IMPLEMENTING A LARGE-SCALE ASSESSMENT SURVEY TO UNDERSTAND THE LEARNING LEVELS FOR POLICY IMPLICATIONS AND TO IMPROVE TEACHING-LEARNING

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The Ministry of Education (MoE), India, in 2017, conducted the National Achievement Survey (NAS) to understand the learning levels of the students in Classes III, V and VIII, to assist in policy implications and to improve teaching-learning. The survey tools used competence based multiple test questions, 45 in Classes III and V and 60 in Class VIII in mathematics, language, sciences and social sciences mapping the learning outcomes corresponding to the three grades. Questionnaires pertaining to students, teachers and schools were also used. The sample consisted of 2.2 million students from 1,10,000 schools across 701 districts from all 36 States/UTs. The results were analysed using both the Classical Test Theory (CTT) and the Item Response Theory (IRT). The findings of the survey helped to guide education policy and enabled differential planning at the district level for improving classroom level teaching-learning.

Keywords: Assessment, large scale studies, School education, National Achievement Survey.

Introduction

Large-scale assessments are common worldwide for understanding the trends in educational systems. In India too, the National Achievement Survey (NAS) provides an effective and a robust dataset for informed policymaking in the field of school education for the country.

NAS 2017, a school-based assessment, reports a fair and an accurate statement of the educational health at the district level for all States and Union Territories in India. It is technically robust and assess the learning levels of students at Classes III, V and VIII vis-a-vis the delineated grade specific learning outcomes.

Due to its large scale, NAS requires a careful and a detailed planning, execution and close monitoring of its implementation, using several quality-control measures. It was subject to scrutiny before national and international experts. During the test development process, each question went through standard technical rigours, while formatting and during translations into twenty languages, before final acceptance. A cadre of field investigators were trained to administer the tests, which was monitored with quality control checks at different levels. The raw data from each district were examined to make sure that no anomalies existed, and all analyses were scrutinised thoroughly. Finally, reports were transcribed, carefully reviewed, and then disseminated in a format suitable for the various stakeholders.

Methodology

Item Development

Test items (questions) were developed in English, through workshop mode, in consultation with teachers, subject experts

and several other assessment agencies in the country. Multiple Choice Questions (MCQ) were developed which consisted of stem (question) and four options (one correct and three distractors). Optical Mark Recognition (OMR) sheets were used during the field test for recording the responses. This was necessitated to obliviate ambiguity and consequent complications at the time of analysis. Efforts were made to develop items of varying degree of difficulty levels and complexities, for as many Learning Outcomes (LO) as possible. Illustrations/ diagrams were used to break the monotony. Developed tests were translated and field tested in 20 languages (Assamese, Bengali, English, Gujarati, Garo, Hindi, Kannada, Khasi, Konkani, Marathi, Malayalam, Manipuri, Mizo, Odia, Punjabi, Tamil, Telugu, Urdu, Bodo and Kokborok (a Sino-Tibetan native language of the Borok people of Tripura). Multiple test booklet matrix design was used wherein two test forms were developed for each class, consisting of 45 questions for Classes III and V and 60 questions for Class VIII. For each subject, first 5 items were kept common across both the test forms.

Contextualising the Student Achievement

In NAS, the participating students, their teachers and school principals completed questionnaires to provide data about school and classroom resources and to understand about students' home contexts for learning. Three questionnaires, i.e., Pupil Questionnaire (PQ), Teacher Questionnaire (TQ) and School Questionnaire (SQ) were developed and administered to study the association of the background variables with the achievement of the students in all the three grades.

Use of Technology

One of the major highlights was the use of technology. A web application developed to scan the OMR at the district level and to upload the .csv files to auto generate the district level reports.

