MAIN FINDINGS

Bihar Elementary School Study

May 2014

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Evidence for Action

Bihar Elementary School Study
May 2014

All photos taken by Pratham/ASER Centre team as they visited schools and villages.

THIS IS THE PROVISIONAL BIHAR ELEMENTARY SCHOOL STUDY REPORT BASED ON DATA RECEIVED FROM CLUSTERS AND DISTRICTS OF BIHAR BY JUNE 01, 2014.

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The 200 "master trainers" who led the exercise were from ASER national teams and also from the Pratham Bihar team. With them were DIET faculty and CRCCs from many districts. We would like to congratulate all of these "master trainers" for the hard work they put in for three straight weeks despite the heat of the summer and the storms in May.

Without the cooperation and collaboration of the data collection teams, none of this would have been possible. In each district at least sixty people (DIET students and CRCCs) went to schools and spent time with children every day for 4-5 days.

We would also like to thank the district administration in every district, DIET principals, CRCCs and teachers of the sampled clusters and others who helped to make the exercise go smoothly. Finally, the most important contribution came from the children. If it wasn't for their enthusiasm and energy in participating in the assessment exercise, none of this would have been possible.

The entire project was conducted under the leadership of SCERT. Logistics and transportation arrangements especially for moving test papers and teams to the district and back were facilitated by SCERT, DIETs and district offices. All district level trainings were conducted as per schedule and on time including the field work that was part of the training. Regardless of the distance of the cluster from the district head quarters, all field teams reached schools in time. Monitoring teams from SCERT and ASER/Pratham were also in the field during district level training and data collection to ensure satisfactory quality of the field work.

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Objectives

In April 2014, Bihar Government invited ASER Centre to do a school based assessment of children's learning. There were at least two reasons for doing this. First, the government felt that it is would be useful to have an end of year school based assessment. Second, the government had been carrying out various interventions for improving quality in elementary schools (Mission Gunwatta) during 2013-14, and therefore, an assessment at the end of the academic year would provide data for how far the children had reached. It was agreed that this exercise would be a joint effort carried out by three partners: Bihar Government, ASER Centre/Pratham and UNICEF. SCERT Bihar provided the leadership for the exercise.

There were three main objectives of this exercise :

- Generating data for student performance for children in Std 2, 4 and 6 (assessments had been done earlier in the year by other agencies for Std 3, 5 and 7).
- Generating cluster level report cards that could guide "Cluster Resource Centre Coordinators" (CRCCs) to improve teaching-learning processes and outcomes in their respective schools.

- Building capacity for doing assessments as well as for translating evidence into action. The trainings at state and district level included classroom sessions and field practice. Each district team graded all the student papers after data collection in the field. This was done so that the district teams gained first hand exposure and experience of large scale assessment.

Sampling

Decisions on sampling were taken at a state level meeting of senior government officials, ASER Centre/Pratham staff and UNICEF in late April 2014. It was decided that instead of taking a random sample of schools across a district (a normal practice followed by researchers), sampling would be done by district and cluster. 2-3 clusters were randomly selected from each district following standard sampling procedures (PPS methods). In each selected cluster, all schools were covered. It was also decided to complete the data collection in no more than one week – the last week of May. Given the size of the survey and manpower that was available – 60 people (that is 30 teams of 2 surveyors) it was estimated that a total of 25-30 schools could be covered in each district. Therefore, if a sampled cluster had 25 or more schools, then only one cluster was covered in those district. 2 clusters were visited if the number of schools were less than 25.

It was hoped that cluster based sampling would generate data that could be easily converted into action on the ground. Bihar government has been investing in building the capacity of CRCCs to become academic "leaders" for the schools in their charge. Field experience indicates that in a cluster there are usually some schools which are functioning well and others need strengthening. It was thought that having cluster based evidence for children's learning could enable a CRCC and others to decide upon how to use the available resources more effectively and to learn good practices from each other.

Target children

The aim was to reach all children in Std 2, 4 and 6 in all government primary and upper primary schools in the selected clusters. The students were those who had been in the selected grades during the 2013-14 school year. This meant that we were actually surveying children who had completed these grades. Earlier in the year, in March, another agency had conducted a student achievement survey of Std 3, 5 and 7.

Tool development

A joint team comprising members from SCERT Bihar, ASER Centre and Pratham was responsible for developing the tools that were used in this study. All recent assessments of student academic performance in Bihar were reviewed – the tools as well as the findings. SCERT convened a workshop of resource persons, SCERT faculty and ASER/Pratham members to design and develop tools. Current Bihar textbooks were also reviewed. Once the first round of tools were developed, they were field tested in rural and urban schools. Based on the field testing, revisions were made. SCERT staff and ASER/Pratham teams participated in the field pilots. The final tools were vetted by senior staff at SCERT before being sent for printing. Entire process for tool finalization took 10 days.

Assessments were done in Hindi and Math using used two methods. The first was a one-on-one

assessment that was done orally with each child and the second was a pen-paper assessment that was done in a group[1]. Children in Std 2 were not given pen-paper tests. Children in Std 4 participated in the one-on-one reading and arithmetic assessments as well as in the pen-paper assessments for both subjects. Std 6 did the reading tasks and also the written assessments in language and mathematics.

The reading tasks were of very basic level; children were asked to recognize letters, read every day common words and basic short sentences. The highest level that children were asked to read in the one-on-one oral assessment was a text at Std 2 level of difficulty. The reading tool used in this exercise followed the same pattern as the ones used in the ASER surveys that are done every year nationally[2]. The one-on-one arithmetic assessment was also a basic one. Here the tasks ranged from recognizing numbers from 1 to 9, 10 to 99 and then doing two digit numerical addition sums without carryover and two-digit numerical subtraction operations with borrowing. The highest task in the one-on-one arithmetic tool was the two-digit subtraction problem. This is expected of children in Bihar (and elsewhere in the country) by the time children complete Std 2. The one-on-one arithmetic tool that was used in this assessment was a slightly modified version of the tool used in the ASER surveys.

The development of the pen and paper tools was based on a number of considerations. Available data and tools used in previous assessments in Bihar for these age groups/grades were reviewed. This included the National Achievement Surveys done by NCERT, earlier assessments done by Education Initiatives and several studies done by ASER Centre in Bihar. The accumulated evidence indicated that a substantial proportion of children were not at grade level. This implied that the items that were to be designed for the assessment should range from basic to grade level[3].

Teams and training

Bihar has 38 districts. Given the constraints of time, a decision had been taken that the entire field work for data collection would be completed in one week. And hence for each district there would be least 60 surveyors so that a team of two could go to one school. In districts where there are DIETs, the surveyors were DIET students. In districts with no DIETs or where the student strength was low, the surveyors were CRCCs.

Participation and capacity building were key objectives for this evaluation. Training sessions at each level were designed and organized keeping these objectives in mind. For each district there were 5 Master Trainers – 3 from Pratham/ASER and 2 from government (DIET faculty or district level government staff). A total of 200 Master Trainers were trained for 4 days in Patna. The training sessions included sessions on theory (example – how the tools were created, why there is a need for standardization in practices) as well as field sessions. One day in the training schedule was used for practicing the assessment process in schools. This was done in 25 schools in and around Patna. These "practice" sessions were a critical part of the capacity building process. It is when the actual work is done that many of the elements of test administration and grading are clearly absorbed. Also discussions about the "practice" were important as they indicated how teams would think about translating the evidence into action.

District level training of the surveyors, by the Master Trainers, was of 4 days in each district. The training sessions at the district level followed the same pattern as the sessions at the state level, with a day of

[1]Urdu medium schools were not included in this assessment as the appropriate tools would not be available on time.

[2]See www.asercentre.org for more details on ASER tools.

[3]More details on tool development are available in the "Background documentation" note.

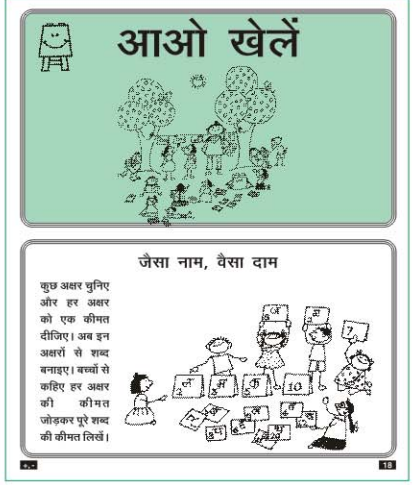
field practice and grading. The actual data collection, in the sampled clusters, started immediately after the district level training and continued for five successive days, in the last week of May (the last week before summer vacations started). All field work was completed by June 1 2014. Close to 3500 people, comprising 200 Master Trainers and close 2,300 surveyors, were involved in the entire exercise.

Data collection and field work

All schools in every sampled cluster were surveyed from 26th May, Monday to 29th May, Thursday with an additional day for spillover in some schools. In all the trainings and the practice sessions, the Master Trainers and the surveyors were told to maximize their time with children in the schools. Hence, on all surveys days the all surveyors reached the school at 6.30 am and were in the school till 11.30 am.

Survey teams were trained to do group activities with children before the actual assessment started. These were interactive games on language and math that could be played with all the children in a school. A booklet of these games was circulated to all surveyors (Figure 1.1). In the feedback sessions, many surveyors felt that this additional activity of 'playing' with children was a unique and effective way to build rapport with children and should also be added to any future assessment activity.

Figure 1.1 "Aao Khelein" - An interactive games booklet for children



The specified daily plan for data collection was:

- Day 1 – School observation and assessment of Std 2 children
- Day 2 – Assessment of Std 4 children
- Day 3 – Assessment of Std 6 children (in upper primary/middle schools)
- Day 4 – Complete unfinished activities from Days 1, 2 and 3
- Day 5 – Complete unfinished activities from Days 1, 2 and 3

The Std 2 children were administered the tests in language and mathematics on a one-on-one basis. The Std 4 children were first administered a pen and paper test in language and mathematics followed by a one-on-one test in language and mathematics. The Std 6 children, similarly were also first administered a pen and paper test in language and mathematics, but were only given the language test in the one-on-one testing phase.

The survey in lower primary schools, which had classes upto Std 5 usually finished earlier than upper primary schools, as more children had to be surveyed in upper primary schools with the additional children in Std 6. The surveyors of these lower primary schools were then relocated to schools which had a high enrollment.

Each day, after the end of the school survey, the surveyors graded the test papers of all children tested that day under the supervision of the Master Trainers. This activity usually took place in the Cluster Resource Centre, the block office, or the district headquarters. The grading of pen and paper tests

though time consuming, was a useful exercise:

- It ensured that all daily activity was reviewed the same day.
- Instances of copying, if any, were detected the same day.
- It provided immediate opportunity to understand and analyse the children's activities.

The grading exercise was useful in catalyzing discussion around:

- What the children had done and what could be done to help them do better
- The process of grading and the need for standardization of grading

The tables below summarize the "who, what, where" elements of this exercise.

Table 1.1 Summary of activities, teams, time for the May assessment[4]

Location	Activities	Timeline
All 38 districts were included in the study	200 Master Trainers led the entire exercise in the field.	State level training for 4 days for Master Trainers who would lead the work in each district second week of May
1-2 clusters were randomly sampled in each district Total = 79 clusters	5 Master Trainers per district: 3 from ASER/Pratham 2 from DIET/district	District level training for 4 days for surveyors third week of May
All schools in the cluster were covered – primary and upper primary Total = 1,047 schools	In each district 60 surveyors: either DIET students or CRCCs	State and district level training had one day of field pilot in nearby schools
All children in Std 2, 4 and 6 were surveyed in each school in the sampled cluster Total = 63,000 children	2 surveyors assigned to each school in the sampled cluster	Two surveyors went to each school for 3-5 days in the first half of the day. Second half of the day for grading papers. last week of May
	2,500 trainers and surveyors	14 working days

Table 1.2 Class wise participation in different types of assessment

Grade/Class	One-on-one/oral test		Written test	
	Hindi (Reading)	Math	Hindi	Math
Std 2	22,425	22,425	Std 2 children were not given any written test	
Std 4	22,467	22,465	22,467	22,465
Std 6	17,646	Std 6 children were not given this test	17,648	17,640
Total children tested	**62,538**	**44,890**	**40,115**	**40,105**

[4]Of the 1,047 government schools that were surveyed, 616 were primary schools and 431 were upper primary schools.

2 What are schools like?

Before going into the details of the assessment exercise, it may be worth providing a quick view of what the schools are like in the clusters where the study was conducted. This section provides a basic description of school characteristics. In a later section, we will attempt to link school characteristics with student achievement.

