

Annual Status of Education Report (ASER) and National Achievement Surveys (NAS): a comparison

Overview

Two large scale nationwide learning assessments are currently conducted in India at the elementary stage. Pratham/ASER Centre's Annual Status of Education Report (ASER) has been brought out annually since 2005, with the exception of 2015.¹ The National Council of Educational Research and Training (NCERT) has conducted National Achievement Surveys (NAS) periodically since 2001 for grades III, V and VIII.² These two sources are frequently cited in discussions on learning outcomes in India.

Although both ASER and NAS are large scale assessments of learning, they are not designed for the same purpose. As a result, they are different in terms of sampling, test design and content, methodology and time frame of assessment. Results of ASER and NAS are computed, reported, and disseminated very differently.

Since estimates generated by ASER and NAS surveys neither cover the same populations nor assess the same content, their results are not comparable. **However, it is worth highlighting one significant common finding: both ASER and NAS data indicate a trend of declining learning levels in language and mathematics among children in Std V.**³

This note summarizes major differences between ASER and NAS. It is based on ASER 2005–2016⁴ and a set of NAS documents⁵ pertaining to elementary education.⁶

Institutions

ASER is facilitated by Pratham, a non-governmental organisation (NGO), and carried out by partner institutions in almost all rural districts of the country. These partner institutions may be colleges, universities, District Institutes of Education and Training (DIETs) and other teacher training institutes, NGOs or other types of formal or informal organisations. While many government institutions participate in conducting ASER, no funds are accepted from any government source. External evaluations and process audits of the ASER methodology are conducted from time to time by independent bodies.

NAS is carried out by the Educational Survey Division (ESD) of the NCERT under the mandate of the Government of India's flagship programme for elementary education, Sarva Shiksha Abhiyan (SSA). The survey is coordinated at the state level by bodies such as State Councils of Educational Research and Training (SCERTs) and State Institutes of Education (SIEs), and is implemented on the field by field investigators, mostly comprising DIET faculty. External technical assistance has been provided by a team of experts known as Technical Services Agency (TSA).⁷

Objectives

ASER's objective is to provide annual, reliable, current and actionable evidence relating to enrollment and basic learning outcomes of children in rural India. It is designed to generate district, state, and national level estimates of children's schooling status for all children aged 3–16, and estimates of

NAS is conducted to "monitor improvement in children's learning levels and to periodically assess the health of the government education system as a whole".⁸ The purpose of the NAS surveys is to "obtain an overall picture of what students in specific classes know and can do and to use these findings to

¹ In 2015, ASER was conducted in two states - Maharashtra and Punjab. See <http://www.asercentre.org/Keywords/p/276.html>

² The timeline of NAS assessments conducted so far is as follows:
(Source: NAS (Cycle3) Class III : Achievement Highlights, NCERT, 2014)

| Cycle/Class | Class III | Class V | Class VIII |
|-------------|-----------|---------|------------|
| Cycle 1 | 2003-04 | 2001-02 | 2002-03 |
| Cycle 2 | 2007-08 | 2005-06 | 2007-08 |
| Cycle 3 | 2012-13 | 2009-11 | 2010-13 |
| Cycle 4 | | 2014 | |

³ Based on comparison of results of NAS (Cycle 3) Class V and NAS (Cycle 4) Class V surveys, it was found that 19 out of 31 states/union territories which participated in both cycles show a significant decline in learning outcomes in language and mathematics. The steepest declines were observed in Uttar Pradesh, Madhya Pradesh and Maharashtra. Learning levels in both subjects were found to be stagnant in 10 states/union territories, while significant improvement was observed only in Andaman & Nicobar and Puducherry.

⁴ See www.asercentre.org for ASER reports from 2005 to 2016 and ASER process documentation.

⁵ These include documents available on the NCERT, MHRD and RMSA websites, such as final reports, summary reports, technical papers etc. Website of SSA was not functional throughout October–December, 2016.

⁶ Cycle 1 of NAS Class X was conducted under the aegis of RMSA during 2014–15. However, this survey has not been considered for this note, as it does not pertain to elementary education.