Sample Selection

The sampling frame consisted of a comprehensive list of schools from the district. The district was taken as the unit for sampling. Each school entry in the frame had the following:

- a unique school ID
- school contact information such as name, physical address, email address, phone number, etc
- explicit stratification variables, i.e., the district name
- implicit stratification variables, i.e., block, area, management, type of school, and medium of instruction
- a school measure of size, i.e., the total number of students in the school

A two-stage stratified sample design was used as follows:

- For the first stage of sampling, schools were selected with probabilities proportional to size (PPS).
- The second stage of sampling consisted of the selection of section (if there were more than one section) in each sampled school.

NAS for Classes III, V and VIII required participation rates for schools and students to be 85 per cent. To compensate for a sampled

school that did not participate, two potential replacement schools were identified. The above requirement minimised the potential for response biases.

Training

Orientation of State Coordinators at the district level was provided by the National Council of Educational Research and Training (NCERT). District Coordinators (DC) and Management Information System (MIS) Coordinators were trained on NAS procedures through workshops organised, who in turn trained Field Investigators (FI).

Training was provided on the following aspects of NAS administration:

- Roles and responsibilities of different personnel involved in NAS administration
- Sampling of section and students in the schools selected
- Administration of test and questionnaires
- Test monitoring
- Data cleaning and uploading, etc

Sessions on all the above aspects were conducted through interactive and activity-based mode with the use of demonstration and group work as facilitation techniques. A comprehensive set of training material was shared with the participants prior to the commencement of the workshops with an aim for an enhancement in their understanding of the processes. Training material consisted of PowerPoint Presentation on administration and videos on roles and responsibilities of stakeholders, made available online along with sharing of the hard copies of the training module which laid down in detail the standard operating procedures. The complete training package is available at:

- http://www.ncert.nic.in/programmes/NAS/Training.html

Administration Process

The field investigators were drawn from amongst the teacher trainees from the colleges and institutes of education. The field investigators were given rigorous standardised training by the master trainers who in turn were trained by the National Council of Educational Research and Training (NCERT). A cadre of master trainers was developed by NCERT, who were subsequently responsible for training the FIs. To conduct NAS 2017, approximately two lakh field investigators were involved.

Over 6000 observers were appointed by the offices of the Chief Secretaries/Commissioners of every state/Union Territory (UT). They were drawn from amongst Class I and Class II officials of departments, other than the Education Department of the state/UT. These observers acted as third-party witnesses on the day of the NAS test, as a check on malpractices, if any.

Results and Discussion

Within the domain of psychometry, two approaches were used for analysing test data, i.e., Classical Test Theory (CTT) and the Item Response Theory (IRT). Though use of Item Response Theory (IRT) in analysing the results of the large-scale assessment is in vogue at the international levels, NAS 2017 utilised both the approaches, in accordance with the requirements of the stakeholders. The analysis for developing the district report

cards and State learning reports was done using a Classical Test Theory (CTT) and Item response theory was used to produce the National Technical report. The use of IRT becomes pertinent as it supports the test development process and construct validation. Also, the use of modelling in conjunction with multiple imputation methodology allowed the construction of a performance scale.

NAS 2017, through elaborate statistical analyses, produced outputs and created the following reports:

- District Report Cards (DRCs)
- State Learning Reports (SLRs)
- National Report, to inform Policy, Practices and Teaching Learning (NPPTL)

District Report Cards (DRCs)

District was taken as the unit of reporting. Within two months of the administration of NAS 2017, district level results, communicated through the DRCs, were put in the public domain (https://ncert.nic.in/DRC.php).

NAS was conducted in 701 districts and in each district, there were 10 report cards, three each for Classes III and V and four for Class VIII. Thus, there were in all 7010 report cards. The DRCs were developed with the primary purpose of communicating to the respective districts, the performance of their students, on the competencies spelt out on the Learning Outcomes (LOs). DRCs also indicate the LOs on which students performed the lowest and required maximum support.