Across the state, 1,047 schools were visited. Of these roughly 60% were primary schools and the remainder were schools with primary and upper primary sections.

Table 2.1 Schools surveyed

Percentage of primary and upper primary schools surveyed	%
% Schools - Std 1-5	58.4
% Schools - Std 1-8	40.7
Others	0.2
Missing data	0.8
Total %	100
Total schools visited	**1,047**

Table 2. 2 below gives details of infrastructure and facilities. Most of these indicators are based on the school norms laid out in the Right to Education Act. On essential facilities like water and toilets, there are still some schools where these facilities need to be made available.

Table 2.2 Infrastructure and facilities

% of schools which have the following facilities	%
Office room	69.7
Boundary wall	37.2
Playground	40.4
Handpump	83.5
If there is a handpump, % of schools where it is useable	93.5
If there is no handpump, % of schools with other facilities for water	41.9
Girls' toilet	61.4
If there is a girls' toilet, % schools where it is not locked	79.9
If there is a girls' toilet which is not locked, % schools where it is useable	79.5
Water arrangement for toilet	70.7
Soap available for hand washing	62.8

In the last five years, one of the activities that has received high priority in Bihar has been recruitment of teachers. Various methods and mechanisms have been used to recruit and train teachers and place them into schools. Table 2.3 shows the distribution of teachers by type of schools.

Table 2.3 Number of teachers by type of school

Number of teachers available: Primary Schools	Number of schools	%	Number of teachers available: upper primary schools	Number of schools	%
5 and above	134	22.0	10 and above	140	32.3
3 to 4	241	39.6	7 to 9	147	33.9
2 and below	233	38.3	6 and below	147	33.9
Total	**608**	**100**	**Total**	**434**	**100**

From the table above we see that both in primary and in upper primary, there are still a substantial number of schools where there is a shortage of teachers. Overall in Bihar today, there are four types of elementary schools. There are the regular primary schools and the regular middle schools – these schools are often old and have been there for many years. Then we have the category called Navsrijit Primary Schools (NPS). These are the newly established primary schools. And finally there are the Utkramit Middle Schools (UMS) – which are primary schools that have been recently upgraded to middle schools and now have upper primary sections. Many schools have been started in recent years in habitations where there were no schools previously. This effort was done to increase access to schooling, especially in those locations and for those populations, where going to school was not

common. While schools have indeed been established, especially in the case of NPS, these schools often do not have adequate facilities or even the minimum number of teachers.

The distribution of student enrollment also varies considerably across the set of schools that were included in this study. Table 2.4 summarizes the current situation by type of school.

Table 2.4 Distribution of student enrollment by type of school

Enrollment in Primary Schools			Enrollment in Upper Primary Schools		
Enrollment	**Number of schools**	**%**	**Enrollment**	**Number of schools**	**%**
Less than 50	16	2.6	Less than 150	11	2.5
51-100	118	19.5			
101-150	203	33.5			
151-200	141	23.3	151-200	35	8.1
201-300	105	17.3	201-300	75	17.4
301-400	15	2.5	301-400	106	24.5
More than 400	8	1.3	More than 400	205	47.5
Total	**606**	**100**	**Total**	**432**	**100**

Student-teacher or pupil-teacher ratios are a convenient way of putting the number of teachers and students together. Table 2. 5 shows the range of pupil-teacher ratios in the schools that were surveyed. It is clear that currently, one third of all schools in primary and in upper primary sectors have very high pupil-teacher ratios. This situation is bound to have some influence on teaching-learning activities in the classroom.

Table 2.5 Student-Teacher Ratios by type of school

Primary	%	Upper- Primary	%
Less than 35	32.4	Less than 40	32.26
35 to 57	34.05	40 to 58	34.33
58 and above	33.55	58 and above	33.41
Total	**100**	**Total**	**100**

Given constraints of teachers and of space, schools often have to take decisions of how to make seating arrangements for students for teaching. Before 2005 when acute teacher shortages were very widespread it was common for students to be grouped together for instruction even if they were from different classes. This practice is still visible today in many schools (Table 2.6).

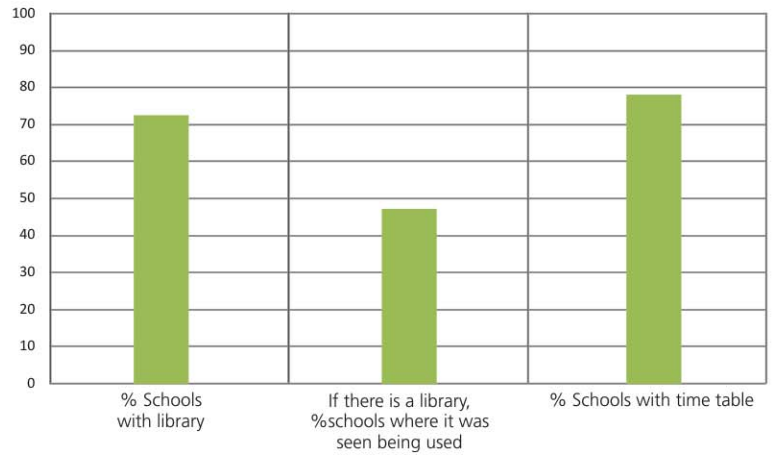
Table 2.6 Seating arrangements by Std and type of school

Seating arrangements by Std and type of school	**Std 2**	**Std 2**	**Std 4**	**Std 4**	**Std 6**
	Primary	**Upper Primary**	**Primary**	**Upper Primary**	**Upper Primary**
	% Schools	**% Schools**	**% Schools**	**% Schools**	**% Schools**
Single grade (class) sitting by themselves	14.9	38.1	12.4	39.7	50.9
2 or 3 grades sitting together	59.4	51.4	59.6	48.1	35.1
More than 3 grades sitting together	21.3	5.1	17.4	5.4	4
Data missing	4.4	5.4	10.6	6.8	10
Total percentage	100	100	100	100	100
Total schools visited	**611**	**428**	**611**	**428**	**428**

In generally upper primary schools are bigger and have more teachers. In Table 2.6 above we see this reflected in more single grade classes in upper primary schools as compared to primary schools and much lower incidence of several classes sitting together. Mixed groups of children pose big challenges for teaching. Not only do children of different grades use different textbooks but they are also of different levels.

There are two indicators related to teaching and learning that are easy to observe in a school setting – one is libraries and the other is the visible presence of a time table. In other research as well, we have seen that these variables are usually positively related to learning outcomes in the school. Chart 2.1 summarizes the current situation related to libraries and timetables in this study.

Chart 2.1 % Schools which have libraries and time tables



Finally, let us look at the patterns of attendance in schools during the survey. This is an important consideration for two reasons. First and most obvious is the fact that if children do not go to school, they cannot learn. Similarly, without teachers, teaching cannot take place. Hence attendance is a essential pre-condition for teaching and learning. Second, the assessments that were conducted in this study were done with children who were present. Only when a high proportion of children are present on the day of the assessment can the data be representative of all children in the school.

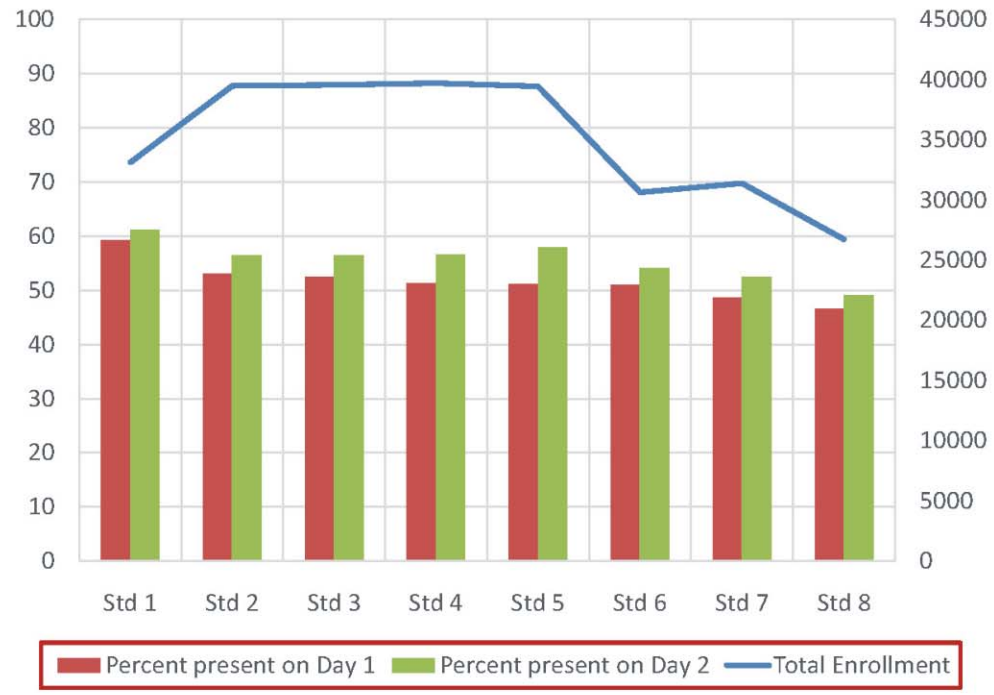
Table 2.7 Teacher attendance in school. May 2014

No. of appointed teachers in schools visited	5,751
% Teachers present in school during survey days	87.3

From the table above we can see that teacher attendance was very high, at least, during the period of the study. However this was not the case for children (Table 2.8). This assessment of student achievement was carried out in the last week of May – the last week before summer vacations were to start. During the first 2-3 days of that week there were heavy rain storms. Anticipation of vacations and bad weather – both may have caused children's attendance in school in this period to be low. The table and chart on the next page show the pattern of attendance across the state in the sampled clusters on the first two days of the assessment.

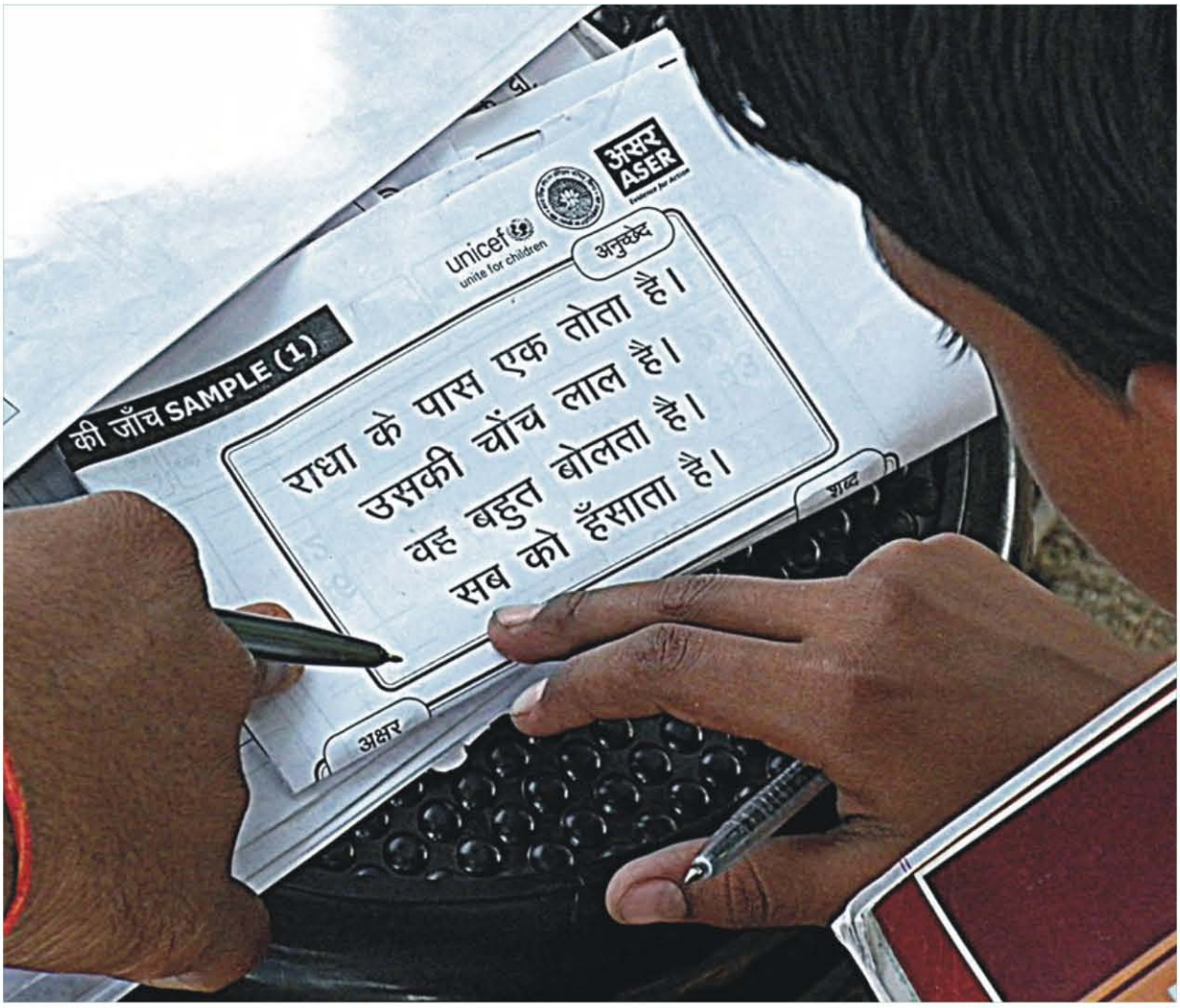
Table 2.8 Children's attendance. May 2014								
In schools that were visited	**Std 1**	**Std 2**	**Std 3**	**Std 4**	**Std 5**	**Std 6**	**Std 7**	**Std 8**
Total student enrollment	33,117	39,481	39,561	39,706	39,436	30,632	31,385	26,736
% Children present on Day 1	56.4	52.7	49.7	49.7	47.9	51.6	48.7	44.1
% Children present on Day 2	58.5	54.4	53.7	53.9	54.8	53.1	50.2	47.1