⁷ Technical Services Agency (TSA) is a team of experts enlisted for medium-term technical assistance. The team is funded by DFID-UK and coordinated by Cambridge Education.

⁸ NAS (Cycle 3) Class III: Achievement Highlights 2014 (p.1).

basic ability in reading and arithmetic for all children aged 5-16.

ASER is therefore designed as a household based survey so as to include all children: those enrolled in government schools, private schools and other types of schools, as well as those not enrolled in school.

Sampling and coverage

ASER aims to reach all rural districts each year. It is a nationwide sample based household survey. It employs a two-stage sample design. At the first stage, 30 villages are selected in each rural district from the Census⁹ directory using Probability Proportional to Size (PPS). In the second stage, 20 households are randomly selected in each village. Surveyors are provided with standardised instructions on sampling of households from various sections/hamlets within a village. All children aged 3-16 who regularly reside in the sampled households are surveyed. Of these, all children aged 5-16 are assessed.¹⁰

ASER 2016 reached 350,232 households in 589 rural districts. 562,305 children aged 3-16 were surveyed, of which 399,859 children aged 5-16 were assessed using the ASER reading tool and 399,408 children were assessed using the ASER arithmetic tool.

ASER also collects background information on parents, households and village characteristics. One government school with primary classes in each sampled village is also visited to collect information about school characteristics such as infrastructure and facilities, student and teacher attendance and finances. 15,630 government schools were visited during ASER 2016.

Tools and testing

ASER assesses basic reading and arithmetic ability, which are foundational skills¹⁷ for language comprehension and mathematics. Basic reading ability implies the acquisition of letter knowledge, ability to decode common everyday high frequency words and fluently read short, simple passages. Similarly, basic arithmetic ability implies ability to recognise numbers and perform basic operations such as subtraction and division. Assessment tasks are based on analysis of state textbooks and curriculum framework documents.

identify gaps and diagnose areas that need improvement".

NAS is therefore designed as a school-based survey of students enrolled in Classes III, V and VIII in government and government-aided schools. It is a grade level assessment, intended to assess students' learning outcomes relative to the curriculum for their grade.

NAS aims to cover all 36 states and union territories.¹¹ In its recent rounds (Cycle 3 and Cycle 4), NAS has employed a three-stage clustered sample design. At the first stage, districts within each state are selected using PPS.¹² At the second stage, the requisite number of schools is chosen within sampled districts, again using PPS. DISE data¹³ is used as the sample frame for this stage of sampling. In the third stage, students are randomly selected¹⁴ within sampled schools. Although the issue of children's attendance is not explicitly addressed in NAS documents, the sampling procedure at the school level¹⁵ seems to imply that only children present in school on the day of the assessment were included. NAS reports also list the exceptions to the above process in various states.

NAS (Cycle 3) Class III survey was implemented in 34 states/union territories. It covered 104,374 students from 7,046 schools. NAS (Cycle 4) Class V survey was implemented in 34 states/union territories. It covered 150,101 students from 8,266 schools. NAS (Cycle 3) Class VIII survey was implemented in 33 states/union territories. It covered 188,647 students from 6,722 schools.¹⁶

NAS assesses grade-level competencies. Therefore, children are administered grade-specific tests. The test forms in various subjects for each class are based on common core content and competencies identified from an analysis of state textbooks. For each subject, a set of competencies/skills are framed, and items are designed and distributed such that they test these specific competencies/skills. In order to calibrate various items, NAS surveys (Cycle 3 and Cycle 4) applied Item Response Theory (IRT) to establish a link between student ability, item difficulty,

⁹ Census 2001 frame was used for ASER surveys 2005-14 and Census 2011 frame was used for ASER 2016.

¹⁰ For more details on the ASER sampling methodology, see detailed sampling note on page 251.

¹¹ Actual coverage varies with each grade and cycle.

¹² With the condition that at least 40% of all districts in a state must be sampled.

