

Learning Levels of Grade V Students in Environmental Studies

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Abstract

The Department of Educational Measurement and Evaluation of National Council of Educational Research and Training (NCERT) is an autonomous organisation under the Government of India. This department conducts the National Achievement Surveys (NAS) at different stages of school education under the *Sarva Shiksha Abhiyan* (Educational for All), a flagship programme of Government of India. The purpose of the NAS is to know the learning levels of students in different subjects across the states in the country periodically and provide inputs to the policy makers, researchers and others for improving the system.

The present study of grade V was initiated in 2009 and data was collected from 1, 22, 543 students and 6,602 schools covering 35 States and Union Territories. Sample was drawn from government and government aided schools by using Population Proportion Sampling (PPS) and Simple Random Sampling (SRS) methods. Using multiple choice items three forms of test booklets were developed in each subject i.e., Language, Mathematics and Environmental Studies (EVS) using Item Response Theory (IRT).

Moving away from Classical Test Theory (CTT), Item Response Theory (IRT) is used to obtain scaled scores of students. Students' scores were calibrated on a scale of 0-500. For knowing what students can do, students' ability and items difficulty was computed. The research findings in Environmental Studies indicate that the average achievement across the states varies significantly.

Key words: Achievement Surveys, Learning Achievement, Sarva Shiksha Abhiyan

Introduction

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

History of NAS in India

In the year 2000, the programme of NAS, originally conceived by NCERT as an independent project, was incorporated into the Government's flagship project *Sarva Shiksha Abhiyan* (SSA). NCERT is responsible for developing and conducting the surveys whilst funding is provided by the Ministry of Human Resource Development (MHRD), Government of India.

Within SSA, three cycles of NAS were planned. Each cycle was to cover three key grades: Class III, Class V and Class VII/VIII. The first cycle, conducted in the period 2001-2004 was named as the Baseline Achievement Survey (BAS). The second cycle, conducted during the period 2005-2008 was called the Mid-term Achievement Survey (MAS). The third cycle was originally named as the Terminal Achievement Survey (TAS) and presently known as 'Cycle 3' as given in the Table 1.1 below:

Table 1.1: Timeline for NAS under SSA

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

* The findings of the Cycle 3, Class V (NAS) are reported herein. **Cycle 3 (NAS) for Class VIII is in progress while class III is initiated.

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

Methodology

Objectives:

- To study the achievement level of students of Class V in Language, Mathematics and Environmental Studies.
- To study the difference in achievement with regard to area, gender and social groups.

Sample:

The Class V (NAS) was designed to investigate learning achievement in the government system at the State/UT level. Hence, the target population for the survey was all Class V students studying in government schools, local body schools, and government-aided schools.

In general, the sample design for each state/UT involved a three-stage cluster design which used a combination of two probability sampling methods. At the first stage, districts were selected using Probability Proportional to Size (PPS) sampling principle. This means that the probability of selecting a particular district depended on the number of Class V students enrolled in that district. At the second stage, in the chosen districts, the requisite number of schools was selected. Once again, PPS principles were used so that large schools had a higher probability of selection than smaller schools. At the third stage, the required number of

students in each school was selected using the Simple Random Sampling (SRS) method. In schools where Class V had multiple sections, an extra stage of selection was added with one section being sampled at random i.e. using SRS.

In the survey, PPS sampling was based on Class V enrolment data from the District Information System for Education (DISE) 2007/08. SRS sampling was conducted according to the class registers available in sampled schools. Although the DISE data was not free from criticism, it was used because it was considered to be the most complete and up to date enrolment data available at the time of sampling. Unfortunately, due to discrepancies in the DISE data, limitations in the sampling method and loss of information at the sampling and administration stages of the survey, it was impossible to estimate sample weights for the survey.

In this survey, information gathered through tests and questionnaires administered to a sample comprising 1,22,543 students in 6,602 schools across 31 States and Union Territories (UT). The subjects covered were Mathematics, Language (including Reading Comprehension) and Environmental Studies (EVS).

Survey Instruments

Development of instruments is one of the most important activities of the survey. This includes test booklets and questionnaires. For Class V, there are three main subjects on which the learning is focussed: Language, Mathematics and Environmental Studies. In this paper only Environmental Studies is covered.

Tests

Before developing the tests, assessment frameworks were developed in each subject. The frameworks describe the competencies to be covered in the tests, the type of items to be used, the number of items to be used for testing each competency, the structure of the test forms and number of tests.

A large number of test items were prepared in each subject and translated into the fifteen regional languages necessary for testing across the different states of India. These were then piloted in each state to see how the items worked in different languages. The difficulty level and discrimination index were computed for each item. This and other evidence allowed suitable items to be selected for the final tests.

In an important development from earlier surveys, instead of one booklet, three booklets for each subject were prepared. Further steps were taken to ensure that the different test booklets in a particular subject could be linked together. This was done by including a block of common items in each booklet. These are the 'anchor items' which, through the application of Item Response Theory, allow us to place the scores from all three booklets on the same scale.