Chart 2.2 Total student enrollment and percentage of enrolled children attending on Day 1 and Day 2: May 2014 (All sampled clusters)



This section provides a basic description of schools where the assessment exercise took place. Now we turn to the details of the actual assessment.

Reading assessments 3



Some introductory thoughts on reading

It is well accepted that reading is a fundamental and foundational skill. Without learning to read, a child cannot progress successfully through the education system. Textbooks and curriculum in India are based on the assumption that children are reading fluently with understanding by the end of their second year in school. Many state governments and agencies are embarking on "state level assessments" of student performance in different subjects. All of these assessments including those done at the national level by NCERT are pen-paper tests. However, repeated rounds of the annual national ASER[5] survey since 2005, indicate that only about half of all children in Std 5 are reading fluently. According to ASER 2013, only 47 % Std 5 children could read a Std 2 level text. Thus, the question arises: For children who are not reading fluently, how useful are pen-paper tests to understand the status of their language proficiency?

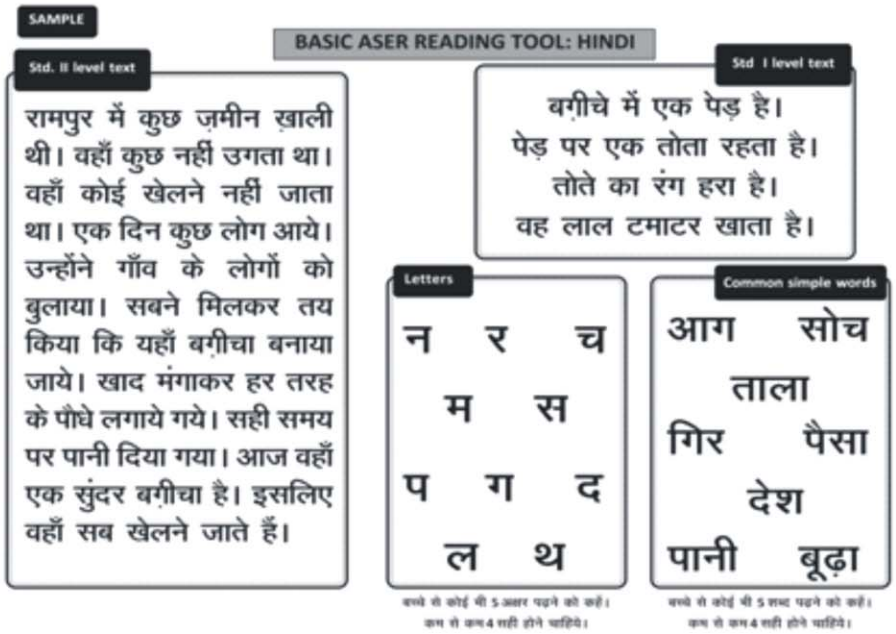
The current exercise in Bihar is perhaps the only state level assessment exercise that has been carried out in recent years that includes reading as a key element of the assessment. All children were given

[5]In the Annual Status of Education Report, a random sample of children is assessed in each rural district each year. This data is representative of all children (aged 5 to 16) at the district, state and national level. All reports are available on www.asercentre.org.

one-on-one reading tasks. We hope that this exercise not only generates useful data on the links between children's reading ability and their performance on the written tests but also provides important inputs for the way ahead both in terms of assessment and instruction.

What were children asked to read?

Figure 3.1 The reading tasks



All children in schools in the sampled clusters in Std 2, 4 and 6 were asked to read aloud, so that their reading ability could be assessed.

Note: Each child is asked to read aloud, on a one-on-one basis. The child is marked at the highest level at which s/he can read comfortably. So a child who can read at "story level" (Std 2 level text) can also read at "para level" (Std 1 level text), words and letters.

How well can children read?

The highest level in the reading assessment is at a Std 2 level of difficulty. It is likely that children who can read at this level can also cope with higher level texts. The Std 2 benchmark can be seen as a cut off for a basic level of reading fluency[6]. The data in Table 3.1 indicates that approximately 12% of children who have completed Std 2 can read at that grade level. For Std 2 if we include the children who are reading paragraphs/sentences at Std 1 level of difficulty, we could say that roughly 20% children have become 'readers' at the end of two years of schooling.

However for older children, if we retain the definition of 'readers' to include those who can read a Std 2 level text, then we see from Table 3.1 that for children who have completed Std 4 this figure rises to 40%. For the oldest children in the sample, in Std 6, we find that almost 62% can read fluently at the Std 2 level.

[6]Analysis using ASER data has shown that most children who are able to read a Std 2 level text are able to understand or "comprehend" the basic content of texts and able to answer direct fact retrieval questions

Table 3.1 Reading levels All schools in sampled clusters May 2014			
% Children reading at different levels by grade			
Reading levels	**Std 2**	**Std 4**	**Std 6**
Story level (Std 2 level text)	11.8	39.5	61.6
Para level (can read Std 1 level text but cannot read longer level text fluently as yet)	9.2	17.0	18.0
Word level (can read words but not sentences as yet)	11.4	12.3	7.9
Letter level (can recognize letters but not read words yet)	36.0	20.9	9.5
Beginner level (still learning to recognize letters)	31.1	9.8	2.4
Total percentage	**100%**	**100%**	**100%**
Total children tested	**22424**	**22467**	**17646**

Although more children in higher grades can read, the evidence suggests that there needs to be serious and urgent focus on building basic reading skills throughout primary and upper primary grades. Upon completion of primary school, if a child does not read fluently, special time and attention must be paid to such children to enable them to build their reading skills.

How does the data from the May school based assessment compare with ASER estimates for reading for the same grades? Before discussing the findings it is important to keep in mind that the data in each of these data-sets was collected using different methods. ASER is a household based survey that assesses children in the middle of the school year. The data collection is done in the community for a variety of reasons. One of the main reasons is so that all children can be sampled. In India, we have children who are enrolled in government schools, those who are enrolled in private schools and other kinds of schools and those who are not in school. Also attendance rates vary considerably across the country. In a school based assessments, if children are absent, the sample is biased in favour of children who are present. The May assessment was done in school with children who were present on that day. Apart from the methods of data collection, there is also a 7-8 month gap between the two measurements.

Table 3.2 Comparison of ASER 2013 and the May 2014 Bihar assessments data			
Reading levels	**Std 4**	**Std 4**	**Std 5**
	ASER 2013 Sept-Oct	**May 2014**	**ASER 2013 Sept-Oct**
Story	27.4	39.5	41.7
Para	18.3	17.0	19.7
Word	15.9	12.3	12.5
Letter	24.3	20.9	17.8
Beginner	14.1	9.8	8.3
Total %	**100**	**100**	**100**

The data from ASER 2013 (Sept-Oct) and the data from the May assessment together point to improvement of basic reading skills over time. However, it would be much better to track the same children over time (especially over the course of one school year) to analyze progress. If possible we would strongly suggest a longitudinal study - going back to the same clusters and schools and to the same children in May 2015 and compare with the data of May 2014.

Reading: Thoughts on the way forward

This exercise shows the importance of including reading as a core part of the assessment for primary and upper primary grades. Under the aegis of Mission Gunwatta, the government's initiative for improving quality, for the past year in Bihar, there has been a focus on building reading skills through the elementary school years especially in Std 3, 4 and 5. Special time has been allocated on a daily basis where children in Std 3, 4 and 5 are taught by level rather than by grade. In addition, Std 1 and 2 teachers have received special training. Both these efforts need to be continued and strengthened in the 2014-15 school year. In Std 1-2 priority should be given to building strong foundations for reading with understanding. For Std 3-5 the focus on building reading skills needs to be sustained and needs to be accompanied by discussions on texts and development of critical thinking skills. The importance of having good reading skills cannot be emphasized enough. It is the very foundation of all learning especially with respect to any academic achievement in the education system. If children's reading levels need strengthening, time and attention should be allocated to solving this problem.

Both Std 4 and Std 6 students were given pen and paper tests. These were administered in classrooms to children in groups. Each test had 2 samples and children seated next to each other were given different samples. Before starting, detailed explanations were given to children about what they were expected to do.

What were the key elements of the pen-paper language test?

For both grades, Std 4 and Std 6, the framework of the pen-paper/written test was similar[7].

Two types of competencies were measured: vocabulary and reading comprehension. In the Std 4 samples the vocabulary tasks ranged from easy activities like recognizing pictures and matching the picture to the correct word to more difficult items like finding antonyms and synonyms. For children in Std 6, the vocabulary tasks started with simple word usage activities like choosing the right word from a list of words to complete a sentence explaining the meaning of a proverb. The reading comprehension tasks for each grade were based on two separate passages – one short and one long. In each case one

[7]More details about tool development is available in the "Background documentation" note for this assessment. Properties of the tools are discussed in the technical note. Both these documents are available on request.

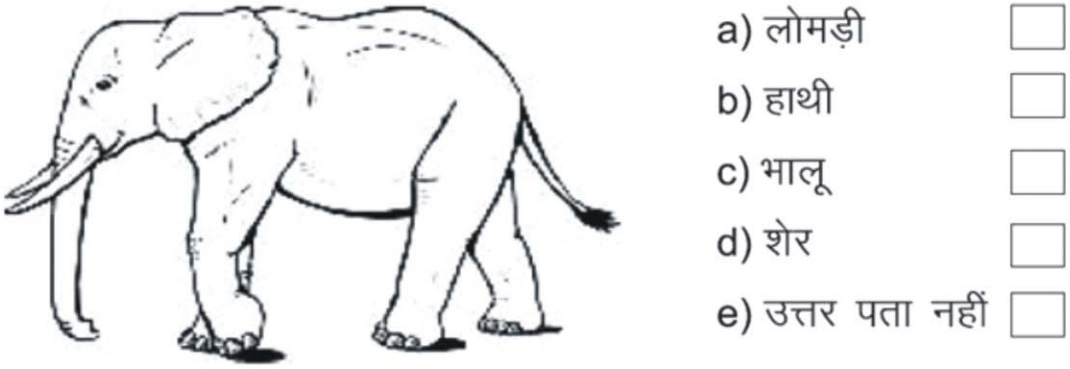
was based on a text that was in the children's textbooks from the previous year. Children were expected to read these passages and answer questions that were of the basic fact retrieval variety as well as those that involved the ability to synthesize, summarize or use inference skills.

All questions for the Std 4 language assessment were in multiple choice format. Every question had 5 options from which the child could choose. For both grades, Std 4 and 6, there were 2 samples for the written test. Children sitting next to each other were given different samples. Grading was done in every district by the DIET students or CRCCs under the supervision of the Master Trainers.

Here are some examples of questions. Children's responses to these questions have also been analysed and their implications discussed.

Example 1: Std 4 pen-paper test. Simple reading tasks

Figure 4.1 The reading tasks



This is an example of a picture-word matching item where the child had to tick the box with the correct option. There were 5 such pictures. This question does not require much reading.