¹³ NAS (Cycle 3) Class V report notes significant discrepancies between DISE data and actual school enrollments. NAS (Cycle 3) Class VIII survey used both DISE and AISES as sample frame.

¹⁴ A maximum of 36-45 students (depending on the grade and cycle) are sampled in each school.

¹⁵ NAS (Cycle 3) Class V report states that within each school, children were selected from class registers using simple random sampling, implemented via a lottery (p.177).

¹⁶ All numbers are extracted from relevant NAS reports (listed in the references section).

¹⁷ Additionally, ASER has periodically included elements of assessment relating to time, money, measurement, problem solving, listening comprehension, and English reading and comprehension.

All children aged 5-16 are administered the same tests, regardless of schooling status, age or grade. ASER tools are designed to assess mastery of these foundational skills and are not intended to differentiate within each mastery level. The highest level tested in reading is the ability to fluently read a Std II level text. The highest level tested in arithmetic is the ability to correctly do a 3-digit by 1-digit division problem, usually taught in Std III or IV.

Test administration

ASER is a household survey. Children are tested at home. ASER reading and arithmetic assessments are administered individually, one on one. All children aged 5-16 who reside regularly in the sampled household are given the same test, regardless of schooling status, age, or grade. Within each household, different children are administered different samples of the testing tool. Children are graded at their highest level of proficiency in reading and arithmetic.

and a student's chance of success in each item.¹⁸

NAS (Cycle 3) Class III survey assessed two subjects - language and mathematics. NAS (Cycle 3 and Cycle 4) Class V surveys assessed three subjects - language, mathematics and environmental studies. The NAS (Cycle 3) Class VIII survey assessed four subjects - language, mathematics, science and social science.¹⁹

NAS is conducted in school (government and government aided schools). Children of different classes are given grade-specific tests. Students are required to choose a correct answer from a set of options and record their response in an Optical Mark Recognition (OMR) sheet. While NAS (Cycle 3 and Cycle 4) Class V and NAS (Cycle 3) Class VIII were pen and paper tests administered to a group of students in school, NAS (Cycle 3) Class III had listening comprehension items in addition to the pen and paper test.²⁰

Process implementation and monitoring

The ASER implementation process usually begins with a national training attended by full time team members of the ASER central team and state teams. Subsequently, state level trainings are held in each state wherein the state ASER leadership team trains Master Trainers from each district. The Master Trainers in turn conduct district level training for surveyors from local partner organisations such as colleges, universities, teacher training institutes, DIETs, NGOs and others. Surveyors receive intensive training over 2-3 days in preparation for the survey, including a day of practice in the field. They are then paired into teams of two and tasked with surveying the allocated villages. After conducting the survey, surveyors submit the survey booklets to Master Trainers. Data entry is outsourced to external agencies selected usually based on past performance and a stringent quality criteria.

NAS is coordinated by NCERT with the support of agencies such as SCERTs and SIEs in the states and union territories. Coordinators at state and district level are given training on field data collection. A guideline-cum-training manual is developed by Education Survey Department (ESD) of NCERT. In each selected district, 10-12 teams of two field investigators each are briefed by the district coordinators on survey processes such as selection of students in the sampled schools, administration of tools, use of OMR sheets by students etc. It is not clear whether field practice is included as part of the training of field investigators. After data collection, OMR sheets, questionnaires and field notes are verified at the district level for correctness of numbers, codes and other information, and then sent to the state coordinators. The response sheets in OMR format are dispatched by the state coordinators to NCERT for scanning and analysis. A third-party agency selected based on competitive tender is tasked with data entry of questionnaires. Documentation is done by NCERT, in consultation with experts from TSA.²²

ASER devotes considerable time and effort to ensuring data quality through carefully designed training, monitoring and recheck procedures, details of which are provided in each year's report and on the ASER Centre website.²¹ A multi-layered system of field monitoring, desk review and field recheck has been established wherein Master Trainers as well as staff from state and central teams travel to surveyed villages in order to check for adherence to process and protocol. Computer recheck is also done at the data entry and data consolidation stages. In addition, external process audits of the ASER data collection methodology are periodically conducted by independent bodies. About 55% of all surveyed villages were monitored/rechecked in ASER 2016.

