or not. The National average score and standard error is also presented in the Table 8.1.

Table 8.1: Average Reading Comprehension Scores for States/UTs/Boards

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Andaman and Nicobar Islands	253	3.8	↔
Andhra Pradesh	255	0.6	↑
Arunachal Pradesh	234	1.7	↓
Assam	253	0.6	↔
Bihar	230	1.1	↓
Chandigarh	264	4.3	↑
Chhattisgarh	258	1.0	↑
Dadra and Nagar Haveli	246	3.1	↓
Daman and Diu	232	4.4	↓
Delhi	272	0.8	↑

States/UTs/Boards	Average Score	Standard Error	Significant Difference
Goa	250	2.9	↓
Gujarat	247	0.7	↓
Haryana	253	1.2	↔
Himachal Pradesh	252	1.2	↔
Jammu and Kashmir	218	3.2	↓
Jharkhand	232	0.5	↓
Karnataka	254	0.4	↔
Kerala	279	1.0	↑
Madhya Pradesh	246	0.5	↓
Maharashtra	263	1.1	↑
Manipur	187	3.7	↓
Mizoram	265	2.9	↑
Odisha	258	0.9	↑
Puducherry	259	2.6	↑
Punjab	261	0.6	↑
Rajasthan	260	1.0	↑
Sikkim	238	3.0	↓
Tamil Nadu	250	0.6	↓
Telangana	247	0.8	↓
Tripura	251	3.1	↔
Uttarakhand	266	8.4	↑
CBSE	280	2.1	↑
ICSE	268	2.6	↑
National	254	0.3	

↔ The state's average score is not significantly different to that of the National.

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

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

In NAS Class X Cycle 2, 36 States/UTs and Boards participated in all four subjects, i.e., English, Mathematics, Science and Social Science based on secondary syllabus, however, in MIL only 33 States/UTs and Boards took part, three States/UTs Meghalaya, Nagaland and Lakshadweep could not participated. Table 8.1 indicates that the average score for 33 States, UTs and Boards was 254 (with a standard error of 0.3). The results reveal substantial difference between the highest

performing State (279 for Kerala) and the lowest performing state (187 for Manipur). It is also observed that 14 States/UTs/Boards showed average scores significantly above that of the overall national average of the group; 13 States/UTs/Boards depicted average scores that were significantly below that of the overall national average and six States/UTs/Boards average scores were not significantly different from that of the overall national average.

8.2. PERCENTILE SCORES IN READING COMPREHENSIONS FOR STATES/UTS

Table 8.2 and Figure 8.1 illustrate the range of achievement within and across the States/UTs/Boards. A percentile score indicates that scale score below which a certain percentage of students fall. For example, the 10th percentile score means that 10 per cent of students found at or below it. In other way, it also connotes that 90 per cent of students found above it. Similarly, the score at the 90th percentile is the score that 10 per cent of students achieve above it.

The report lists scores achieved by students at key percentiles. Among these are the 25th (first quartile), 50th (second quartile), 75th (third quartile) and the 90th percentiles. The range between the 25th and 75th percentile (inter-quartile range) represents the performance of the middle 50 per cent of students. Hence, both inter-quartile range and range between 90th percentile and 10th percentile is a good indicator of reflecting degree of homogeneity in terms of the reading comprehension achievement in MIL across States/UTs/Boards.

Table 8.2: Percentile Scores in MIL for States/UTs/Boards

States/UTs/Boards	P10	P25	P50	P75	P90	P75–P25	P90–P10
Andaman and Nicobar Islands	187	212	250	294	321	82	134
Andhra Pradesh	194	226	258	286	313	60	119
Arunachal Pradesh	158	191	225	278	321	87	163
Assam	195	224	254	284	309	60	114
Bihar	165	196	228	265	296	69	131
Chandigarh	198	229	267	297	333	68	135
Chhattisgarh	192	223	261	290	320	67	128
Dadra and Nagar Haveli	205	224	243	267	294	43	89
Daman and Diu	174	199	236	263	281	64	107
Delhi	206	242	276	307	331	65	125
Goa	193	220	251	281	304	61	111
Gujarat	187	217	246	279	307	62	120
Haryana	187	220	255	289	318	69	131
Himachal Pradesh	198	221	251	282	310	61	112
Jammu and Kashmir	162	186	211	245	286	59	124
Jharkhand	170	198	231	267	296	69	126
Karnataka	196	224	255	285	311	61	115
Kerala	216	247	283	312	335	65	119
Madhya Pradesh	184	214	245	279	308	65	124
Maharashtra	196	229	265	298	329	69	133
Manipur	145	159	187	212	230	53	85
Mizoram	220	238	268	290	308	52	88
Odisha	191	222	260	294	325	72	134
Puducherry	203	226	260	291	320	65	117
Punjab	197	228	263	294	324	66	127
Rajasthan	192	226	264	296	326	70	134
Sikkim	185	212	235	260	296	48	111
Tamil Nadu	194	222	251	279	302	57	108
Telangana	188	218	246	279	306	61	118
Tripura	185	222	255	285	312	63	127

States/UTs/Boards	P10	P25	P50	P75	P90	P75–P25	P90–P10
Uttarakhand	202	240	265	296	332	56	130
CBSE	215	241	282	318	347	77	132
ICSE	192	230	275	303	331	73	139
National	189	221	255	287	317	66	128