Table 4.1 Std 4 language pen-paper test : Picture-word matching

Std 4 language written test : Of those who can read at different levels, what % can answer this question correctly

Question type	Different items	All children (Std 4)	Std 2 level readers (story)*	Std 1 level readers (para) **	Word level readers	Letter level readers	Beginners
Match a given picture with the correct word from a given list of words (Std 1-2 level question)	Picture 1	77.6	89.2	82.6	76.3	66.1	48.8
	Picture 2	64.6	74.5	66.1	62.7	55.6	43.6
	Picture 3	71.5	86.6	76.1	68.3	55.2	41.8
	Picture 4	73.4	86.5	77.6	70.1	60.4	45.0
	Picture 5	72.1	85.4	76.2	69.2	58.3	44.5

How to read the table: 89.2% of children at story level can answer Picture 1 question correctly.82.6% of children at para level can answer Picture 1 question correctly. Same logic can be applied to all other reading levels as well.*

Looking at Table 4.1 it is clear that in Std 4 approximately every three out of four children can do this question correctly. If one looks at children's performance categorized by reading ability, more than 85% children who are fluent readers could do these items as compared to less than 65% children who are still struggling with recognizing letters. This question did not involve much reading. Letter recognition skills along with some guess work helped children to get the right answer.

Example 2: Std 4 pen-paper test. Vocabulary

In each sample, there were 3 questions to assess vocabulary. They included completing a sentence with the right word from a list of words (not shown here), as well as antonyms and synonyms like those shown below. All were multiple choice questions. The words that were used for the vocabulary tasks were of Std 3 level.

Figure 4.2 Vocabulary questions

इनमें से कौन-सा शब्द 'निकट' का <u>विलोम/उल्टे अर्थ वाला शब्द</u> है?

a) दूर ☐
b) नीचे ☐
c) पास ☐
d) ऊपर ☐
e) उत्तर पता नहीं ☐

इनमें से कौन-सा शब्द 'इनाम' का <u>समानार्थी/समान अर्थ वाला शब्द</u> है?

a) संस्कार ☐
b) पुरस्कार ☐
c) निमंत्रण ☐
d) पकवान ☐
e) उत्तर पता नहीं ☐

For the multiple choice questions, there were five possible outcomes: Of the five options that were given, the child could tick the correct option, incorrect options or the option that said "I don't know". Table 4.2 above indicates that about one third of all children got the answer correct. One third ticked on incorrect options. And one third did not attempt, or did not know how to handle multiple choice questions or ticked the option for "I don't know".

Table 4.2 % Response of Std 4 children in MCQs

	Synonym task	Antonym task
Blank	14.7	14.0
Multiple ticks/ ticked outside box	8.6	10.1
Ticked the "I don't know" option	7.7	6.9
Ticked incorrect options	31.8	37.0
Ticked correct option	37.1	32.0
Total percentage	**100**	100

Example 3: Std 4 pen-paper test. Reading and comprehension

The first task in reading comprehension that the child had to perform was to read the given text. Following this, a set of questions were asked from the text. Usually the first one was a direct fact retrieval task. This narrative text was taken from one of the chapters of Bihar Std 2 language textbooks.

Figure 4.3 Reading comprehension question

एक दिन जंगल में सभी जानवरों की सभा रखी गई। बरगद के नीचे हाथी, शेर, लोमड़ी, सियार, भालू, बन्दर, हिरण, खरगोश और अजगर सभी आ चुके थे। सबने हाथी को अपना सभापति चुना। सबने अपनी-अपनी परेशानी बताई। मिलकर हल ढूँढने की कोशिश की। खरगोश ने शिकायत की - ''भालू अपने घर का सारा कचरा मेरे बिल के पास फेंक देता है। बन्दर भी केला खाकर छिलका रास्ते में गिरा देता है। सभी जहाँ-तहाँ थूकते रहते हैं। तालाब का पानी भी गंदा हो गया है।'' तभी अचानक आँधी चलने लगी और बारिश शुरू हो गई। सभा अगले दिन तक के लिए रोक दी गई।

Q10. खरगोश ने भालू की क्या शिकायत की?

a) वह जहाँ-तहाँ थूकता रहता है। ☐

b) वह तालाब का पानी गंदा करता है। ☐

c) वह कचरा खरगोश के बिल के पास फेंक देता है। ☐

d) वह केले का छिलका रास्ते में गिरा देता है। ☐

e) उत्तर पता नहीं ☐

22,354 Std 4 children took the pen-paper language test. Of all the Std 4 children who took the test, 36.3% children could answer this question correctly. Children who could read were more likely to answer this question correctly. But not all children who could read could answer this simple fact retrieval question.

Std 4: Overall Findings in Language test

Table 4.3 % Children in Std 4 who answered correctly		
No.	**Task (Total children tested = 22,354)**	**% Children who answered correctly**
Word recognition and vocabulary items		
1	Matching a given picture to the right word	71.84%
2	Vocabulary tasks - synonyms	37.0%
3	Vocabulary tasks - antonyms	32.0%
Reading-comprehension: Short seen question (Std 2 level narrative text)		
4	Direct fact retrieval	36.3%
Reading-comprehension: Longer unseen passage (Std 2 level informative text)		
5	Direct fact retrieval	37.3%
6	Integrate information (Fact retrieval from more than one sentence in the text)	28.7%
7	Inference	17.0%
8	Synthesize/summarize	25.9%

Apart from the easy items (matching pictures with words), for all the other questions only 1 out of 3 children got correct answers for most questions. Doing tasks other than fact retrieval from the text seems to be difficult for most children. While most of the questions like the matching pictures to the right word or the direct fact retrieval questions are well below grade level, it can be argued that the reading-comprehension questions that requires inference, synthesis and summary are closer to grade level. Here we find that approximately 17 to 25% children could answer these questions correctly.

Teachers need to focus more on discussing texts and engage the children in critical thinking activities in classrooms. Such preparation could be included in trainings.

How is the ability to tackle questions in the pen-paper test in language linked to reading?

Chart 4.1 % Std 4 Children answering specific questions correctly on the language written test by reading level

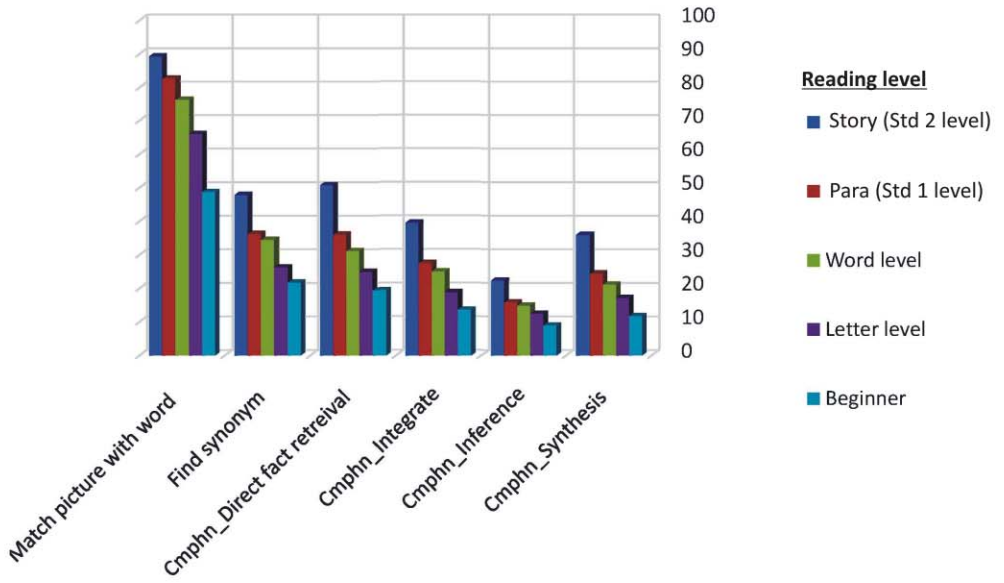


Chart 4.1 shows that for every question, children who are fluent readers perform much better than those whose reading ability is weaker. In interpreting this graph it is important to remember that for each item if children randomly mark options in the multiple choice format, 20% of the time they are likely to get the question correct.

While it is clear that reading-comprehension tasks cannot be done by children who cannot read, at the same time, not all who can read can answer the comprehension questions.

How well are children in Std 6 doing in the written test for language?

Let us look at some questions and answers for the older children. Here too the basic structure of the assessment included vocabulary and word usage. The words used in this vocabulary tasks are of Std 3 level.

Example 1: Std 6 pen and paper test. Vocabulary/word usage tasks as well as reading comprehension questions

Figure 4.4 Std 6 Vocabulary tasks

Q1. वाक्य पूरा करने के लिए सही शब्द चुनो।

अपना काम पूरा किए बिना रमा ____ नहीं करती।

a) गुस्सा ☐
b) ज़िद ☐
c) खुश ☐
d) विश्राम ☐
e) उत्तर पता नहीं ☐

Q5. इनमें से कौन-सा शब्द 'इनाम' का <u>समानार्थी/समान अर्थ वाला शब्द</u> है?

a) पकवान ☐
b) निमंत्रण ☐
c) पुरस्कार ☐
d) संस्कार ☐
e) उत्तर पता नहीं ☐

Across the state in the sampled clusters, a total of 17,648 children in Std 6 took the pen-paper language test. About half of all children tested were able to do the questions on word usage and vocabulary correctly. These items all had multiple choice format.

Table 4.4 Std 6 Written test in language. Children's performance

Vocabulary and word usage: Brief description of question	Items	% Children who answered correctly
Word usage : Choose correct word from word list to complete a given sentence	Item 1	51.2
	Item 2	57.4
	Item 3	57.9
	Item 4	43.2
Find synonym word	Item 5	50.9
Find antonym word	Item 6	32.3
	Item 7	47.9
Find correct meaning of proverb (muhavara)	Item 8	52.5

Example 2: Std 6 pen and paper test. Reading and comprehension. The questions given below are based on an "unseen passage" which is a narrative text at Std 4 level. The passage is about 30 sentences and 330 words long.

Figure 4.5 Std 6 Reading comprehension tasks

Q9. माही को ''हठी'' नाम किसने दिया?

a) माँ ने ☐
b) जयन्त फूफा ने ☐
c) नानीजी ने ☐
d) अशोक चाचा ने ☐
e) उत्तर पता नहीं ☐

61% got this question correct

Direct fact retrieval question – The answer to this question can be found in one sentence in the text.

Q10. माही का नाम ''माही हठी'' क्यों पड़ा?

a) क्योंकि वह किसी की भी बात में हाँ मिला लेता था। ☐
b) क्योंकि वह हर बार बहुत ज़िद करता था। ☐
c) क्योंकि वह हर किसी के साथ बदमाशी किया करता था। ☐
d) क्योंकि वह अपनी बात न माने जाने पर गुस्सा हो जाता था। ☐
e) उत्तर पता नहीं ☐

Q11. मेले में माही को अपने नानाजी पर गुस्सा क्यों आया?

a) नानाजी ने उसे आइसक्रीम देने से मना कर दिया। ☐
b) नानाजी ने उससे शर्त रखी थी कि वह हठ नहीं करेगा। ☐
c) नानाजी ने फूफाजी को माही को मनाने से मना कर दिया। ☐
d) माही पेट दर्द से परेशान था और नानाजी ने कुछ नहीं किया। ☐
e) उत्तर पता नहीं ☐

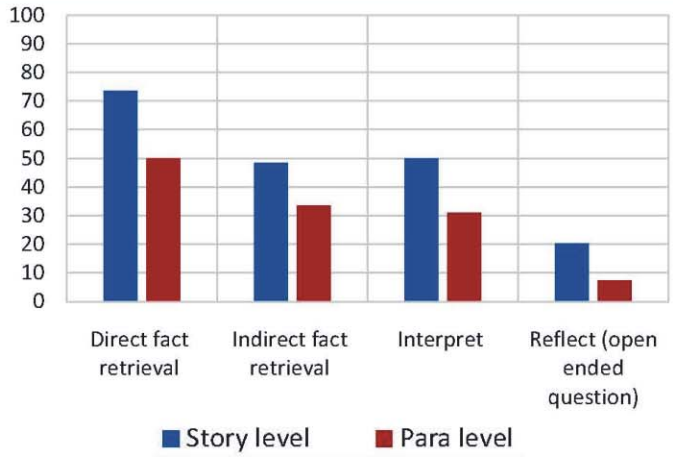
About 40% got each of these questions correct

Indirect fact retrieval question – The answer to this question requires the student to read an entire paragraph and find the correct answer.