Each DRC included information on the following heads:

- Overall learning levels of the district, shown by the overall performance of the district in a subject, i.e., a 55 per cent on science meant that students of a district correctly responded to 55 per cent of the items in science.
- Disaggregated learning levels by gender, location, social groups, and school management, depicted by the percentage of questions which various subgroups (e.g., boys and girls) correctly responded to in a subject.
- Performance against each of the learning outcomes, reported by student achievement against a LO, for example, a 45 per cent against a LO meant that 45 per cent of the students in a district could correctly answer the questions measuring the LO.
- Distribution of learning level shown by the range/number of students who correctly responded to questions in a class and a subject. Number of students scoring within each of the following four performance slabs were shown (below 30 per cent, 30-50 per cent, 50-75 per cent and above 75 per cent).
- Identify five learning outcomes on which children required maximal support.

State Learning Reports (SLRs)

There are in all 36 SLRs generated based on the NAS. After the production of the DRCs, a single State Learning Report (SLR) was developed for each State (and UTs). Each SLR gave an overview of the State's performance on all the tested LOs for each class and subject. Based on the SLR results,

State level officials were expected to provide academic support towards the district-wise implementation of interventions designed to improve student attainment of LOs.

- https://ncert.nic.in/src.php?ln=#:~:text=State%20Reports%202017%2D18&text=The%20National%20Achievement%20Survey%20(NAS,government%20and%20government%20aided%20schools.&text=The%20learning%20levels%20of%202.2,36%20States%2FUTs%20were%20assessed.

SLR provides information on the following points:

- Class-wise participation of students/teachers and school principals in the survey.
- Average State/UT achievement by classes and subjects against the National Achievement.
- Distribution of students in different achievement levels (0–30%, 30–50%, 50–75%, above 75%) by classes and by subjects.
- Disaggregated performance in terms of gender, location, management, and social groups.
- Students' perceptions about coming to school, difficulty faced in travelling to school, understand what the teacher says in the class, etc.
- Teachers' responses to a few aspects of schools and schooling such as infrastructure; availability of instructional material; classroom assessment practices and parental involvement, etc. (school and teacher questionnaires).
- A composite score to indicate the average performance of a district across classes and subjects.
- Performance of the LOs in the state.

All the results in the SLRs were computed using the Classical Test Theory (CTT) and reported through percentages.

National Report to Inform Policy, Practices and Teaching-learning

National Report to Inform Policy, Practices and Teaching-learning is meant for reference of researchers, assessment specialists with existing technical understanding of assessments and in large scale quantitative data sets.

This report provides information on the following aspects of the assessment:

- Assessment framework and NAS tools (tests and questionnaires)
- Psychometric analysis of the test items
- Sampling design and detailed procedures
- Procedures followed, including field operations, data analysis and limitations
- Descriptions of student achievement in scale scores using IRT, including differences between subgroups
- Representation of achievement in scale scores using IRT
- Computation of achievement proficiency bands
- Association of Background Variables that correlate against achievement
- Achievement shown against proficiency

bands

NAS Mobile Application

A user-friendly mobile application for NAS 2017 was also developed. The application enabled users to run queries on the NAS 2017 data and visualise the reported data in the form of maps, charts and tables. The mobile application is available on the android platform.

NAS Results for Policy Implications

Performance of States/UTs in Class III

Analysis of the data showed that the performance of Class III students in the learning outcomes of language is low in the States of Arunachal Pradesh, Lakshadweep, Uttar Pradesh, Puducherry and Delhi. In mathematics, the performance was lower than the national average in the States of Arunachal Pradesh, Delhi, Punjab, Meghalaya, and Haryana. Performance in the learning outcomes of Environmental Studies was low in the States of Arunachal Pradesh, Lakshadweep, Uttar Pradesh, Delhi, and Sikkim. Overall, the performance of the students in mathematics was found to be lower as compared to the other subjects. States/UTs in which ST students performed better than other social groups in languages were Nagaland, Manipur, and Tamil Nadu. States/UTs in which SC students performed better than general category students in languages were Manipur, Karnataka, and Tamil Nadu. States/UTs in which ST students performed better than other social groups in mathematics were Delhi, Arunachal Pradesh, Nagaland, and Manipur. States/UTs in which ST students performed better than other social groups in EVS were Delhi, Arunachal Pradesh, and Manipur. Performance of the rural students in the learning outcomes of language was found to be higher in the following States: Andhra Pradesh, Karnataka, Uttarakhand, Nagaland, and Maharashtra. Performance of the rural students in the learning outcomes of mathematics was found to be higher in the following States: Karnataka, Andhra Pradesh, Uttarakhand, Maharashtra, and Himachal Pradesh. Performance of the rural students in the learning outcomes of EVS was found to be higher in the following States: Karnataka, Andhra Pradesh, Uttarakhand, Maharashtra, and Himachal Pradesh.