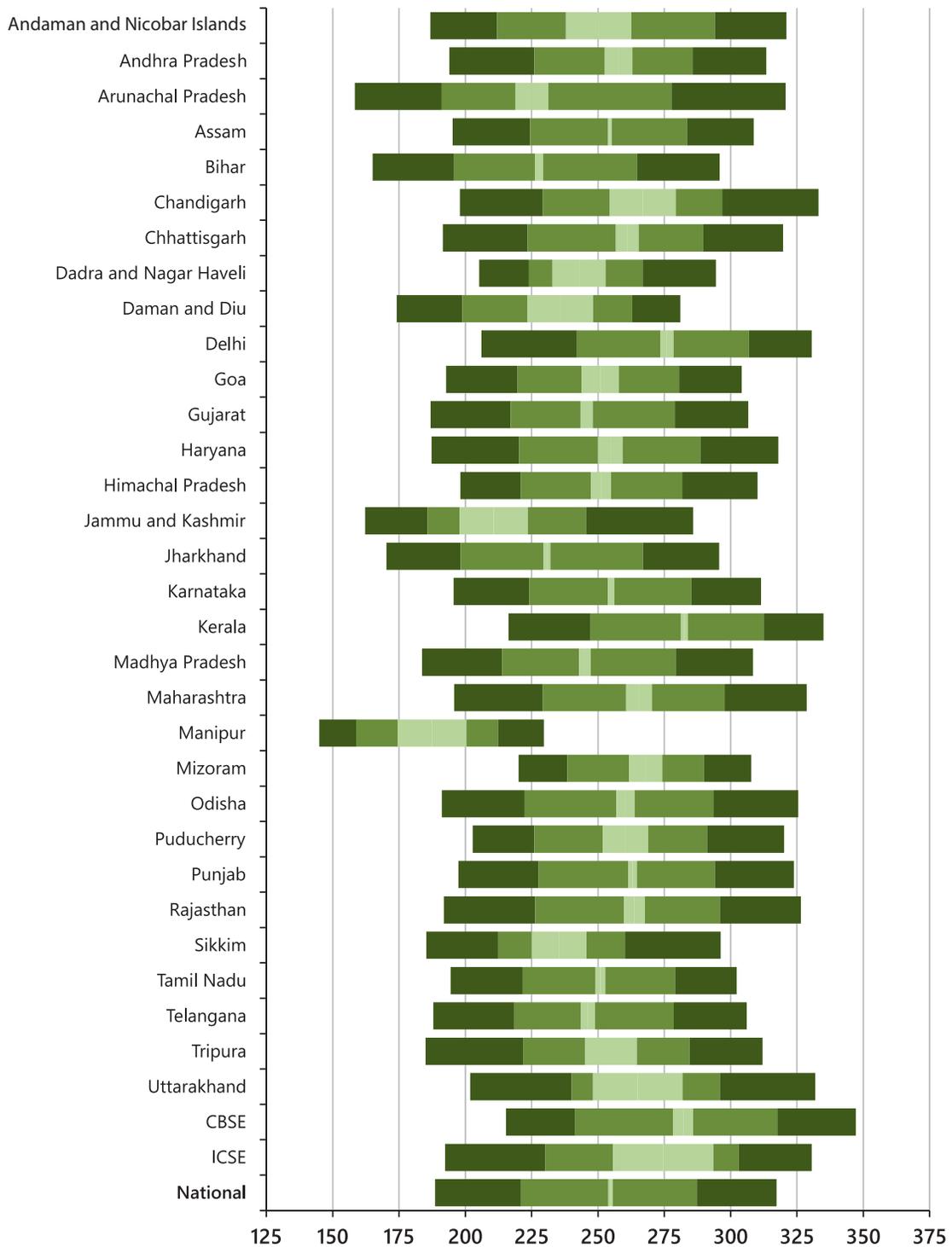


Fig. 8.1: Percentile Scores in MIL for States/UTs/Boards

The inter-quartile range (that is the range between the 75th and 25th percentiles) at national level is a score of 66 which represents a more homogenous scenario in comparison to the variation of scores among the individual States. For example, Dadra and Nagar Haveli has an inter-quartile range of 43 score while Arunachal Pradesh has a corresponding value of 87. These values represent that the Class X population in Dadra and Nagar Haveli is far more homogeneous as regard to the learning levels than that of Arunachal Pradesh. In most States, the range of performance for the middle group was between 60 and 70 scale-score points. Performance at the 10th and the 90th percentiles, respectively, shows extreme in low and high achievements. The range between these two points, which includes 80 per cent of the population, is highly varying, ranging from 85 (Manipur) to 163 (Arunachal Pradesh).

The percentile scores provide additional information when comparing Reading Comprehension achievement scores amongst States. For example, when the States are arranged in order of average score, the difference 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 Andaman and Nicobar Islands, Goa, Tamil Nadu and Himachal Pradesh (250–251). However, the range of scores between the 25th percentile and 75th percentiles are very different— Andaman and Nicobar Islands (82), Goa and Himachal Pradesh (61), Tamil Nadu (57). This indicates that while the average achievement is similar in the States, Tamil Nadu has a homogenous

group of Class X students than Andaman and Nicobar Islands.

Moreover, the 50th percentile scores of the students of Kerala (283) are far better than 75th percentile scores of 14 States, i.e., Manipur (212), Jammu and Kashmir (245), Sikkim (260), Daman and Diu (263), Bihar (265), Dadra and Nagar Haveli (267), Jharkhand (267), Arunachal Pradesh (278), Telangana (279), Gujarat (279), Tamil Nadu (279), Madhya Pradesh (279) and Goa (281).

8.3. GROUP-WISE PERFORMANCE IN READING COMPREHENSION

In this section performance of various categories are reflected. Within the group significant difference is also measured in this part.

Gender

Table 8.3 compares the average Reading comprehension scores achieved by boys and girls. Overall performance by girls (255) was significantly better than boys (253). This trend was observed in States/UTs like Punjab, Chandigarh, Delhi, Assam, Chhattisgarh, Gujarat, Dadra and Nagar Haveli, Maharashtra, Himachal Pradesh, Andhra Pradesh and Tamil Nadu. In Uttarakhand, Arunachal Pradesh, Tripura, Jharkhand and Puducherry girls are significantly performing lower than boys. In remaining States/UTs like Jammu and Kashmir, Haryana, Rajasthan, Bihar, Sikkim, Manipur, Mizoram, Odisha, Madhya Pradesh, Daman and Diu, Karnataka, Goa, Kerala, Andaman and Nicobar Islands and Telangana there was no significant difference between the performance of girls and boys.

Table 8.3: Average Reading Comprehension Scores by Gender

States/UTs/Boards	Boys' Average (Standard Error)	Girls' Average (Standard Error)	Significant Difference
Andaman and Nicobar Islands	255(4.6)	250(4.5)	↔
Andhra Pradesh	250(1.5)	260(0.5)	↑
Arunachal Pradesh	239(2.4)	228(2.5)	↓
Assam	251(1.3)	255(0.4)	↑
Bihar	232(0.7)	229(1.4)	↔
Chandigarh	259(5.6)	271(3.7)	↑
Chhattisgarh	254(0.6)	261(1.5)	↑
Dadra and Nagar Haveli	236(5.2)	252(4.5)	↑
Daman and Diu	233(5.6)	232(4.5)	↔

States/UTs/Boards	Boys' Average (Standard Error)	Girls' Average (Standard Error)	Significant Difference
Delhi	268(1.3)	276(1.5)	↑
Goa	250(2.1)	250(4.7)	↔
Gujarat	245(1.3)	250(0.5)	↑
Haryana	253(1.3)	254(1.6)	↔
Himachal Pradesh	249(1.7)	255(2.4)	↑
Jammu and Kashmir	214(5.4)	221(2.5)	↔
Jharkhand	236(1.3)	230(1.1)	↓
Karnataka	253(0.6)	255(0.7)	↔
Kerala	276(1.0)	281(2.1)	↔
Madhya Pradesh	246(1.1)	246(0.6)	↔
Maharashtra	260(1.3)	266(1.2)	↑
Manipur	187(4.2)	186(5.4)	↔
Mizoram	266(4.8)	264(1.6)	↔
Odisha	257(1.7)	260(0.4)	↔
Puducherry	270(2.0)	245(5.1)	↓
Punjab	256(1.3)	268(1.1)	↑
Rajasthan	261(1.4)	259(0.5)	↔
Sikkim	238(3.6)	237(3.4)	↔
Tamil Nadu	248(0.6)	251(1.0)	↑
Telangana	247(1.6)	247(1.6)	↔
Tripura	256(5.1)	243(2.2)	↓
Uttarakhand	272(10.9)	250(0.9)	↓
CBSE	284(1.8)	275(6.0)	↓
ICSE	260(1.8)	278(5.4)	↑
National	253(0.6)	255(0.2)	↑

↔ 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.