Std 6: Links between reading and comprehension

In the sampled clusters, for all children who were tested in Std 6, 61.6% can read a Std 2 level text or higher and 18% can read only paras (Std 1 level). Although the performance for the remaining 20% children is not included here, it is important to remember that one out five children in Std 6 is not even at Std 1 or 2 level of reading.

Chart 4.2 Reading comprehension - 'Seen' short passage Std 6 : % children answering correctly



Among comprehension items, children find it easier to do the fact retrieval tasks than the questions which need interpretation, application or reflection. The indirect fact retrieval task requires children to extract facts from several parts of the passage. It goes without saying that the ability to read strongly influences the ability to do reading-comprehension tasks.

The data indicates that in our classroom teaching, much more focus needs to be put on deeper discussion of texts and on higher order critical thinking skills so that children learn how to interpret, infer, summarize and reflect. These abilities get stronger if there is more in depth discussions in the classroom based on texts and if children are encouraged to connect what they read with what they learn.

Std 6: Analysis of "mistakes" in reading comprehension MCQ items

Chart 4.3 Reading comprehension MCQ analysis : % children ticking different options

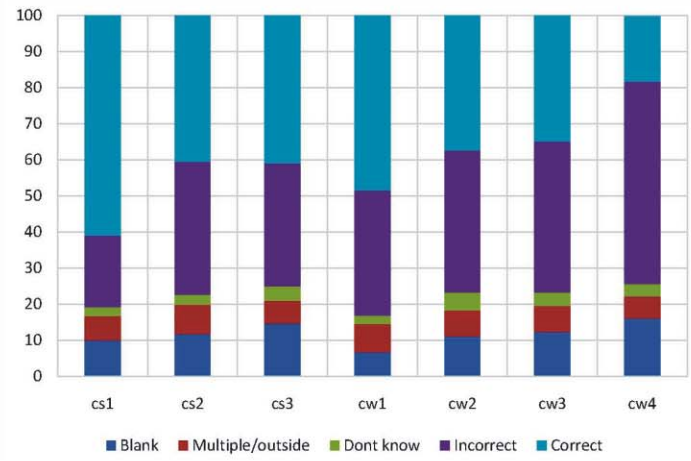
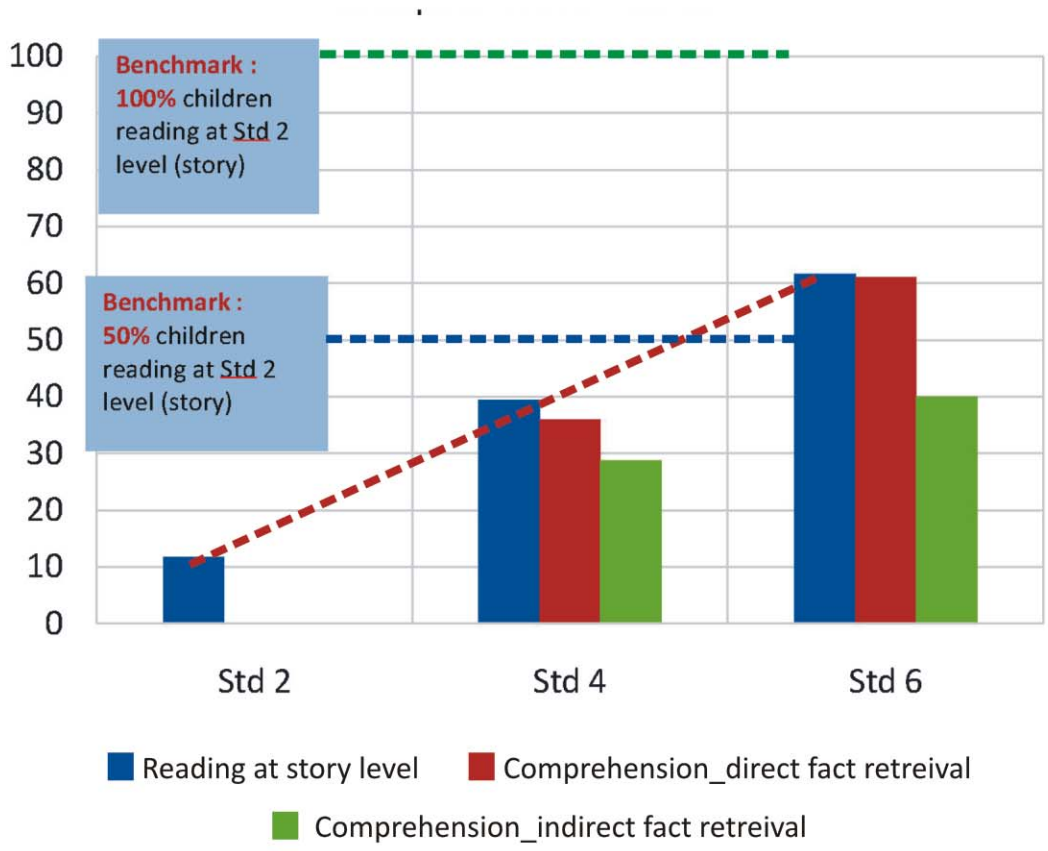


Chart 4.3 shows that "correct" and "incorrect" responses vary by the level of difficulty of the question but approximately 10% of children did not attempt the question and left it blank. 6-8% put multiple ticks or did not tick in the box at all. 2-5% ticked the 'do not know' option. Since multiple choice items are not very commonly used question types in the school textbooks, children in our school systems are not familiar with it. This is one of the main reason why even the older children (Std 6) are getting confused resulting to random ticking, as observed in the above chart.

How well are children able to read and comprehend – Comparison across grade levels: Data from written language assessment

Chart 4.4 clearly shows that ability to read is higher in higher classes. But even in Std 6 not all children are reading at Std 2 level. The ability to read and comprehend at least at the basic level (fact retrieval) is highly correlated with the ability to read fluently.

Chart 4.4 % children at different grade levels who are able to read fluently and do basic reading comprehension tasks



Thinking about way forward

All the evidence that has been collected and analysed for the sampled clusters clearly shows the importance of building strong ability to read. Without being able to read fluently, children cannot progress successfully in school. Going beyond reading to comprehension, we see that of children who can read, a majority can do basic tasks like direct fact retrieval. But most are unable to go beyond just facts to tasks that involve integrating information, inferring meaning or synthesizing or summarizing what they have read. In daily classroom activity, much more discussion is needed so that children learn to engage meaningfully with texts. Such activities will also help to improve critical thinking skills among children.

For children particularly younger children such as those in Std 4, the data using MCQ format have to be interpreted with caution. Recall that the multiple choice questions had 5 options. This means that the

probability that a child would get the correct response, by randomly ticking an option, is 20%. Therefore, estimates around 20% have to be interpreted with caution -- they may be indicative of children choosing random responses rather than knowing the correct response.

To start and to sustain the practice of “discussion” and “talk” in the classroom and not simply depend on rote learning or routine use of the textbook, several measures will have to be introduced. Although manuals and documents already emphasize such behaviour, teachers need actual demonstration, first hand exposure and practical experience. From the pre-service training stage, discussion and talk at every opportunity in the teacher training classes should be introduced. It is only when people have experienced the usefulness of a certain practice that they begin to do it wherever they are. Role modelling of how discussions around texts and beyond texts can be done in primary and upper primary classrooms will have to be led by teacher trainers and cluster resource centre coordinators. Discussions around these practices will need to be conducted at every level where “teaching” is the main topic of conversation and dialogue.

Math assessments 5

Introduction

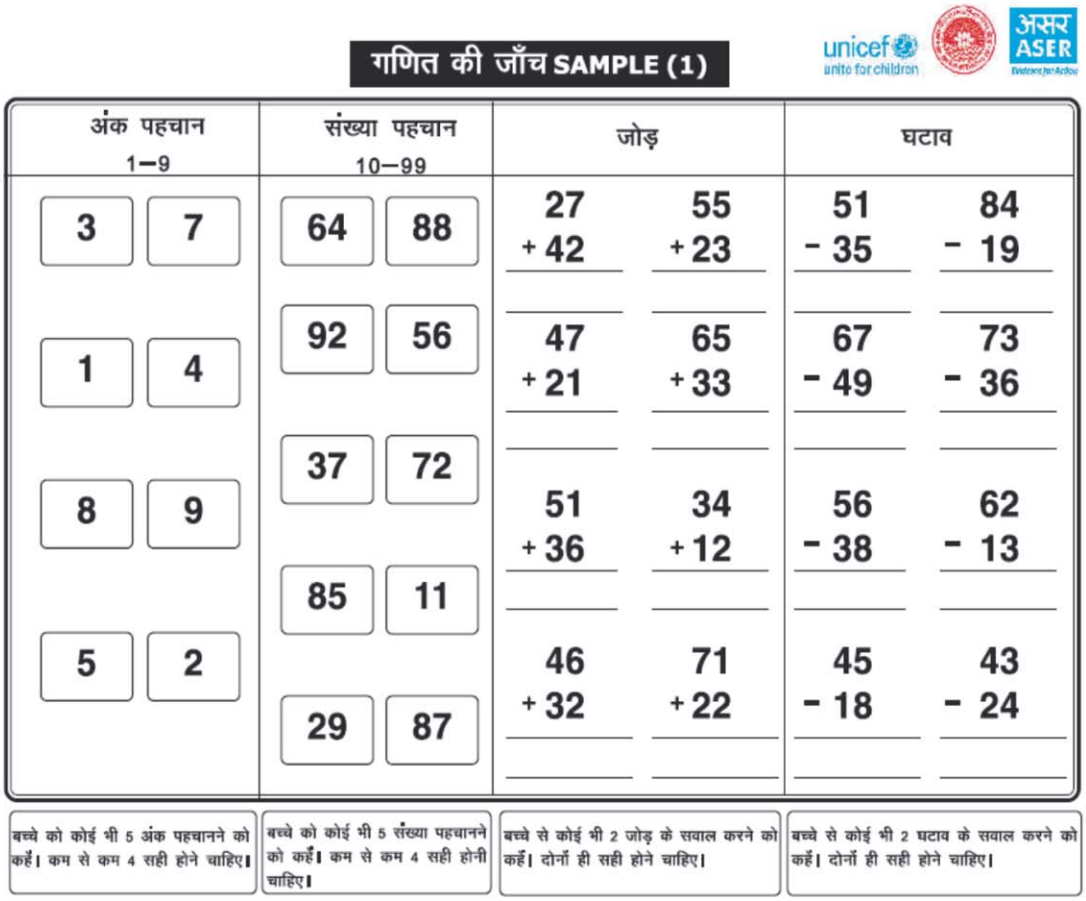
For math, two types of assessments were done – one-on-one/oral assessments and written/ pen-paper assessments. For Std 2, only one-on-one assessments were done. Std 4 had both types of tests and Std 6 children only took the written test in math. Based on past experiences and available data on math skills of primary school children from Bihar and other states, it was felt that the one- on-one assessment would be useful to do with the lower grades. If children's reading skills are weak, it is difficult to gauge what they can do from written tests, hence it is essential to spend time individually with each child to understand his or her level of number knowledge/sense and the ability to do basic operations.

One-on-one assessment in math

The simple one-on-one tool that was used for children in Std 2 and Std 4 is shown in Figure 1. The tool used in this assessment is based on the standard ASER arithmetic tool with some modifications. The highest level task in this case is the numerical two digit subtraction with borrowing. In many states in India, as well as in Bihar, it is expected that by the time children reach the end of their second year of

schooling they will be able to do basic operations like addition and subtraction with numbers up to 100. The tasks in the oral assessment are progressive. For example, a child who can do the addition problem is able to do the number recognition tasks correctly. As in the reading assessment, children are marked at the highest level that they can do comfortably. For the addition and subtraction problems, the child can give the answer in any way that he or she wants. For example she can say the answer orally or work it out in writing. This is a "floor" test and so it is possible that children who are able to do the highest level in this test can do tasks at a higher level than two digit subtraction. For Std 2 children no written test was conducted. For Std 4 children, we have data from this one-on-one test as well as from the written test.