Analysis and Interpretation of Data:

For the Class V (NAS), each test form of EVS consisted of 40 multiple-choice items. Of these, 20 were anchor items which appeared in all the test forms. Thus overall 80 unique items were used to measure learning achievement.

The responses of students to the various tasks were analysed using Item Response Theory. The three test forms were then aligned using the anchor items thereby placing all items on a single scale comprising scores from 0 to 500. On this scale, the mean score was set at 250 with a standard deviation of 50.

The 20 States and UTs represented in Table 1.2 are those in which Class V students were tested and where the sample covered at least 80% of the target population. The average score for this group was 249 (with a standard error of 0.7). The results reveal substantial differences in EVS achievement between the highest performing state (288 for Tamil Nadu) and the lowest performing state (222 for Puducherry). In EVS, seven states had average scores significantly above that of the group; nine states had average scores significantly below that of the group; four states had average scores that were not significantly different from that of the group.

Table 1.2: Average EVS scores for States and Union Territories where Class V students were tested and the population coverage was >80%

State or Union Territory	Average Score	Standard Error	Significant Difference
A & N Islands	233	3.1	U
Andhra Pradesh	238	2.0	U
Bihar	236	3.1	U
Chandigarh	226	2.1	U
Chhattisgarh	234	3.7	U
Delhi	262	3.2	U
Gujarat	250	2.9	●
Haryana	232	2.2	U
Himachal Pradesh	243	2.9	U
Jammu & Kashmir	258	2.9	U
Karnataka	275	2.7	U
Madhya Pradesh	264	3.3	U
Orissa	253	3.0	●
Puducherry	222	3.1	U
Punjab	245	2.9	●
Rajasthan	246	3.1	●
Tamil Nadu	288	2.7	U
Tripura	257	3.3	U
Uttar Pradesh	284	3.6	U
Uttarakhand	237	3.0	U
Group Average	249	0.7	

- The state's average score is not significantly different to that of the group.
- ⤴ The state's average score is significantly above that of the group.
- ⤵ The state's average score is significantly below that of the group.

The five States and UTs represented in Table 1.3 are those in which Class V students were tested but where the sample covered less than 80% of the target population. For this group, great care should be taken when considering an average score as it may not be a reliable measure for the whole State/UT. For this reason, no average score is calculated for this group.

Table 1.3: Average EVS scores for States and Union Territories where Class V students were tested and the population coverage was <80%

State or Union Territory	Average Score	Standard Error	Significant Difference
Assam	239	2.1	⤵
Daman & Diu	255	6.8	●
Goa	235	3.2	⤵
Kerala	252	1.6	●
Maharashtra	263	2.3	⤴

- The state's average score is not significantly different to that of the group.
- ⤴ The state's average score is significantly above that of the group.
- ⤵ The state's average score is significantly below that of the group.

The six states represented in Table 1.4 are those in which Class VI students were tested. For this group, the average EVS score was 254 (standard error 1.1). West Bengal performed significantly better than the group average whereas the average scores of Sikkim and Jharkhand were significantly below the group average.

Table 1.4: Average EVS scores for States where Class VI students were tested

State or Union Territory	Average Score	Standard Error	Significant Difference
Jharkhand	245	3.6	⤵
Meghalaya	256	2.7	●
Mizoram	255	1.0	●
Nagaland	255	3.7	●
Sikkim	245	1.8	⤵
West Bengal	266	2.4	⤴
Group Average	254	1.1	

- The state's average score is not significantly different to that of the group.
- ⤴ The state's average score is significantly above that of the group.
- ⤵ The state's average score is significantly below that of the group.

Table 1.5 illustrates the range of achievement within states and across groups of states. The tables list the scores achieved by students at key *percentiles*. For example, the score at the 25th percentile is the score which 75% of students achieve or surpass: the score at the 90th percentile is the score that 10% of students achieve or surpass.

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

Table 1.5: Percentile scores in EVS for States where Class V students were tested and the population coverage was >80%

State or Union Territory	10 th percentile	25 th percentile	50 th percentile	75 th percentile	90 th percentile	Range 75-25	Range 90-10
A & N Islands	182	204	227	260	290	56	108
Andhra Pradesh	184	215	228	269	292	54	108
Bihar	177	194	227	274	315	80	138
Chandigarh	183	203	226	241	272	38	89
Chhattisgarh	170	190	227	271	318	81	149
Delhi	201	227	263	292	332	66	131
Gujarat	186	222	240	280	319	58	133
Haryana	180	203	227	259	290	56	110
Himachal Pradesh	184	216	231	272	309	56	125
Jammu & Kashmir	182	222	265	300	331	78	148
Karnataka	212	232	275	316	341	84	129
Madhya Pradesh	186	225	271	308	335	83	149
Orissa	181	222	250	292	324	69	143
Puducherry	179	192	223	235	271	43	92
Punjab	186	219	232	273	314	54	128
Rajasthan	181	212	236	280	320	68	139
Tamil Nadu	225	250	283	327	356	77	132
Tripura	186	224	263	295	326	70	140
Uttar Pradesh	218	239	281	328	355	89	137
Uttarakhand	179	207	229	271	300	63	121
Group Distribution	188	216	245	282	316	66	128

Note: Ranges may not agree due to rounding.