Location of Schools

Table 8.4 depicts the average Reading Comprehension scores achieved by students in rural and urban schools. Results reveal that overall there was a significant difference observed between the performance of rural and urban students. Performance of rural students was significantly lower

than the urban students in reading comprehension achievements. Similar trend showing in 15 States/UTs of Jammu and Kashmir, Uttarakhand, Haryana, Delhi, Rajasthan, Sikkim, Manipur, Mizoram, Jharkhand, Chhattisgarh, Madhya Pradesh, Gujarat, Daman and Diu, Goa and Puducherry, i.e., rural students significantly performed lower than urban students.

Table 8.4: Average Reading Comprehension Scores by Location

States/UTs/Boards	Rural Average (Standard Error)	Urban Average (Standard Error)	Significant Difference
Andaman and Nicobar Islands	255(5.1)	241(7.2)	↑
Andhra Pradesh	251(0.5)	249(0.9)	↔
Arunachal Pradesh	239(1.9)	224(3.4)	↑
Assam	253(0.7)	254(2.3)	↔
Bihar	230(1.3)	230(1.4)	↔
Chandigarh	264(6.5)	264(4.8)	↔
Chhattisgarh	252(0.5)	272(3.2)	↓
Dadra and Nagar Haveli	245(6.0)	249(10.8)	↔
Daman and Diu	225(7.8)	243(7.3)	↓
Delhi	263(3.8)	274(0.8)	↓
Goa	247(3.9)	260(2.9)	↓
Gujarat	241(0.8)	257(1.1)	↓
Haryana	251(1.2)	262(2.4)	↓
Himachal Pradesh	252(1.3)	252(3.1)	↔
Jammu and Kashmir	213(3.5)	239(5.1)	↓
Jharkhand	232(0.5)	238(2.1)	↓
Karnataka	258(0.4)	249(0.7)	↑
Kerala	278(0.9)	279(2.5)	↔
Madhya Pradesh	243(0.7)	250(0.4)	↓
Maharashtra	263(0.8)	262(2.3)	↔
Manipur	180(3.1)	194(7.0)	↓
Mizoram	260(2.6)	268(3.6)	↓
Odisha	258(0.6)	261(2.4)	↔
Puducherry	253(5.3)	263(6.0)	↓
Punjab	261(0.3)	261(1.2)	↔
Rajasthan	256(1.0)	269(1.3)	↓
Sikkim	236(2.9)	263(8.3)	↓
Tamil Nadu	249(1.2)	251(0.5)	↔
Telangana	246(0.6)	248(1.8)	↔
Tripura	252(3.6)	241(2.7)	↑
Uttarakhand	244(0.6)	282(14.0)	↓
CBSE	276(6.2)	282(2.4)	↓
ICSE	254(4.9)	271(3.3)	↓
National	251(0.2)	258(0.6)	↓

↔ 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.

Social Category

Table 8.5 shows the average Reading Comprehension scores achieved by students in social categories across States/UTs. At National level SC, ST and OBC category students were performing lower than the 'Others'. SC and OBC students were performing significantly better than the ST students

in MIL (Reading Comprehension). In Jammu and Kashmir, Chandigarh and Dadra and Nagar Haveli SC students performed better than the 'Others' category students. The States of Arunachal Pradesh, Manipur, Tamil Nadu and Andaman and Nicobar Islands, OBC students performed better than 'Others' category students.

Table 8.5: Average Reading Comprehension Scores by Social Category

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Andaman and Nicobar Islands	253(3.4)	–	–	203(11.3)	↓	276(6.0)	↑
Andhra Pradesh	264(1.5)	254(1.1)	↓	242(5.2)	↓	254(0.8)	↓
Arunachal Pradesh	234(5.7)	205(14.3)	↓	235(1.5)	↔	252(5.7)	↑
Assam	254(1.0)	252(1.9)	↔	250(2.0)	↔	255(1.0)	↔
Bihar	236(2.4)	226(1.5)	↓	222(2.3)	↓	230(1.3)	↓
Chandigarh	265(4.7)	270(3.7)	↑	149(25.2)	↓	261(17.0)	↓
Chhattisgarh	266(3.8)	251(2.0)	↓	266(3.1)	↔	255(1.9)	↓
Dadra and Nagar Haveli	246(10.0)	262(23.4)	↑	245(5.2)	↔	–	–
Daman and Diu	237(7.3)	–	–	223(11.4)	↓	231(4.7)	↔
Delhi	274(1.0)	268(2.4)	↓	278(12.0)	↑	268(3.3)	↔
Goa	256(3.7)	245(9.4)	↓	237(7.5)	↓	245(3.9)	↓
Gujarat	260(1.3)	251(2.2)	↓	233(1.5)	↓	245(1.4)	↓
Haryana	263(2.2)	245(1.5)	↓	–	–	251(1.1)	↓
Himachal Pradesh	253(1.7)	251(4.4)	↔	245(4.5)	↓	254(2.0)	↔
Jammu and Kashmir	218(2.3)	237(5.4)	↑	206(5.5)	↓	210(13.0)	↓
Jharkhand	241(2.9)	224(1.6)	↓	232(1.4)	↓	233(0.7)	↓
Karnataka	254(1.8)	251(1.8)	↔	251(2.2)	↔	255(0.3)	↔
Kerala	277(1.3)	265(4.0)	↓	274(2.3)	↔	281(1.5)	↔
Madhya Pradesh	251(1.2)	244(0.8)	↓	237(0.7)	↓	248(0.9)	↔
Maharashtra	266(2.4)	263(1.0)	↔	245(1.1)	↓	264(0.6)	↔
Manipur	182(6.2)	170(2.7)	↓	182(12.9)	↔	192(6.0)	↑
Mizoram	–	274(21.2)	–	265(3.0)	–	–	–
Odisha	270(3.0)	255(1.6)	↓	249(1.3)	↓	260(1.0)	↓
Puducherry	269(4.9)	239(7.3)	↓	–	–	263(4.1)	↓
Punjab	265(1.2)	257(0.6)	↓	191(19.8)	↓	257(1.7)	↓
Rajasthan	271(1.0)	256(2.0)	↓	243(2.5)	↓	262(2.1)	↓
Sikkim	251(4.5)	223(8.9)	↓	233(4.2)	↔	245(4.7)	↓

* Sig - Significant Difference

States/UTs/Boards	Others	Scheduled Caste	Sig.	Scheduled Tribe	Sig.	Other Backward Classes	Sig.
Tamil Nadu	245(4.4)	246(1.6)	↔	225(4.0)	↓	252(0.9)	↑
Telangana	254(2.9)	243(2.5)	↓	244(3.3)	↓	246(1.1)	↓
Tripura	252(2.2)	254(1.9)	↔	253(8.3)	↔	247(5.2)	↓
Uttarakhand	276(14.4)	266(8.4)	↓	210(2.6)	↓	243(2.0)	↓
CBSE	288(4.0)	278(5.8)	↓	–	–	269(5.6)	↓
ICSE	269(3.7)	237(12.1)	↓	270(19.3)	↑	275(6.2)	↑
National	261(0.6)	252(0.5)	↓	244(1.0)	↓	253(0.3)	↓

↔ No significant difference between the average performance of SC/ST/OBC students and Others students.