Monitoring guidelines are laid out by NCERT. Monitoring at all levels is expected from coordinators. For example, the NAS (Cycle 3) Class V report states that 10-15 schools in each states are required to be monitored randomly by SCERT faculty and 5-10 schools in each district are required to be monitored by DIET faculty. The same report states "NCERT team reflected that there was no monitoring done from their end while the survey was

¹⁸ Based on NAS (Cycle 3) Class V report and NAS (Cycle 3) Class VIII report.

¹⁹ All details are extracted from relevant NAS reports (listed in the references section).

²⁰ Based on NAS (Cycle 3) Class V report and NAS (Cycle 3) Class VIII report.

²¹ Refer to p.270 of this report.

²² Based on NAS (Cycle 3) Class V report and NAS (Cycle 3) Class VIII report.

being conducted and they relied too heavily on the state and district coordinators to carry out the monitoring tasks" (p.16). NAS (Cycle 3) Class VIII report states that monitoring was done by NCERT personnel during the survey.

Precision of estimates

ASER estimates are self-weighting at the district level. At the state and national levels, estimates are weighted by the appropriate population weights. ASER does not report standard errors and margins of error for its state and national estimates. However, a study done on the precision of ASER enrollment and learning estimates shows that margins of error are well within 5% at the state level.²³ Where the number of observations in the sample is found to be insufficient, estimates are not presented in the report. Since 2011 ASER reports also present estimates at divisional level, along with the associated confidence intervals.

NAS assigns weights as per the student response data. Student responses were equally weighted within their state/union territory and each state/union territory carried equal weight as a reporting unit.²⁴ NAS (Cycle 3) Class V report states that systematic sampling techniques and matrix sampling methods were adopted to improve cost-effectiveness and reduce the burden on students of responding to a long test. In order to quantify the resultant uncertainty, the survey estimated standard errors for all reported statistics. For the key statistical indicators, a replication procedure (jack-knife method) was used to estimate standard errors.

Availability of tools and results

ASER findings are made available in the same school year that the data is collected. The survey is conducted between September and November of each year and the report is published the following January. District, divisional, state, and national level estimates are made available in the public domain.

All ASER tools, testing procedures and findings are available in the public domain.²⁵ All ASER data sets are available to researchers and research institutions upon request.

NAS (Cycle 3) Class III survey was conducted during 2012-13 and the final report was released in 2014. NAS (Cycle 3) Class V survey was conducted during 2010-11 and the final report was released in 2012²⁶. NAS (Cycle 3) Class VIII survey was conducted during 2012-13 and the final report was released in 2014. These reports are available on the NCERT website.

NCERT has published a "Data Sharing and Accessibility Policy" to facilitate public access to NAS data through a web-based portal. Timeline for implementation of this policy has not been specified in the document.

Test reliability and validity

ASER testing tools assess achievement of mastery rather than the performance of children relative to their peers. Reliability in this case refers to the consistency of the decision-making process in assigning children to a mastery level across repeated administrations of the test. In addition, since examiners assign each child to a mastery level, it is important to estimate the consistency of the decision-making process across examiners. This is referred to as inter-rater reliability. A series of studies²⁷ indicates substantial reliability of decisions across repeated measurements (test-retest) as well as satisfactory inter-rater reliability. The validity of the ASER Hindi reading tool (that is, whether the test actually measures the constructs it is intended

From Cycle 3 onwards, **NAS** shifted from Classical Test Theory (CTT) model to Item Response Theory (IRT) model for analysis of data. Reliability of the test score scales was estimated from the IRT scaling done using specialist software such as BILOG-MG. NAS (Cycle 3) Class V report mentions marginal reliability coefficients as follows: 0.83 for language, 0.89 for Mathematics and 0.89 for EVS. (p.183)

²³ See Ramaswami, B. Et Wadhwa, W. (2010). Available at:

http://img.asercentre.org/docs/Asere%20survey/Technical%20Papers/precisionofaserestimates_ramaswami_wadhwa.pdf

²⁴ According to NAS (Cycle 3) Class V and NAS (Cycle 3) Class VIII reports, this was due to discrepancies in the DISE and AISES data, limitations in the sampling method, and loss of information at the sampling and administration stages of the survey, which made it impossible to estimate ideal sample weights.