The inter-quartile range (i.e. the range between the 75th and 25th percentiles) is highly variable. For example, Chandigarh has an inter-quartile range of just 38 whilst Uttar Pradesh has a corresponding value of 89. These values suggest that the Class V population in Chandigarh is far more homogeneous than that of Uttar Pradesh. In most states, the range of performance for the middle group was between 50 and 80 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 90 percent of the population, is highly variable ranging from 89 (Chandigarh) to 149 (Chhattisgarh and Madhya Pradesh).

The percentiles provide additional information when comparing EVS 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 average score of Bihar (236) and Andhra Pradesh (238). However, the score ranges between the 25th and 75th percentiles are very different: Bihar's range is 80 compared with Andhra Pradesh range of 54. This indicates that whilst average achievement is very similar in the two areas, Bihar has more heterogeneous group of Class V students than the Andhra Pradesh.

Table 1.6: Percentile scores in EVS for States where Class V students were tested and the population coverage was <80%

State or Union Territory	10 th percentile	25 th percentile	50 th percentile	75 th percentile	90 th percentile	Range 75-25	Range 90-10
Assam	182	211	230	272	296	60	114
Daman & Diu	194	224	250	283	326	59	132
Goa	188	214	228	261	284	47	96
Kerala	207	227	257	275	296	48	90
Maharashtra	199	227	265	299	334	72	135

Table 1.7: Percentile scores in EVS for States where Class VI students were tested

State or Union Territory	10 th percentile	25 th percentile	50 th percentile	75 th percentile	90 th percentile	Range 75-25	Range 90-10
Jharkhand	178	202	231	281	328	79	150
Meghalaya	199	225	250	281	322	56	123
Mizoram	220	230	263	275	289	46	69
Nagaland	185	220	242	296	332	76	147
Sikkim	209	226	237	271	282	44	73
Group Distribution	201	222	249	283	313	61	112

The inter-quartile range for the states where Class VI students were tested varied considerably from about 44 scale-points in Sikkim and Mizoram to more than 75 points in Nagaland and Jharkhand. The range of scale-points covering the population from the 10th to the 90th percentile varied dramatically from the diverse state of Jharkhand (150) to Mizoram (69) where relatively little difference between high and low performing student was detected. Performance between 10th and 90th percentile, which includes 90 percent of the population, was between 69 for Mizoram and 150 points for Jharkhand. It can be seen that even though West Bengal has the highest median performance (270), Nagaland has a higher score at the 90th percentile suggesting that its high achieving students do extremely well.

How did Various Groups Perform in Environmental Studies?

Performance is compared by gender, by school location, and by social category. (The quoted scores were calculated for the 20 States and UTs where students were tested in Class V and coverage of the population was at least 80% since this group gives the most reliable picture.)

Are there any gender related-differences in EVS achievement?

The average EVS scores achieved by boys and girls shows that, within this group of states, no significant difference was detected in the average achievement levels of the two groups. In general, the general result, i.e. no significant difference between the average achievement of boys and girls holds for all states and UTs.

Are there any differences in EVS achievement related to school location?

The average EVS scores achieved by students in rural and urban schools shows that within this group of states, no significant difference was detected in the average achievement levels of the two groups.

In general, no significant difference between rural and urban students holds for all states and UTs. However, four exceptional cases were detected: in A & N Islands, Daman and Diu and Nagaland the rural students outperformed the urban students whereas in Goa the urban students outperformed the rural students by a margin which is statistically significant.

Are there any differences in EVS achievement related to caste category?

Table 1.8 compares the average EVS scores achieved by students in different social categories. It shows that, within this group of states, no significant difference was detected in the average achievement levels of students in the SC and ST categories. Students classified as being in the OBC category group significantly outperformed those in the ST group. On average, students in the general category achieved significantly higher scores than those in other categories.

Table 1.8: Average EVS scores for groups by social category (Class V)

Category	Average (SE)	SC	ST	OBC	General
SC	245 (1.1)	-	●	⬇	⬇
ST	245 (1.8)	●	-	⬇	⬇
OBC	250 (1.1)	⬆	⬆	-	⬇
General	254 (1.2)	⬆	⬆	⬆	-

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

Conclusion

The average achievement of students in environmental studies varies greatly across the States and UTs of India. There is a highly significant difference between outcomes in high scoring States such as Tamil Nadu (288), Uttar Pradesh (284) and Karnataka (275) and low scoring States/UTs such as Puducherry (222), Chandigarh (226) and Haryana (232).

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, e.g. Chandigarh (38), Puducherry (43) and Sikkim (44) have relatively homogeneous cohorts whilst others have far more diverse outcomes e.g. Uttar Pradesh (89), Karnataka (84) and Madhya Pradesh (83).

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

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

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