↑ SC/ST/OBC students' average performance is significantly higher than that of Others students.

↓ SC/ST/OBC students' average performance is significantly lower than that of Others students.

School Management

Table 8.6 shows the average reading comprehension scores achieved by students in different management categories across States/UTs. There was significant difference in scores of students from government, government-aided and private schools. Data also revealed significant difference in scores of government and government-aided schools. Government-aided schools performed significantly better than the government schools. Government-aided schools in States/UTs like Chandigarh, Uttarakhand, Delhi, Rajasthan, Sikkim, Arunachal Pradesh, Chhattisgarh, Daman and Diu, Dadra and Nagar Haveli, Maharashtra, Andhra Pradesh, Goa, Tamil Nadu, Gujarat, Haryana, Jharkhand and

Telangana performed better than government schools.

Private schools performed significantly better than the government schools in 17 States/UTs, namely Jammu and Kashmir, Punjab, Uttarakhand, Haryana, Delhi, Rajasthan, Assam, Jharkhand, Madhya Pradesh, Gujarat, Daman and Diu, Dadra and Nagar Haveli, Maharashtra, Andhra Pradesh, Tamil Nadu, Andaman and Nicobar Islands and Telangana. However, in States/UTs like Himachal Pradesh, Goa, Manipur, Mizoram, and Puducherry, private schools performed significantly lower than government schools. In remaining States/UTs, there was no significant difference in the scores of private and government schools.

Table 8.6: Average Reading Comprehension Scores by School Management

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Andaman and Nicobar Islands	242(3.4)	–	–	291(8.2)	↑
Andhra Pradesh	245(3.3)	255(0.9)	↑	258(2.5)	↑
Arunachal Pradesh	233(1.0)	244(8.9)	↑	234(6.7)	↔
Assam	253(0.6)	251(1.2)	↔	264(3.2)	↑
Bihar	230(1.1)	220(1.3)	↓	231(1.6)	↔
Chandigarh	262(4.7)	333(17.1)	↑	–	–
Chhattisgarh	257(0.9)	265(4.1)	↑	259(3.9)	↔
Dadra and Nagar Haveli	244(3.3)	277(21.8)	↑	298(24.1)	↑
Daman and Diu	222(6.2)	280(10.7)	↑	251(5.7)	↑
Delhi	268(0.8)	278(4.5)	↑	280(3.0)	↑

States/UTs/Boards	Government	Government-aided	Significant Difference	Private	Significant Difference
Goa	244(6.9)	252(3.8)	↑	219(15.1)	↓
Gujarat	238(3.2)	244(0.7)	↑	257(1.7)	↑
Haryana	246(0.9)	251(4.0)	↑	264(2.0)	↑
Himachal Pradesh	253(1.4)	–	–	244(3.4)	↓
Jammu and Kashmir	205(3.6)	188(17.1)	↓	237(3.3)	↑
Jharkhand	231(0.8)	238(3.5)	↑	239(1.4)	↑
Karnataka	255(0.6)	254(1.0)	↔	252(1.3)	↔
Kerala	280(1.4)	278(1.8)	↔	277(3.4)	↔
Madhya Pradesh	243(0.6)	236(4.8)	↓	251(0.7)	↑
Maharashtra	230(5.5)	262(0.7)	↑	272(5.3)	↑
Manipur	190(7.6)	178(5.8)	↓	185(3.6)	↓
Mizoram	267(4.2)	261(5.4)	↓	259(6.9)	↓
Odisha	258(0.8)	263(2.9)	↔	262(3.5)	↔
Puducherry	269(6.6)	256(7.8)	↓	252(1.9)	↓
Punjab	258(0.8)	260(3.5)	↔	264(1.0)	↑
Rajasthan	254(0.6)	261(9.5)	↑	265(1.4)	↑
Sikkim	237(2.9)	252(27.7)	↑	–	–
Tamil Nadu	246(1.3)	253(0.6)	↑	251(1.0)	↑
Telangana	245(0.3)	250(6.6)	↑	249(1.7)	↑
Tripura	251(3.1)	–	–	–	–
Uttarakhand	244(1.2)	252(1.7)	↑	282(14.0)	↑
CBSE	291(15.4)	–	–	280(2.0)	↓
ICSE	–	–	–	268(2.6)	–
National	248(0.2)	257(0.4)	↑	259(0.6)	↑

↔ No significant difference between the average performance of government-aided/private students and government students.

↑ Government Aided/private students' average performance is significantly higher than that of government students.

↓ Government Aided/private students' average performance is significantly lower than that of government students.

8.4. PROFICIENCY LEVELS

Proficiency levels provide a convenient way to describe profiles of student achievement. Children whose results are located within a particular level of proficiency are expected to understand the competencies and skills associated with that and lower levels. In NAS Class X Cycle 2 student's performance in MIL was gauged using five proficiency levels based on the numeric scores achieved in the assessment.

Figure 8.2 divides the average MIL scores achieved by students into five proficiency levels. Each level comprises of the percentage of the students for that level. It can be observed that maximum number of students that is 35 per cent lied between proficiency level 251–300 whereas 16 per cent students belong to lower proficiency level of less than 200. Only 2 per cent students belong to the highest proficiency levels, i.e., greater than 350.