Some of the low performing learning outcomes (LOs) in the States/UTs were:

Language

- Reads small text with comprehension, i.e., identifies main ideas, details, sequence and draws conclusion.

Mathematics

- Fills a given region leaving no gaps using a tile of a given shape.
- Extends patterns in simple shapes and numbers.

Environmental Studies

- Observes rules in games (local, indoor, outdoor).
- Records observations, experiences, information on objects/activities/places visited.
- Identifies simple features of animals and birds in the immediate surroundings.

Performance of States/UTs in Class V

Performance in the learning outcomes of

language is low in the States of Arunachal Pradesh, Meghalaya, Sikkim, Uttar Pradesh, and Puducherry. In mathematics, States in which the performance was low were Arunachal Pradesh, Sikkim, Meghalaya, Delhi, and Daman and Diu. Performance in the learning outcomes of Environmental Studies was found to be low in the States of Arunachal Pradesh, Sikkim, Meghalaya, Lakshadweep, and Daman and Diu. Performance of the girls in the learning outcomes of language was found to be higher in the following States: Kerala, Karnataka, Maharashtra, Gujarat, and Jharkhand. In mathematics girls performed better in the States of Karnataka, Jharkhand, Gujarat, Maharashtra, and Tamil Nadu. While in EVS, the girls were ahead in the States of Kerala, Karnataka, Jharkhand, Assam, and Gujarat. Performance of the rural students in the learning outcomes of language was found to be higher in the States of Kerala, Karnataka, Maharashtra, Nagaland and Chhattisgarh. While performance of the rural students in the learning outcomes of mathematics was found to be higher in the States of Karnataka, Kerala, Assam, Uttarakhand, and Delhi. In EVS, the rural students did better in the States of Kerala, Karnataka, Uttarakhand, Assam, and Odisha.

Some of the low performing learning outcomes (LOs) in the States/UTs were:

Language

- Reads and comprehends independently story books, news items/headlines, advertisements, etc.

Mathematics

- Estimates the volume of a solid body in known units.
- Identifies and forms equivalent fraction of a given fraction.
- Applies operations of numbers in daily life situations.

Environmental Studies

- Establishes linkages among terrain, climate resources (food, water, shelter, livelihood) and cultural life (example, life in distant/difficult areas like hot/cold deserts).
- Groups objects, materials, activities for features/properties such as shape, taste, colour, texture, sounds, traits, etc.
- Guesses (properties, conditions of phenomena), estimates spatial quantities (distance, area, volume, weight) and time in simple standard units and verifies using simple tools/setups.

Performance of States/UTs in Class VIII

Performance in the learning outcomes of language is low in the States of Nagaland, Jammu and Kashmir, Puducherry, Arunachal Pradesh, and Mizoram. In mathematics the States of Puducherry, Sikkim, Daman and Diu, Punjab, and Delhi performed lower than the average performance of the nation as a whole. The States/UTs whose performance in sciences is low are Puducherry, Lakshadweep, Nagaland, Daman and Diu, and Delhi. Performance of Social Science is low in Puducherry, Lakshadweep, Tamil Nadu, Mizoram, and Daman and Diu. In languages, in the State of Gujarat, Kerala, Maharashtra, Karnataka and Chandigarh girls performed better than the boys. In