Figure 5.1. Sample of the one-on-one math assessment tool



गणित की जाँच SAMPLE (1)

अंक पहचान 1–9	संख्या पहचान 10–99	जोड़	घटाव
3 7	64 88	27 + 42 ; 55 + 23	51 - 35 ; 84 - 19
1 4	92 56	47 + 21 ; 65 + 33	67 - 49 ; 73 - 36
8 9	37 72	51 + 36 ; 34 + 12	56 - 38 ; 62 - 13
5 2	85 11	46 + 32 ; 71 + 22	45 - 18 ; 43 - 24
	29 87		

बच्चे को कोई भी 5 अंक पहचानने को कहें। कम से कम 4 सही होने चाहिए।

बच्चे को कोई भी 5 संख्या पहचानने को कहें। कम से कम 4 सही होनी चाहिए।

बच्चे से कोई भी 2 जोड़ के सवाल करने को कहें। दोनों ही सही होने चाहिए।

बच्चे से कोई भी 2 घटाव के सवाल करने को कहें। दोनों ही सही होने चाहिए।

Trends from the one-on-one arithmetic assessment for Std 2 and Std 4:

The one-on-one assessment in maths reveals some important facts about children's basic learning in primary grades in Bihar (see Table 5.1). Looking at the data for Std 2 children, it is clear that 15% children reached grade level expectations in arithmetic by the end of the 2013-14 school year. These children have moved to Std 3 in 2014-15. However, these figures also imply that by teaching directly from the prescribed Std 3 curriculum and textbook in Std 3, 85% of children will get left out. In the first few months in Std 3, for a majority of children (close to 50%), teachers need to focus simply on building number sense and number knowledge of numbers up to 100 and on basic operations.

Table 5.1 One-on-one assessment in maths Std 2 and 4		
MAY 2014 : Basic math test : one-on-one		
% Children ability to do basic maths at different levels by grade	**Std 2**	**Std 4**
Can do 2 digit subtraction with borrowing	14.8	46.6
Can do 2 digit addition without carry over but not 2 digit subtraction with borrowing	21.5	24.9
Recognizes 2 digit numbers but cannot do 2 digit addition	10.0	8.0
Recognizes 1 digit numbers but not 2 digit numbers	42.5	17.3
Not yet able to recognize numbers till 9	10.4	2.5
Total %	**100**	**100**
Number of children tested	**22,424**	**22,467**

Close to half of all children in Std 4 are at Std 2 level or higher (Tabel 5.1). In this case, two digit subtraction with borrowing signifies "Std 2 level".[8] It is important to note that for the remaining children, it is not just that they could not do the subtraction problem, but that there is substantial variance in what they can do. For example, among Std 4 children there are still approximately 20% children who need to become comfortable with recognizing two digit numbers. Another 25% have a sense of place value, can do basic addition problems but have not as yet become adept at subtraction with borrowing. Each of these two big groups in Std 4 need different kinds of focussed activities to help them acquire these skills. Teaching them from the Std 4 textbook will not be helpful at this stage. Without strong foundational skills – number knowledge and basic operations, it will not be possible for these children to move ahead.

Research studies show that if these fundamental, foundational skills are not built now, future learning trajectories of majority of children will be flat – meaning that they will not gain much from being in school for additional years. Such data from over 50,000 children across the state need to be taken seriously as teaching-learning, training-monitoring activities are planned for the next academic years.

May 2014 assessment results as compared to ASER results from September 2013:

For Bihar, for the school year 2013-2014, we have state level data samples from two sources - ASER 2013 data (from September-October 2013) and the current assessment in May 2014. However, there are some key differences. First, the May assessment is a school-based assessment of students from selected grades. ASER is a household based survey of a representative sample of children aged 5 to 16. Second, the school based assessment was done in May 2014 and the ASER 2013 data collection was done in September-October 2013. Third, the tools for the two exercises are slightly different. In the standard ASER tool, the highest level is a division problem (numerical) in which a three digit number has

[8] In the one-on-one test, there are only a few items. The subtraction item is the only one that is at Std 2 grade level.

to be divided by a one digit number. The standard ASER tool also does not have the addition task. In the May school based assessment, there are two number recognition tasks and also an addition task where two 2 digit numbers have to be added but without carryover. The subtraction task with two digit numbers with borrowing, was the highest level task in the May school based assessment. Finally, it is important to remember that in the May school-based assessment, only half of all enrolled children were present in school on the day(s) of the assessment. These major differences in methods, measures, timing and location need to be kept in mind when we interpret the data.

Table 5.2 presents the distribution of children across different learning levels from the two sources of data. Keeping all the caveats in mind, we can see that for the same cohort, overall, performance in May is better than that in September of the previous year. The proportion of children who are able to do subtraction was about 38% in September. That figure is almost 10 percentage points higher in May (see the figures highlighted by an arrow in Table 5.2). Similarly, the fraction of children who are unable to recognize two digit numbers has dropped 10 percentage points from 34% to 25%. But it is unclear from the data whether this improvement can be attributed to real changes in the distribution or whether it is a consequence of the different measures and methods that were used in the two exercises.

Table 5.2 One-on-one assessment in math Std 2 and 4

% Children in Std 4 who can do different arithmetic tasks	Sept-Oct 2013 ASER
Division 3 digit by 1	18.5
Subtraction with borrowing	19.7
Number recognition 11-99	27.5
Number recognition 1-9	25.2
Beginner level	9.2
Total %	100

% Children in Std 4 who can do different arithmetic task	May 2014
Subtraction with borrowing	46.6
Addition without carry	24.9
Number recognition 11-99	8.0
Number recognition 1-9	17.3
Beginner level	8.5
Total %	100

Written (pen-paper) assessment in mathematics for Std 4

Content of the pen-paper maths written assessment

The basic structure of the written tests had the following elements for both grade levels:

- Number knowledge/sense : Tasks that assessed child's number knowledge included items like comparison between numbers, writing numbers in words and numerals
- Basic operations : addition, subtraction, multiplication, division – both in numerical and word problem forms
- Applied questions like tasks with calendar, menu, telling time
- Additional items for Std 6 included questions on geometry, fractions, integers, pictographs, and interpretation of graphs to assess data handling.

Taking into consideration the requirement of the evaluation as well as experiences from previous exercises, the decision was taken to include question-items mainly from lower grades, so as to enable an analysis of learning level for children who are not at grade level. Accordingly, the proportion of easy, medium and difficult question-items for both Std 4 and 6 maths written tool is kept at 70:30, which means that each tool consist of 70% easy and medium level and 30% difficult items.

For example in the Std 4 math tool, easy items are of Std 1 level; medium level items of difficulty are from Std 2 and 3, and difficult levels of items are of Std 3 and 4 competencies. A similar pattern is followed in the Std 6 math tool. For more details, please refer to the technical report.

The math written assessment had multiple choice questions as well as items that children had to solve. Children in both grades were explained, using examples, how to do multiple choice questions. Two samples of question papers were used for each grade. Children sitting next to each other were given different samples of the question paper. At the end of each day of assessment, grading was done by surveyors (DIET students and Cluster Coordinators) under the guidance and supervision of the Master Trainers.

Std 4 children and the math written test

Table 5.3 indicates that by end of Std 4, about two thirds of the children have knowledge of numbers up to 100 and are able to do operations with two digit numbers. (By this stage in school, all children should have number knowledge of all numbers up to 100 and beyond.) About half the children can deal with 3-digit numbers.

Table 5.3 Std 4 : Number knowledge and numerical operations

Number knowledge and simple operations			% Children who answered correctly	
Q1a	2 digit	Comparison of numbers	67.0	Multiple choice questions
Q1b	3 digit	Comparison of numbers	62.8	
Q1c	3 digit	Comparison of numbers	50.6	
Q3a	3 digit	Write number in numerals	46.4	Requires reading
Q3b	3 digit	Write number in numerals	46.9	
Q4a	2 digit	Numerical addition sum with carryover	69.8	Does not require reading
Q4b	2 by 1	Numerical multiplication	60.2	
Q4c	2 by 1	Numerical division	47.5	

Table 5.4 Std 4: Word problems using basic operations

% Children who answered correctly			All children	Children who can read at Std 2 level	Children who can read at Std 1 level
Q7	2 digit	Word problem subtraction (borrow)	49.1	68.8	50.8
Q8	2 by 2	Word problem multiplication	30.1	46.2	28.6
Q9	2 by 1	Word problem division	31.1	47.7	30.4

Q7.	एक दुकानदार के पास 70 किलो आलू थे। उसने 35 किलो आलू बेच दिए। बताओ कि दुकानदार के पास कितने किलो आलू बचे?
Q8.	एक कलम की कीमत 15 रुपये है। रमेश ने दुकानदार से 12 कलम खरीदे। बताओ कि रमेश ने दुकानदार को कुल कितने रुपये दिए?
Q9.	सीमा दीदी 75 बिस्कुट को 5 बच्चों में बराबर-बराबर बाँटती है। अब बताओ कि हर बच्चे को कितने बिस्कुट मिलेंगे?

To do word problems correctly, several skills have to be applied in an integrated way. A child should know how to read, understand what is to be done, know how to do the operation and then be able do the operation correctly. Comparison between questions reveals that for the same operation, more children can correctly do the numerical problem rather than the word problem. Even among children who can read, we can see that a large proportion does not know what is to be done to solve the word problems.

Chart 5.1 Std 4 : Written test in math

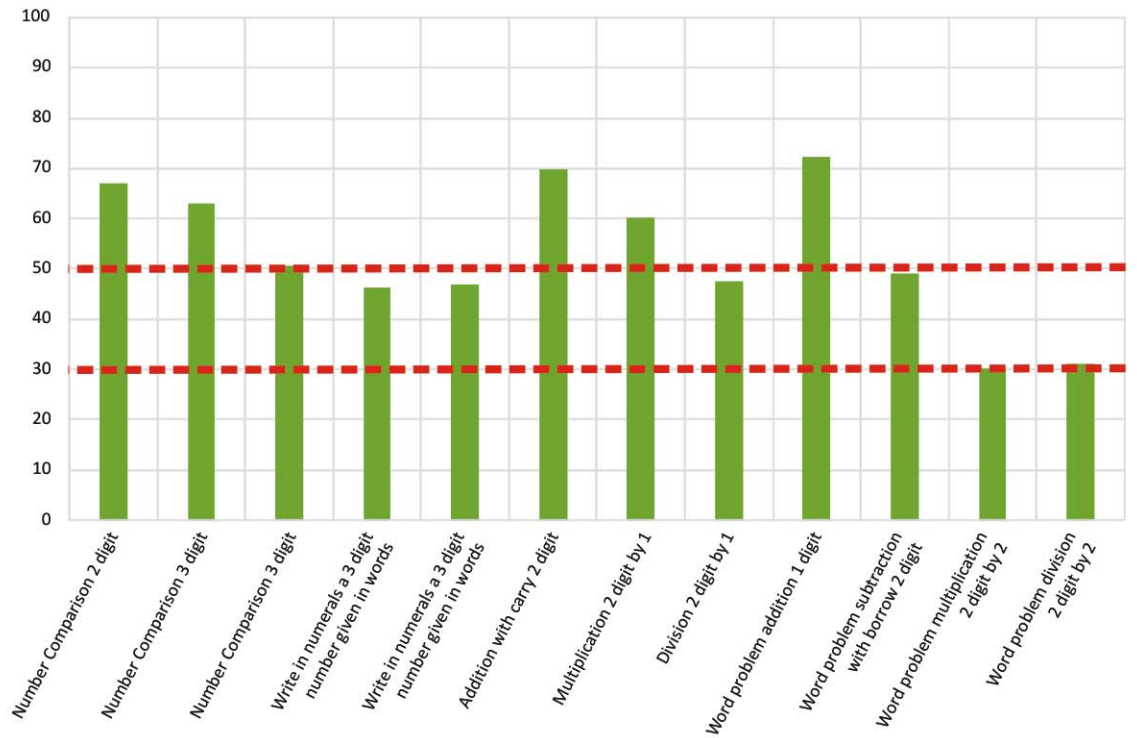


Table 5.5: Std 4 children basic operations and reading level

Children in Std 4	Total children
Children tested in maths and reading in Std 4	22,463
Total children who can read at least para or story level and can do numerical subtraction problems in oral math test	8,961 (40%)

The table above shows that about 40% of all children tested in Std 4 are at Std 2 level of reading (or higher). In the next page table 5.6 explores what else these children can do.