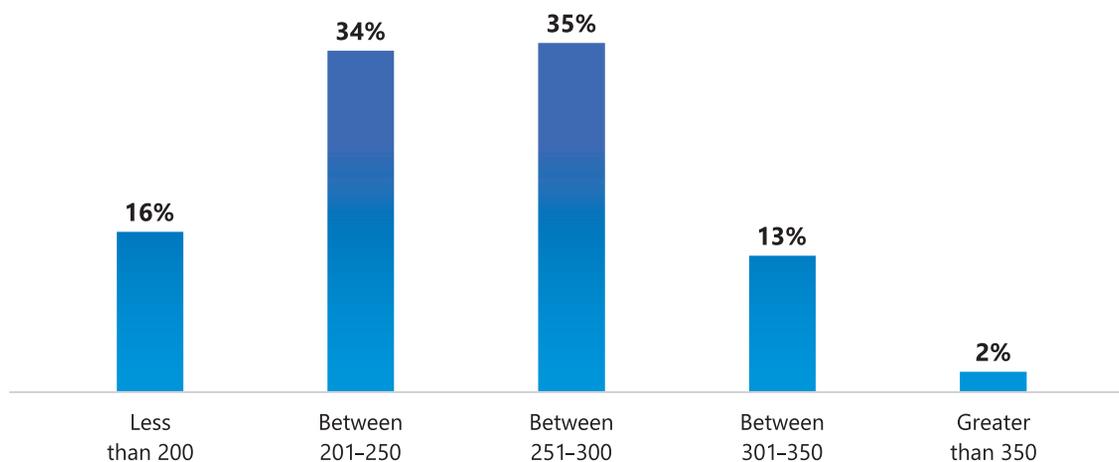


Fig. 8.2: Proficiency Levels in MIL

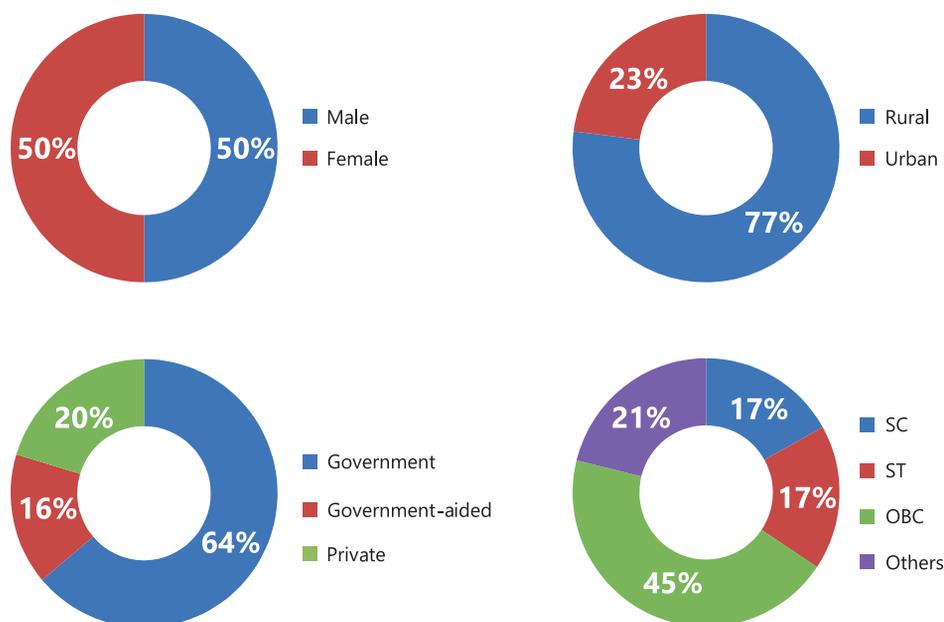


Fig. 8.3: Characteristics of Students Performing below the Mean Score of 200 by Gender, Location, School Management, and Social Groups

Distribution of Students Performing Less than 200

Figure 8.3 shows the distribution of students' characteristics performing below score 200 in reading comprehension.

- Gender:** The graphs shows that overall 50 per cent of male and 50 per cent of female students performed below the 200 score in MIL.
- Location:** It was observed that 77 per cent of rural students performed in this category, whereas only 23 per cent of urban students performed below score 200 in reading comprehension in MIL.
- Management:** 16 per cent and 20 per cent of students from government-aided schools and private schools, respectively, performed in this category, whereas 64 per cent of students from government schools performed below score 200.
- Social Groups:** On an average, 45 per cent of OBC category students scored in this category whereas 17 per cent of students belonging to SC category, 17 per cent of students belonging to ST category and 21 per cent of students belonging to 'Others' category performed below the score of 200 in reading comprehension in MIL.

Distribution of Students based on Score Range

Table 8.7 depicts the distribution of the range of students' ability in terms of correct answers across States/UTs. The table shows the proportion of students answering correctly in four ranges. It shows the proportion of students who scored 0–35 per cent, 36–50 per cent, 51–75 per cent and the proportion of students who scored more than 75 per cent. At national level, majority of students i.e.,

39 per cent students scored in range of 51–75 per cent. There is a huge inter-state variation with respect to proportion of students answering correctly in varied four ranges. For instance, more than 50 per cent of students in States/UTs like Jammu and Kashmir, Sikkim, Manipur and Arunachal Pradesh scored in the range of 0 to 35 per cent whereas on an average 50 per cent of students in States/UTs like Kerala, Karnataka, Mizoram and Delhi scored in the range of 51–75 per cent.

Table 8.7: Students' Performance using Absolute Scores

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Andaman and Nicobar Islands	34.76	27.04	28.97	9.23
Andhra Pradesh	32.76	39.05	26.81	1.38
Arunachal Pradesh	51.65	22.47	23.13	2.75
Assam	18.87	28.39	46.37	6.37
Bihar	45.88	22.85	25.88	5.40
Chandigarh	15.57	23.44	44.83	16.16
Chhattisgarh	22.93	28.04	41.63	7.40
Dadra and Nagar Haveli	35.00	43.08	21.15	0.77
Daman and Diu	32.71	39.25	27.57	0.47
Delhi	11.31	20.77	51.00	16.92
Goa	23.01	36.41	37.73	2.84
Gujarat	25.39	29.88	40.30	4.43
Haryana	26.72	25.65	37.91	9.71
Himachal Pradesh	21.18	27.35	43.46	8.01
Jammu and Kashmir	72.26	20.37	6.40	0.97
Jharkhand	35.56	26.02	32.56	5.86
Karnataka	13.96	22.84	54.90	8.30
Kerala	13.00	22.65	59.21	5.13
Madhya Pradesh	27.09	28.61	37.10	7.20
Maharashtra	21.93	31.72	40.94	5.41
Manipur	53.74	39.70	6.56	–
Mizoram	8.77	15.27	68.07	7.88
Odisha	26.59	25.46	38.37	9.58
Puducherry	30.18	31.40	36.75	1.67
Punjab	22.68	29.44	42.19	5.69
Rajasthan	16.47	20.23	43.93	19.38

States/UTs/Boards	(0–35 %)	(36–50 %)	(51–75 %)	(76–100 %)
Sikkim	50.38	29.70	19.08	0.85
Tamil Nadu	23.99	34.90	38.63	2.49
Telangana	27.18	32.75	36.29	3.78
Tripura	46.56	36.78	16.66	–
Uttarakhand	20.80	26.25	44.34	8.61
CBSE	10.49	16.15	49.13	24.23
ICSE	21.81	20.64	43.46	14.09
National	26.51	27.46	38.98	7.05

8.5. CONCLUSION

The average achievement of students in Reading Comprehension varies across the States and UTs of India. There is a significant difference between performances in high scoring States/UTs, such as Kerala (279), Delhi (272), Uttarakhand (266), Maharashtra (263) and low scoring States/UTs such as Manipur (187), Jammu and Kashmir (218), Bihar (230) and Daman and Diu (232).

Besides this, States also vary in the range between their lowest and highest achieving students as revealed by their inter-quartile score ranges; that presents relatively homogeneous cohorts in some States/UTs and far more diverse performances amongst the others. Overall significant difference was observed in the average achievement of girls and boys. Similarly, significant difference was observed between the achievement level of rural and urban

students. Further, the students of general category outperformed their peers from the SC, ST and OBC categories by a statistically significant margin.

The significant difference was also observed in the achievement level of students studying in schools managed by different managements. While students in private schools significantly performed better than government and government-aided schools, there persisted variation in the performance of students from government and government-aided schools and later was found to outperform than former.