mathematics, the States in which girls did better were Jharkhand, Karnataka, Gujarat, Madhya Pradesh, and Maharashtra. In the States of Karnataka, Gujarat, Andhra Pradesh, and Tamil Nadu, girls did better than the boys in sciences. Performance of the girls in the learning outcomes of social science was found to be higher in the States/UTs of Gujarat, Chandigarh, Karnataka, Andhra Pradesh, and Haryana. Performance of the rural students in the learning outcomes of language was found to be higher in the States/UTs of Gujarat, Chandigarh, Karnataka, Uttarakhand, and Andhra Pradesh. Learning outcomes of mathematics was found to be higher in the States of Rajasthan, Jharkhand, Karnataka, Andhra Pradesh, and Gujarat. Rural students did better in science than their urban counterparts in the States of Rajasthan, Karnataka, Jharkhand, Gujarat and Andhra Pradesh. Achievement of the learning outcome of social science was found to be higher for the rural students in the States of Rajasthan, Gujarat, Jharkhand, Karnataka and Andhra Pradesh.

Some of the low performing learning outcomes (LOs) in the States/UTs were:

Language

- Reads textual/non-textual material with comprehension and identifies the details, characters, main idea, and sequence of ideas and events while reading.

Mathematics

- Finds surface area and volume of cuboidal and cylindrical objects.
- Generalises properties of addition and subtraction, multiplication and division.
- Finds out approximate area of closed shapes by using units, square grid/graph.
- Solves problems related to conversion of percentage to fraction and decimals and vice versa.
- Arranges given/collected information in the form of table, pictograph and bar graph and interprets them.
- Uses exponential form of numbers to simplify problems involving multiplication and division of large numbers.

Science

- Understands simple investigation to seek answers to queries.
- Explains processes and phenomenon.

Social Science

- Describes the functioning of rural and urban local government bodies in sectors like health and education.
- Analyses the decline of pre-existing urban centres and handicraft industries and the development of new urban centres and industries in India during the colonial period.
- Locates important historical sites, places on outline map of India.
- Locates distribution of important minerals, e.g., coal and mineral oil on the world map.
- Draws interrelationship between types of farming and development in different regions of the world.
- Applies the knowledge of the

fundamental rights to find out about their violation, protection and promotion in each situation.

- Identifies the role of government in providing public facilities such as water, sanitation, road, electricity, etc., and recognises their availability.

Discussion and Conclusion

In India, NAS presents a system level reflection on effectiveness of school education in the country. NAS is embedded in a rich system of background variables. These variables help to contextualise the achievement of the students. The synthesis of the results at the national level becomes a unique source for the development of Indian education system. The sample for NAS is drawn from all government and government aided schools. Inclusion of all those in the government set up majorly helps to understand the delivery of the system. Also, in the near future, it is envisaged to broaden the sample framework of NAS to include the private schools as well.

Given India's present situation, it may not be possible to emulate the examples of the developed countries such as Finland and Singapore and to do away totally with the national large-scale assessment focusing only on school-based assessment. Though the practices being followed in such developed countries should be the ultimate goal, at present a blended environment which has both, will be more appropriate. The argument towards a blended approach is crystallised by the Performance Grading Index (PGI) of the Department of School Education and Literacy, MoE, wherein all 36 States and UTs are at different levels. While a lot still needs to be done, the good news is that some states and UTs, such as Karnataka, Rajasthan, Kerala, Gujarat and Chandigarh, etc., are excellently positioned to reach the standards in school education which are comparable to those in the developed countries. In these states and UTs, therefore, it would be admissible to focus on School Based Assessment (SBA) along with intensive training of teachers vis-à-vis those where a more autocratic learning assessment would be desirable. It is expected that the initiatives of the Department of School Education and Literacy, i.e., PGI, and SBA together will create a situation for learning outcomes to improve through a sustainable methodology.

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