Table 5.6 Std 4 children basic operations and problem solving		
Type	**Details about children**	**Number or percentage**
A	Total children who can read at least para or story and can do numerical subtraction problems in oral math test	8,961
B	Total children who are at least at para or story level and can do numerical subtraction problems in oral math test **and** can do number comparison item correctly in written test (comparison of several 2 digit numbers to choose the biggest/smallest number)	7,763
B as a percentage of A	% Children who are at least at para or story level and can do numerical subtraction problems in oral math test **and** can do number comparison item correctly in written test	86.6
C	Total children who are at least at para or story level and can do numerical subtraction problems in oral math test **and** can do number comparison item correctly in written test **and** can do 2 digit subtraction word problem correctly in written test.	5,677
as percentage of A	% Children who can read at least para or story level and can do numerical subtraction problems in oral math test and can do number comparison item correctly in written test **and** can do 2 digit subtraction word problem correctly in written test.	63.4

We know that the 8,981 sampled children in Std 4 can read fluently, can recognize numbers correctly up to 100 and can do subtraction problems with borrowing. Yet:

- About 13% of these children (approximately 1,200 students) are unable to do the number comparison item(s) in the written test correctly. Here it is not just reading the question and comprehending it but it also needs application of number knowledge skills to compare numbers.
- About 36% or one out of every three children (approximately 3,284 students) are unable to solve the word problem in subtraction.

While reading skills and the ability to do numerical operations are absolutely necessary, it is clear that children need to know how to apply their number knowledge and operations skills in different contexts. Beyond reading, children need to be able to think about what kinds of problems solving strategies are needed.

The ability of children to apply their knowledge to different situations is further illustrated by the items which were designed to gauge this skill. The National Curriculum Framework 2005 and the Bihar Curriculum Framework both emphasize the need to be able to connect school knowledge to real life situations. The "applied" questions that were designed for the Std 4 written assessment aimed to see if the children could apply what they knew of "real life settings". See Figure 5.2 for an example of an applied question. To answer the question(s) correctly, the computations, if any, are straightforward but the format/context of the questions may be unfamiliar to children. In addition, the question requires that children can read and comprehend. Overall, performance in these questions is quite low. Even among children who can read fluently, 1 out of 3 can do the first calendar problem and 1 out of 4 can do the second.

Fig 5.2 Example of an applied question

Q10. नीचे दिए गए जून 2014 के कैलेन्डर को देखो और दिए गए प्रश्नों के उत्तर दो।

जून 2014

रविवार	सोमवार	मंगलवार	बुधवार	वृहस्पतिवार	शुक्रवार	शनिवार
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

a) इस महीने का तीसरा मंगलवार 17 तारीख को है। बताओ कि इस महीने का दूसरा बुधवार कौन-सी तारीख को था?

उत्तर यहाँ लिखो

b) ये कैलेन्डर जून 2014 का है। बताओ 2 जुलाई 2014 को कौन-सा दिन होगा?

उत्तर यहाँ लिखो

Written (pen-paper) assessment in math for Std 6 students

For Std 6, the only assessment in math was the pen-paper, written test. No one-on-one testing was done to ascertain whether children could recognize numbers or do the basic numerical operations. However, the oral reading test was done with Std 6 students. So it is be possible to explore the relationship of reading ability and math learning outcomes for these students.

Across the state, 17,640 Std 6 children took the math written test. As far as number knowledge items go, children were given 2 digit, 3 digit and 4 digit numbers and asked to pick the largest or smallest numbers. Depending on the items, 70-80% children could do the number knowledge questions correctly. A similar proportion could correctly do numerical addition (3 digits with carryover) and subtraction problems (without borrowing) with 3 digits or more.

What about operations and word problems? Charts 5.2 and 5.3 give a quick visual glimpse of what children can do. For every operation, word problems seem harder than numerical problems. The ability to do division seems to be the weakest skill. For example, by the time children have completed four years of schooling and are entering Std 5, far higher proportions than visible in this assessment should be able to do division confidently and correctly, whether the problem is presented in numerical form or in the form of a word problem.

Chart 5.2 % Children in Std 6 who can do question correctly

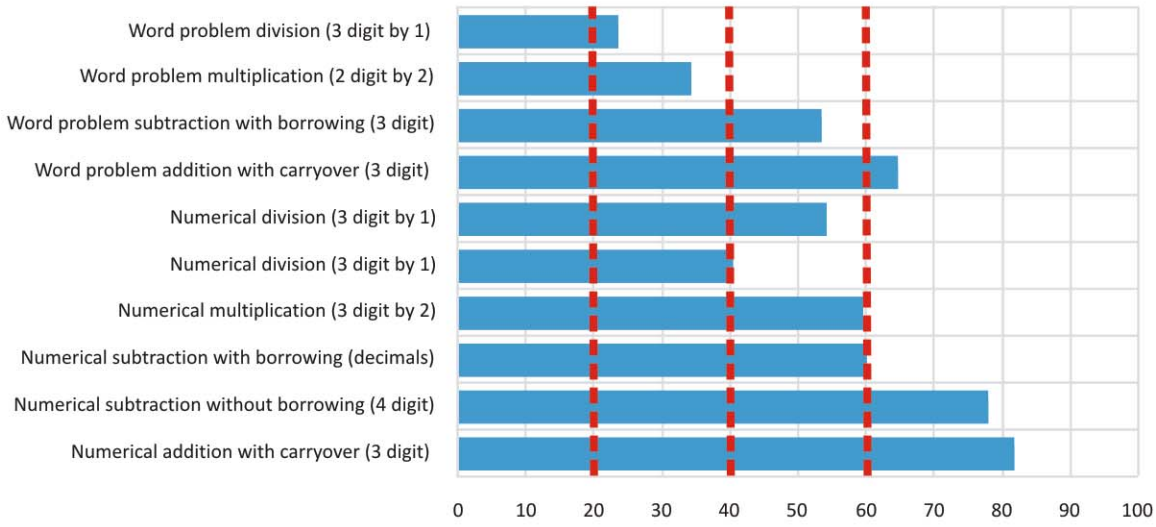
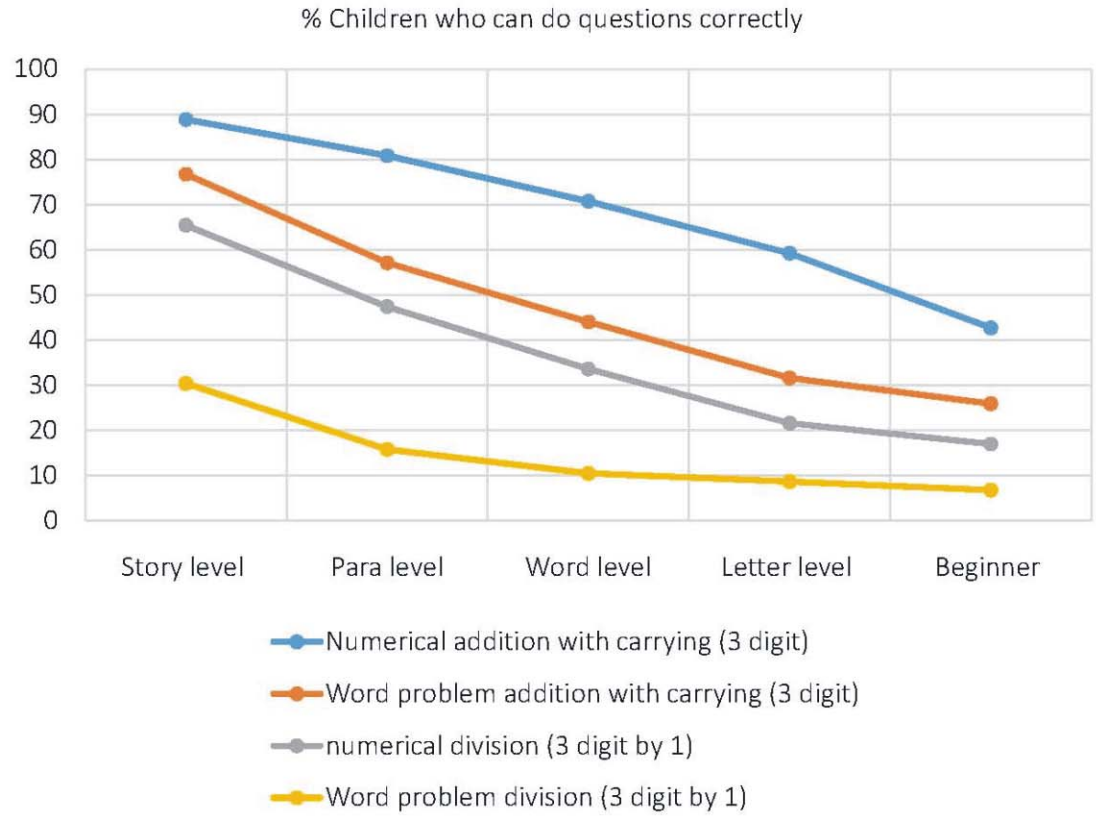


Chart 5.3 Relationship between reading ability and the ability to do basic operations



Std 6 students were also had questions where they had to apply their skills. Such questions included finding area and perimeter of a given piece of land as well as calculating what it would cost to put a fence around the land.

Figure 5.3. Example of an applied question

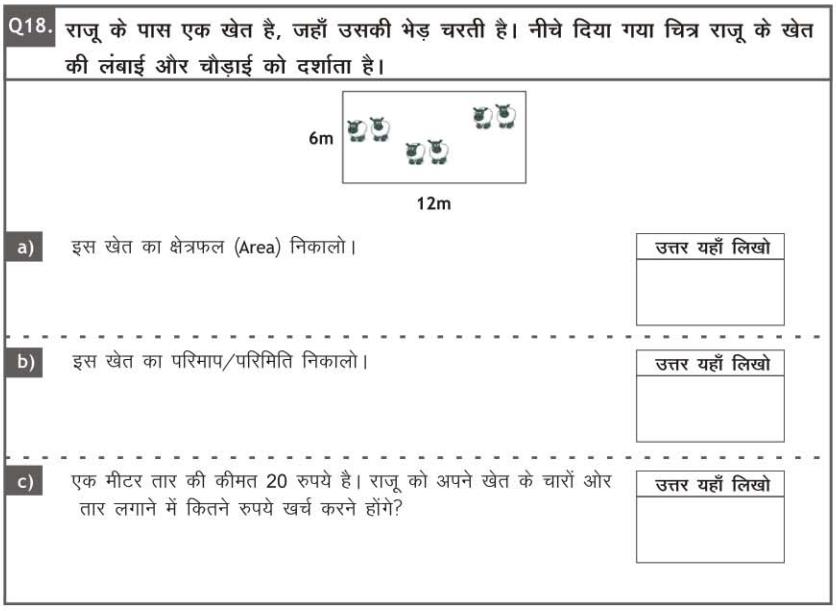


Table 5.7 Std 6: % Children getting correct answer

	Of all story level readers % who answered correctly	Of all para level readers % who answered correctly
Area question	36.8	23.7
Perimeter question	27.2	15.3
Calculation question	16.8	9.8

Overall, children's ability to do basic operations and problem solving skills needs to be strengthened. Apart from the example given above, other "applied" questions also indicate similar trends. Further, the ability to read also influences the possibility of solving problems that are presented in non-numerical ways (text, graphs etc). This is yet another example of how reading level influences the ability to do maths even in middle school.

Concluding thoughts: Maths

Whether in Std 4 or Std 6, of all the competencies in math, children at different grade levels are relatively better in number knowledge. Even with basic operations, strengthening of children's computational ability is needed. For each operation, children find the numerical problems easier than the word problems even if the calculation that needs to be done is similar. The ability to do word problems is based on the ability to read, to understand what needs to be done and the computational ability to do the operation correctly. All of these three abilities need to be developed for majority of children in Std 4 and Std 6.

The data from the one-on-one assessments as well as from the written test indicate that most children are well below grade level and that the distribution of abilities has a wide spread. Teaching at grade

level or from the textbook from that class will not benefit children because they need help with much more fundamental and foundational skills.

Given the current focus of Mission Gunwatta (the Quality Mission program in Bihar), here are some suggestions from the analysis of the May assessment data:

- For the two years leading up to Std 2 there needs to be a strong focus on ensuring that children develop basic knowledge of numbers (number recognition, number names, comparison, ordering etc) and a facility with basic operations. Learning goals need to be clearly articulated and understood by teachers. Special attention needs to be given to children who do not progress at the expected pace. If the foundations are built well by the end of Std 2, then many of the other academic weaknesses that are visible today in older children will not be there.