Moreover, majority of students in MIL were found to score between 251 to 300, whereas 64 per cent of students from the government schools across States performed below the average score of 200 in the reading comprehension. Further, at National level, majority of students answered the items correctly and are lying between the range of 51–75 per cent.

Contextual Analysis of Background Variables

The relationship between learning achievement of students and some variables related to student's home background and school were analysed 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.

For analysis three 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:

- The relation ('bivariate') between the background variable and the outcome in five subjects are presented without key variables 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.

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 educational system.

9.1. SCHOOL FACTORS AND STUDENT ACHIEVEMENT

The earlier National Achievement Survey conducted by NCERT supported the hypothesis 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 analyse the relationship of students' achievement with some school related variables.

Table 9.1: School Participation

School Participation	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Science Exhibition	-0.41	0.93	-0.27	1.06
Art club Activities	2.82	0.83	3.33	0.93

Sports Activities	1.67	1.38	2.21	1.58
Cultural Activities	0.67	1.2	-1.06	1.35
Quiz	0.42	1.05	1.64	1.17

Table 9.1 shows that schools' participation in various activities like art club activities, sports activities, cultural activities and quiz had positive association with the achievement of students without key variables. The similar kind of positive association was found between the achievement of students and their school participation after including key variables except for participation in science exhibition and cultural activities after including key variables.

Table 9.2 shows that schools having the learning facilities of language laboratory, library, computer lab and audio-video resources had positive association with the achievement of students.

However, the difference is very small or negligible. The similar kind of positive association was observed with achievement for the learning facilities library, computer lab and audio-video resources after including key variables. On the other hand science laboratory, mathematics laboratory, social science room and indoor games had negative association with achievement of students in school. The similar kind of negative association was observed after including key variables for the learning facilities, science laboratory, mathematics laboratory, language laboratory, social science and indoor games.

Table 9.2: Learning Facilities

Learning Facilities	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Science Laboratory	-1.24	1.03	-1.23	1.16
Mathematics Laboratory	-0.86	0.93	-0.21	1.07
Language Laboratory	1.47	1.08	-0.18	1.25
Social Science Room	-1.37	0.95	-2	1.09
Indoor Games	-0.85	0.76	-1.25	0.87
Library	1.72	1.25	1.23	1.4
Computer Lab	4.15	0.93	3.24	1.05
Audio Video Resources	1.8	0.82	1.59	0.93

Table 9.3: School Facilities

Facilities in School	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Trained ICT Personnel	2.33	0.81	2.8	0.92
Electric Connection	0.32	0.03	0.33	0.03
Staff Room	0.54	1.13	-0.01	1.25
Drinking Water	0.04	1.7	1.74	1.88
Classroom Access to Children with Special Needs (CWSN)	1.82	0.85	1.67	0.96
Toilet Access to CWSN	1.35	0.82	0.23	0.94
Playground	0.06	1.03	0.63	1.17
Trained Physical Education Teachers	3.5	0.84	2.82	0.94
Parent Teacher Association	2.45	1.13	3.22	1.29

Table 9.3 shows the infrastructure facilities that affect the achievement of students. Trained ICT personnel, electric connection, staff room, drinking water, classroom access to Children with Special Needs (CWSN), toilet access to CWSN, playground, trained physical education teachers and parent-teacher association had positive association with the achievement of students in school. However, the difference is very small or negligible. After including key variables, the similar kind of positive association was observed with the achievement of students for the facilities.

9.2. STUDENTS' BACKGROUND AND ACHIEVEMENT

Student learning never takes 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 their 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.

9.2.1 Mathematics

Table 9.4: Distance to School

Distance to School	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
More than 10 km.	0.5	0.81	0.74	1.12

Table 9.4 shows that the distance of school from residence of the students is positively associated

with achievement of students in Mathematics. The similar kind of positive association was observed after including key variables.

Table 9.5: Facilities at Home

Facilities at Home	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Newspaper	-1.07	0.82	-0.38	1.2
Magazine	1.89	0.84	0.82	1.22
Radio	0.5	0.89	1.39	1.3
Television	-1.97	0.96	-3.7	1.44
Calculator	2.44	1.22	3.45	1.97
Computer	0.38	0.83	-0.04	1.22
Internet	-0.38	0.84	-0.21	1.25

Table 9.5 shows that the availability of facilities at home, such as magazine, radio, calculator and computer had positive association with achievement of students. The similar kind of positive association was observed for the availability of facilities like magazine, radio and calculator with achievement of students in mathematics after including key variables.

Table 9.6 shows that the assignments/projects posted online by school and communication with teachers using the Internet had positive association with achievements of students, without and with key variables. However, reading the textbook/reference materials and communication with classmates showed negative impact on achievement of students in mathematics, both before and after including key variables.

Table 9.6: Use of Internet for Completing Homework or School Work

Use of Internet for Completing Homework/School Work	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Read the textbook/reference materials	-2.74	1.08	-3.34	1.2
Assignments/projects, posted online by school	1.36	0.99	0.45	1.1
Communicate with classmates	-0.66	1.21	-0.76	1.32
Communicate with the teachers	2.14	1.15	2.34	1.25

9.2.2 English

Table 9.7: Distance to School

Distance to School	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
More than 10 km.	-1.40	0.72	-2.57	1.09

Table 9.7 shows that, the distance of school from residence of the students was negatively associated with achievement of students in English. The similar kind of negative association was observed after including key variables.

Table 9.8: Facilities at Home

Facilities at Home	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Newspaper	-1.62	0.81	0.27	1.18
Magazine	0.53	0.83	0.83	1.19
Radio	1.82	0.88	0.74	1.27
Television	-0.80	0.95	-0.45	1.41
Calculator	0.94	0.95	0.25	1.93
Computer	-0.37	0.82	-0.44	1.19
Internet	0.75	0.83	1.69	1.22

Table 9.8 shows that the availability of magazine, radio, calculator and Internet facilities at home had positive association with achievement of students, without and with key variables and other facilities had negative impact on achievement of students in English.

Table 9.9 shows that the assignments and projects posted online by school and communication with teachers using Internet had positive association with achievements of students and tasks like assignments/

Table 9.9: Use of Internet for Completing Homework or School Work

Use of Internet for Completing Homework/ School work	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Read the textbook/reference materials	0.93	1.07	1.01	1.17
Assignments/projects, posted online by school	-3.78	0.98	-4.26	1.08
Communicate with classmates	-1.00	1.19	-1.79	1.29
Communicate with the teachers	0.92	1.13	2.04	1.22

projects and communication with classmates were negatively associated with achievement of students in English. The similar kind of positive and negative associations were observed for other tasks using Internet with the achievement of students in English after including key variables.

9.2.3 Modern Indian Language (MIL)

Table 9.10: Distance to School

Distance to School	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
More than 10 km	-0.56	0.81	-1.30	1.09

Table 9.10 shows that, the distance of school from residence of the students is negatively associated with achievement of students in MIL. The similar kind of negative association was observed after including key variables.