²⁵ In ASER 2016, the reading test was conducted in 19 languages across India.

²⁶ NAS (Cycle 4) Class V survey was conducted in 2014 and a summary report based on unweighted data was released in September, 2015. Final report for NAS (Cycle 4) Class V has not been published on the NCERT website at the time of writing this note.

²⁷ See papers by Shaher Banu Vagh (2009 and 2013), available at <http://www.asercentre.org/sampling/precision/reliability/validity/p/180.html>

to measure) was examined using the Fluency Battery²⁸ test. The ASER reading assessment is strongly associated with the Fluency Battery with magnitude of the correlation coefficients ranging from 0.90 to 0.94.²⁹

Comparisons over time

ASER has used the same sampling procedures since 2006. The reading assessment framework has not changed since the first survey in 2005, and the arithmetic framework has not changed since 2007. Therefore all estimates generated since 2007 are comparable.

From Cycle 3 onwards, **NAS** reports have used item response theory (IRT) to analyse the data, unlike earlier two cycles of the survey which used classical test theory (CTT). Thus, results of NAS are comparable across cycles 3 and 4, but not directly comparable with earlier rounds.³⁰

Conclusions

Several conclusions may be drawn on the basis of differences and similarities in design and methodology of the two assessment models.

On assessment frameworks: While it is essential to assess a broad range of domains and competencies in order to get a comprehensive picture of what children know and can do, there remains an equal, if not greater need to establish whether children possess foundational skills such as literacy and numeracy, which are a prerequisite for mastery of skills such as reading comprehension and higher mathematical operations.

On sampling design: ASER has been criticised for not following a school based survey design. However, the greatest limitation of the NAS model, as indeed of any school based assessment is that it excludes several categories of children, such as those enrolled in private schools, unrecognized schools, institutions of religious learning, out of school children as well as those children who are absent on the day of assessment. On the other hand, a household based survey, while being limited by its design in depth and scope of assessment, is more inclusive in coverage. Additionally, it has to be simple, understandable and rapid, which ASER has consistently strived to maintain.

On representation: NAS provides information relating to government educational systems at the national and state levels. There are no estimates at the district level. ASER provides comprehensive learning level estimates of the entire geography - representative of rural population at the national, state and district levels. In many districts of India, ASER is perhaps the only data source on learning levels, thus serving as a vital input for district-level educational planning.

On implementation: NAS is implemented with the help of state machinery - SIEs, SCERTs, DIETs etc. ASER is a citizen-led participatory exercise, with the involvement of local partners and surveyors from diverse backgrounds. In addition to collection of field data, there is an organic element of engaging ordinary citizens and a wide range of stakeholders in a debate around the issue of quality of education in our schools.

On reporting: NAS findings are reported with academic and technical rigour, and student performance is represented mainly in the form of scale scores. While appreciable efforts have been made to demystify the technical language, it remains largely a report by experts for experts. On the other hand, ASER attempts to simplify the process of understanding learning assessments by displaying snapshots of the actual tool alongside distribution of children across various levels of ability. Notwithstanding criticism for its simplicity, ASER's findings serve as actionable evidence for policy, as they are easy to understand for policy-makers, educationists, teachers, parents, and indeed children themselves.

²⁸ The Fluency Battery is a test of early reading ability adapted from the Early Grade Reading Assessment (USAID, 2009) and the Dynamic Indicators of Basic Early Literacy Skills (University of Oregon Center on Teaching and Learning, 2002).

²⁹ A correlation coefficient of 1 indexes a perfect and positive association between two measures.

³⁰ Oza, J. & Bethell, G. (2013).

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