Table 9.11: Facilities at Home

Facilities at Home	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Newspaper	-0.55	0.81	-0.18	1.17
Magazine	1.69	0.83	2.57	1.19
Radio	0.58	0.88	0.02	1.26
Television	-2.12	0.95	-1.18	1.40
Calculator	1.11	1.21	0.86	1.92
Computer	-0.45	0.82	-1.12	1.19
Internet	0.19	0.83	0.24	1.22

Table 9.11 shows that the magazine, radio, calculator and Internet facilities at home show positive impact on achievement of students and other facilities had negative impact on achievement of students in MIL. The similar kind of positive and negative associations

Table 9.12: Use of Internet for Completing Homework/School Work

Use of Internet for Completing HomeWork/School work	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Read the textbook/reference materials	-2.58	1.06	-2.37	1.17
Assignment and projects, posted online by school	0.12	0.97	0.13	1.07
Communicate with classmates	0.25	1.18	0.38	1.29
Communicate with the teachers	1.10	1.12	1.15	1.21

were observed with the achievement of students in MIL after including key variables.

Table 9.12 shows that, completing assignments/projects, communication with teachers and communication with classmates using Internet facility had positive impact on achievement of students without and with key variables.

9.2.4 Science

Table 9.13: Distance to School

Distance to School	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
More than 10 km	-0.94	0.76	-1.48	1.10

Table 9.13 shows that, the distance of school from residence of the students is negatively associated with achievement of students in science. The similar kind of negative association with achievement of students was observed after including key variables.

Table 9.14: Facilities at Home

Facilities at Home	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Newspaper	0.05	0.81	1.48	1.18
Magazine	1.92	0.83	0.65	1.20

Table 9.15: Use of Internet for Completing Homework or School Work

Use of Internet for Completing Homework/School work	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Read the textbook/reference materials	-1.34	1.07	-1.83	1.18
Assignments/projects, posted online by school	0.62	0.98	0.01	1.08
Communicate with classmates	0.32	1.19	-0.21	1.30
Communicate with the teachers	-0.49	1.13	-0.28	1.23

Radio	1.47	0.88	1.15	1.28
Television	-1.11	0.96	-0.34	1.42
Calculator	-1.68	1.21	-1.06	1.94
Computer	-0.84	0.82	-0.89	1.20
Internet	0.38	0.83	1.60	1.23

Table 9.14 shows that the newspaper, magazine, radio, Internet facilities have positive impact on achievement of students, while other facilities had negative impact on achievement of students in science. The similar kind of positive and negative association with achievement of students was observed after including key variables.

Table 9.15 shows that, the assignments/projects, posted online by school and communication with classmates using Internet had positive impact on achievements of students while communication with classmates using Internet showed negative impact on attainment after including key variable. Reading the textbook/references materials and communication with teachers using Internet had negative impact on science achievement. The similar kind of negative association was observed for the same after including key variables.

9.2.5 Social Science

Table 9.16: Distance to School

Distance to School	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
More than 10 km.	-0.24	0.76	-0.02	1.11

Table 9.16 shows that, the distance of school from residence of the students is negatively associated with achievement of students in social science. The similar kind of negative association with achievement of students in social science was observed after including key variables.

Table 9.17: Facilities at Home

Facilities at Home	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Newspaper	0.08	0.81	0.39	1.19
Magazine	-0.29	0.83	-2.41	1.21
Radio	3.17	0.88	1.98	1.29
Television	0.18	0.96	0.80	1.43
Calculator	-0.37	1.21	-0.68	1.95
Computer	-1.00	0.82	-0.38	1.21
Internet	-0.78	0.83	-0.47	1.24

Table 9.17 shows that, the facilities, such as newspaper, radio and television had positive association with achievement of students, while other facilities available at home showed negative impact on achievement of students in social science. The similar kind of positive and negative association with achievement of students was observed after including key variables.

Table 9.18 shows that, usage of Internet for the assignments/projects and reading the textbook/reference material had positive impact on achievement of students while communication

Table 9.18: Use of Internet for Completing Homework or School Work

Use of Internet for Completing Homework/ School work	Without Key Variable		With Key Variable	
	Coeff.	SE	Coeff.	SE
Read the textbook/reference materials	0.72	1.08	2.13	1.19
Assignments/projects, posted online by school	2.22	0.99	3.09	1.09
Communicate with classmates	-0.29	1.20	-0.50	1.31
Communicate with the teachers	-0.63	1.14	-1.26	1.23

with teachers and classmates using internet had negative impact in social science achievement. The similar kind of positive and negative association was observed after including key variables.

9.3. TEACHER FACTORS AND STUDENT ACHIEVEMENT

The earlier National Achievement Survey conducted by NCERT shows that teacher performance is directly linked with the quality of education. Learning environment and school infrastructural facilities also contribute in all round development of the students. This section attempts to analyse the relationship of students' achievement with some teacher related variables. Teachers are a vital component of the educational process and it is very important to know the characteristics of teachers, the strategies they use in the classroom and their general attitudes towards teaching in schools, etc.

9.3.1 Student Achievement of English

Table 9.19: Highest Educational Qualification

Highest Educational Qualification	Coeff.	SE
Graduation	7.52	2.14
Post-graduation	4.94	2.14
M.Phil./Ph.D	1.62	2.40

From the results shown in Table 9.19 interpreted that teacher's educational qualification, i.e., graduation, post-graduation, M.Phil./Ph.D. had positive association with attainment of students.

Table 9.20: Highest Teacher Training

Highest Teacher Training	Coeff.	SE
B.Ed.	-3.45	0.50
M.Ed.	-5.26	0.81

Table 9.20 shows that teacher's training qualifications, i.e., Secondary Teacher Training (B.Ed. and M.Ed.) had negative association with achievement of students.

Table 9.21: Teaching Experience

Teaching Experience	Coeff.	SE
6–10 year	3.24	0.53
More than 10 year	6.97	0.55

Table 9.21 shows that teacher's teaching experience is positively associated with achievement of students.

Table 9.22: In-service Training

In-service Training	Coeff.	SE
3–5 month	-0.85	0.48
None	0.60	0.46

Table 9.22 shows that teacher's having attended in-service training programmes had negative association with achievement of students.

Table 9.23: Participation in Activities

Participation in Activities	Coeff.	SE
Qualification Enrichment Programme	-2.29	0.42
Participation in Professional Development Programme	0.64	0.43
Individual or Collaborative Research	0.32	0.45
Mentoring/Peer Observation	2.61	0.41
Engaging in informal dialogue with colleagues to improve teaching	3.08	0.51

Table 9.23 shows that teacher's participation in activities, such as participation in professional development programme, individual or collaborative research, mentoring/peer observation as part of a formal school management and engaging in informal dialogue with colleagues to improve teaching had positive association with achievement of students. However, teacher's participation in qualification enrichment programme had negative association with achievement of students.

9.3.2 Student Achievement of Mathematics

Table 9.24: Highest Educational Qualification

Highest educational qualification	Coeff.	SE
Graduation	-9.45	7.55
Post-graduation	-4.81	7.52
M.Phil./Ph.D.	-6.44	8.52

Results shown in the Table 9.24 reveal that teachers' educational qualification i.e., graduation, post-graduation, M.Phil. /Ph.D. had negative association with achievement of students.

Table 9.25: Highest Teacher Training

Highest teacher training	Coeff.	SE
B.Ed.	-0.94	2.42
M.Ed.	-2.36	3.12

According to the results shown in Table 9.25 the teacher's professional qualification i.e., Secondary Teacher Training (B.Ed.) and M.Ed. had negative association with achievement of students.

Table 9.26: Teaching Experience

Teaching Experience	Coeff.	SE
06–10 years	4.76	2.08
More than 10 years	-1.02	2.20

Teacher's teaching experience of 6–10 years had positive association and experience of more than 10 years had negative association with achievement of students in mathematics (Table 9.26).

Table 9.27: In-service Training

In-service Training	Coeff.	SE
3–5 years	3.98	2.33
None	4.85	1.89

Teachers having attended in-service training programme had positive association with achievement of students (Table 9.27).

Table 9.28: Participation in Activities

Participation in Activities	Coeff.	SE
Qualification Enrichment Programme	-1.75	1.99
Participation in Professional Development Programme	2.92	1.81
Individual or Collaborative Research	1.38	2.04
Mentoring/Peer Observation	3.83	1.74
Engaging in informal dialogue with colleagues to improve teaching	2.69	2.17

Table 9.28 shows that teacher's participation in activities, such as participation in professional

development programme, individual or collaborative research, mentoring/peer observation and engagement in informal dialogue with colleagues to improve teaching had positive association with achievement of students. On the other hand teacher's participation in qualification enrichment programme had negative association with achievement of students.

9.3.3 Student Achievement of MIL

Table 9.29: Highest Educational Qualification

Highest Educational	Coeff.	SE
Graduation	6.90	2.16
Post-graduation	5.63	2.15
M.Phil./Ph.D.	6.28	2.41

Teacher's educational qualification, i.e., graduation, post-graduation, M.Phil./Ph.D. had positive association with achievement of students (Table 9.29).

Table 9.30: Highest Teacher Training

Highest Teacher Training	Coeff	SE
B.Ed.	3.75	0.52
M.Ed.	1.61	0.82

Table 9.30 shows that teacher's training qualifications, i.e., Teacher Training (B.Ed.) and M.Ed. had positive association with achievement of students.

Table 9.31: Teaching Experience

Teaching Experience	Coeff.	SE
06–10 years	3.02	0.53
More than 10 years	5.50	0.55

Table 9.31 shows that teacher's teaching experience is positively associated with achievement of students.

Table 9.32: In-service Training

In-service Training	Coeff.	SE
3–5 month	1.41	0.48
None	-0.06	0.46

Teachers were asked whether they had attended the in-service training programmes and in-service training of teachers had positive association with achievement of students (Table 9.32).

Table 9.33: Participation in Activities

Participation in Activities	Coeff.	SE
Qualification Enrichment Programme	0.51	0.42
Participation in Professional Development Programme	1.01	0.43
Individual or Collaborative Research	-0.48	0.45
Mentoring/Peer Observation	0.42	0.41
Engaging in informal dialogue with colleagues to improve teaching	2.82	0.51

Teacher's participation in qualification enrichment programme, professional development programme, mentoring/peer observation and engagement in informal dialogue with colleagues to improve teaching had positive association with achievement of students. On the other hand teacher's participation in individual or collaborative research had negative association with achievement of students (Table 9.33).

9.3.4 Student Achievement of Science

Table 9.34: Highest Educational Qualification

Highest Educational Qualification	Coeff.	SE
Graduation	2.18	2.09
Post-graduation	2.11	2.09
M.Phil./Ph.D	-1.83	2.36

From the results shown in Table 9.34 interpreted that teacher's educational qualification, i.e., graduation and post-graduation had positive association with attainment of students while higher qualifications such as M.Phil./Ph.D. had negative association with achievement of students.

Table 9.35: Highest Teacher Training

Highest Teacher Training	Coeff.	SE
B.Ed.	-1.82	0.79
M.Ed.	-1.37	0.61

Table 9.35 shows that teacher's training qualifications, i.e., B.Ed. and M.Ed. had negative association with achievement of students.

Table 9.36: Teaching Experience

Teaching Experience	Coeff.	SE
6–10 year	3.09	0.54
More than 10 year	3.26	0.56

Table 9.36 shows that teacher's teaching experience is positively associated with achievement of students.

Table 9.37: In-service Training

In-service Training	Coeff.	SE
3–5 month	0.05	0.49
None	0.01	0.47

Table 9.37 shows that teacher's having attended in-service training programmes had positive association with achievement of students.

Table 9.38: Participation in Activities

Participation in Activities	Coeff.	SE
Qualification Enrichment Programme	-1.71	0.43
Participation in Professional Development Programme	3.05	0.44
Individual or Collaborative Research	1.01	0.46
Mentoring/Peer Observation	0.45	0.42
Engaging in informal dialogue with colleagues to improve teaching	1.24	0.52

Table 9.38 shows that teacher's participation in activities, such as participation in professional development programme, individual or collaborative research, mentoring/peer observation as part of a formal school management and engaging in informal dialogue with colleagues to improve teaching had positive association with achievement of students. However, teacher's participation in qualification enrichment programme had negative association with achievement of students.

9.3.5 Student Achievement of Social Science

Table 9.39: Highest Educational Qualification

Highest Educational Qualification	Coeff.	SE
Graduation	7.34	2.06
Post-graduation	7.71	2.06
M.Phil./Ph.D.	4.68	2.33

From the results shown in Table 9.39 interpreted that teacher's educational qualification, i.e., graduation, post-graduation, M.Phil./Ph.D. had positive association with attainment of students.

Table 9.40: Highest Teacher Training

Highest Teacher Training	Coeff.	SE
B.Ed.	-0.32	0.78
M.Ed.	-1.93	0.60

Table 9.40 shows that teacher's training qualifications, i.e., Secondary Teacher Training (B.Ed. and M.Ed.) had negative association with achievement of students.

Table 9.41: Teaching Experience

Teaching Experience	Coeff.	SE
6–10 years	-0.46	0.54
More than 10 year	-0.08	0.55

Table 9.41 shows that teacher's teaching experience is negatively associated with achievement of students.

Table 9.42: In-service Training

In-service Training	Coeff.	SE
3–5 months	0.74	0.49
None	-0.27	0.47

Table 9.42 shows that teacher's having attended in-service training programmes had positive association with achievement of students.

Table 9.43: Participation in Activities

Participation in Activities	Coeff.	SE
Qualification Enrichment Programme	-0.64	0.43
Participation in Professional Development Programme	0.81	0.44
Individual or Collaborative Research	0.89	0.45
Mentoring/Peer Observation	0.40	0.42
Engaging in informal dialogue with colleagues to improve teaching	1.38	0.51

Table 9.43 shows that teacher's participation in activities, such as participation in professional development programme, individual or collaborative research, mentoring/peer observation as part of a

formal school management and engaging in informal dialogue with colleagues to improve teaching had positive association with achievement of students.

However, teacher's participation in qualification enrichment programme had negative association with achievement of students.

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