- As the current cohort of Std 4 students moves into Std 5 in the school year 2014-15, it is critical that time is given to ensuring that these students not only have adequate basic skills but are also confidently able to solve problems that are presented in different contexts and formats. This work needs to be prioritized over the usual objective of "completing the curriculum" by the end of the year. Teaching from the textbook for the grade will not help children gain ground. It is only when the basic skills are in place that children can move towards grade level expectations.

- Middle school grades also need strengthening in basic skills. Many of the recommendations for Std 4 also apply to Std 6.

- The importance of reading ability for predicting performance in arithmetic underscores the essential and immediate need for building the skill of reading with understanding across all grades in primary and middle school.

Children's performance levels in "applied" questions suggests that perhaps they are not exposed to a variety of applications or of how to link questions/problems or contexts that need mathematical applications in real life (See NCF and BCF recommendations on this issue). Classroom teaching activities need to focus on discussions of problems in maths as well as on developing critical thinking skills. (Note: a recent study on teachers and teaching done by ASER Centre in Bihar also indicated that teachers have difficulties in teaching such competencies.) This is clearly an input that needs to go into teacher training.

This study also suggests that when children have difficulty reading, it is better to have other ways to assess their skills. For example, in addition to the reading test, it is possible to introduce a "problem solving" set of tasks that can be carried out in a one-on-one and oral format. A word problem can be read out. The child can be asked to explain what he or she thinks needs to be done and then the child can do it. In doing the assessment this way, it is possible to understand exactly what the child is able to do and what s/he is thinking. Such assessments help to provide direct inputs for how to change instructional practice.

The maths data from this assessment exercise provides a variety of suggestions for future years in terms of assessment practices and use of evidence as well as what learning goals should be set, how teachers should be trained and how schools can be supported.

Cluster report cards 6

Introduction

In the planning meetings to finalize the design of this school based assessment, a key decision was taken about the location of the study. It was decided by the senior officers of education department that instead of taking a random sample of schools from each district (which is the usual practice for many studies), in each district sampling would be done at the cluster level. For each sampled cluster, all schools would be surveyed. The reason behind this decision had to do with a desire to translate the evidence to actual action. Locating this assessment exercise and linking it to the overall effort being made by Bihar government to strengthen academic monitoring, mentoring and leadership at the sub-district level made sense[9]. The original envisioned role for the cluster coordinator was to provide on-site support to schools in the cluster. Hence, one of the reasons to do this exercise at the cluster level was to provide information to cluster coordinators and others of how to monitor/guide and support the schools in their care[10].

[9]Currently Bihar government has been focussing on capacity building of cluster coordinators via specially designed training programs.

[10]Cluster level report cards from this assessment exercise will be made available to all districts and to the surveyed clusters shortly. Meetings with all participating cluster coordinators to discuss the report cards are also being planned.

Administratively, the cluster is a useful unit of analysis – one cluster coordinator is responsible for monitoring all schools in the cluster. Often many socio-economic and cultural characteristics are also shared across these schools. However in terms of educational inputs, processes and outcomes, there are substantial variations across schools within the same cluster. This point is often made in anecdotes from field experience. However, systematic evidence on student outcomes at cluster level matched with concerted action to see how the stronger schools can help the weaker schools in the cluster is rare. The data generated in this assessment exercise could provide an opportunity to use evidence to fuel focused action for schools by cluster.

For the study, 2 clusters were randomly sampled from each district. Given the time and the manpower resources that were available, a total of approximately 25-30 schools could be surveyed. In a few districts, one of the sampled clusters had the required number of schools. In this case only one cluster was surveyed. If in any district, the number of schools in the sampled clusters was small, then a third randomly sampled cluster was added to the survey to ensure adequate number of schools.

Basic characteristics of schools in a cluster

For this report we are going to take up one cluster as a sample cluster, MS Kabiya in this case. This cluster is one of the sampled clusters of Begusarai district and there are 12 schools in this cluster – six with primary sections only and the rest which go from Std 1 to Std 8.

Table 6.1 Basic characteristics of schools under the MS Kabiya cluster

School name	Classes	Type of school	Total student enrollment	Number of teachers	PTR
PS BANAULI	class 1-4/5	Primary	140	7	20.0
PS DOHATTA MUSAHRI	class 1-4/5	Primary	126	6	21.0
UMS DOHATTA	class 1-7/8	Upper Primary	304	9	33.8
UMS JAGDISHPUR	class 1-7/8	Upper Primary	442	11	40.2
NPS SAMUDAYAK BHAWAN JADISHPUR	class 1-4/5	Primary	164	2	82.0
MS KAVIA	class 1-7/8	Upper Primary	472	10	47.2
UMS KANYA KAVIA	class 1-7/8	Upper Primary	334	9	37.1
MS MOKHTIYARPUR	class 1-7/8	Upper Primary	393	12	32.8
NPS HARIJAN POKHAR	class 1-4/5	Primary	61	2	30.5
NPS MAHTO TOLA MOKHTIYARPUR	class 1-4/5	Primary	104	2	52.0
PS MUSAHRI MOKHTIYARPUR	class 1-4/5	Primary	118	5	23.6
UMS AMBEDKARNAGAR MOKHTIYARPUR	class 1-7/8	Upper Primary	158	7	22.6

The school names signify the type of school: PS refers to a regular primary school, MS to a regular middle school. NPS refers to a newly opened ("navsrijit") primary school and UMS means an upgraded ("utkramit") middle school. From the table above, one can see that the NPS schools often have low enrollment and fewer teachers. The location of the NPS is decided at the local level and these are often to be found in hamlets or tolas which did not have primary schools before. In this entire cluster, the three NPS schools have only two teachers each. Where enrollment is low, as in NPS Harijan Pokhar, the

student-teacher ratio is within manageable limits, but where enrollment is high, the PTR is extremely high. However, it is worth remembering that even if enrollment is low, having two teachers for 5 classes/grades means that several classes have to be taught together. All other primary schools have at least 5 teachers. All the upper primary schools have at least 7 teachers, if not more, in place.

Looking closely at the data from this cluster, it seems that in all clusters, it is worth giving all the NPS schools a much closer look. While the access question has been solved by bringing the school very close to the child's hamlet and home, it is important to assess if a school that is very close to a child's home also has adequate facilities. Overall in terms of facilities as well, often the newly opened schools have disadvantages.

Comparison across cluster

The availability of cluster level data enables cluster wise comparisons to be made with the state averages. If such comparisons are useful, then it is possible in the future for the state government to think about all clusters in a district doing similar report cards.

Table 6.2 and 6.3 show how children have done in the oral one-on-one reading and arithmetic assessments as well as in the written tests in the cluster as compared to the Bihar average.

Table 6.2 Cluster wise and class wise student performance in oral assessments

District Begusarai	Std 2			Std 4			Std 6	
	Total children tested in Std 2	% Children who can read at story level	% Children who can recognise numbers up to 100	Total children tested in Std 4	% Children who can read at story level	% Children who can do subtraction	Total children tested in Std 6	% Children who can read at story level
MS KABIYA	213	6.6	13.6	216	28.7	44.7	230	53.5
MS SAHEBPURKAMAL	322	4.3	9.3	298	33.6	48.0	235	57.0
BIHAR	22,424	11.8	10.0	22,469	39.5	46.6	17,651	61.6

Table 6.3 Clusterwise and classwise student performance in written tests

District Begusarai	Std 4			Std 6		
	Total children tested in Std 4	Average percentage Scores in Language (written)	Average percentage Scores in Math (written)	Total children tested in Std 4	Average percentage Scores in Language (written)	Average percentage Scores in Math (written)
MS KABIYA	216	37.9	30.6	230	29.0	38.4
MS SAHEBPURKAMAL	298	42.8	39.4	235	27.3	34.3
BIHAR	22,469	47.8	43.9	17,651	40.5	40.0

Comparisons by cluster can be useful at district level to decide which clusters need the most attention in terms of on-site monitoring and support as well for strengthening of teacher capacity via training. For this all clusters would need to have data on student performance which could be discussed at block and district levels.

For a cluster coordinator however, it is important to be able to look at the performance of individual schools by class. A close school-by-school look at student outcomes would enable the cluster coordinator to decide which schools and which classes need focussed attention from him/her for improving children's learning.

Understanding schools within a cluster

The next set of tables are examples of how data from a cluster report card could be interpreted to understand how schools are doing within a cluster.

Table 6.4 Students' enrolment and attendance for schools in MS Kabiya cluster

CLUSTER: MS KABIYA : School Name	School Type	Total enrollment in school	Students' Attendance Day 1	Students' Attendance Day 2
NPS HARJAIN POKHAR	Primary	61	34	35
NPS MAHTO TOLA MOKHTIYARPUR	Primary	104	34	7
NPS SAMUDAYAK BHAWAN JADISHPUR	Primary	164	110	109
PS BANAULI	Primary	140	70	78
PS DOHATTA MUSAHRI	Primary	126	80	83
PS MUSAHRI MOKHTIYARPUR	Primary	118	68	85
MS KAVIA	Upper-Primary	472	295	311
MS MOKHTIYARPUR	Upper-Primary	393	174	140
UMS AMBEDKARNAGAR MOKHTIYARPUR	Upper-Primary	158	61	65
UMS DOHATTA	Upper-Primary	304	204	179
UMS JAGDISPUR	Upper-Primary	442	328	315
UMS KANYA KAVIA	Upper-Primary	334	173	133
Total		**2,816**	**1,631**	**1,540**

Table 6.5 Total children tested by grade and school

CLUSTER: MS KABIYA : School Name	Std 2 reading Total children tested	Std 4 reading Total children tested	Std 6 reading Total children tested
PS BANAULI	15	11	na
PS DOHATTA MUSAHRI	21	13	na
UMS DOHATTA	40	21	31
UMS JAGDISPUR	28	43	51
MS KAVIA	18	21	64
NPS SAMUDAYAK BHAWAN JADISHPUR	21	32	na
UMS KANYA KAVIA	18	21	26
MS MOKHTIYARPUR	14	25	47
NPS HARJAIN POKHAR	8	7	na
NPS MAHTO TOLA MOKHTIYARPUR	4	4	na
PS MUSAHRI MOKHTIYARPUR	19	3	na
UMS AMBEDKARNAGAR MOKHTIYARPUR	7	15	11
Total Cluster	**213**	**216**	**230**

Note: "na" means not applicable. Cells shaded in blue have very few tested children. Cells shaded in yellow refer to middle schools.

The table above gives a snapshot of the number of children tested. Several schools in this cluster have very few tested children. In this section, discussions of student performance will not refer to the schools and classes where the number of children tested is ten or less. The possible issues of teaching and learning in small schools is discussed in a later section.

The performance of the Std 2 class in a school in basic reading and basic arithmetic skills is a good indicator of how far the school has succeeded in building these fundamental foundations of learning. Both curricular expectations and textbook content suggest that by the end of two years of schooling, a child should be reading simple text confidently and be comfortable with numbers up to 100 and the basic operations. If learning goals are defined in this way, then based on the one-on-one oral testing, we can see what percentage of children in each Std 2 class in each school in the cluster are at "grade level". For Std 2, let us consider being able to read at "para or story" level as "grade level" in reading and being able to do addition or subtraction as "grade level" in arithmetic.

Table 6.6 shows the variation across schools. For basic reading, only one school (UMS Kanya Kavia) has about 40% children reading at grade level. Ignoring the schools where very few children were tested,

Table 6.6 Std 2 oral testing in reading and maths by school

DISTRICT : BEGUSARAI	Std 2: Total children tested	Std 2: Oral testing: % Children			
CLUSTER : M.S.KABIYA		Reading		Arithmetic	
School Name		Beginner or can recognize only letters	Can read either at para level or at story level	Beginner or can only recognize numbers upto 10	Can do addition or subtraction
PS BANAULI	15	73.3	13.3	33.3	60.0
PS DOHATTA MUSAHRI	21	85.7	9.5	52.4	28.6
UMS DOHATTA	40	70.0	22.5	37.5	37.5
UMS JAGDISHPUR	28	96.4	0.0	67.9	17.9
MS KAVIA	18	83.3	11.1	66.7	11.1
NPS SAMUDAYAK BHAWAN JAGDISHPUR	21	90.5	9.5	90.5	9.5
UMS KANYA KAVIA	18	55.6	38.9	50.0	33.3
MS MOKHTIYARPUR	14	64.3	14.3	42.9	50.0
NPS HARJAIN POKHAR	8	75.0	0.0	50.0	37.5
NPS MAHTO TOLA MOKHTIYARPUR	4	50.0	25.0	25.0	50.0
PS MUSAHRI MOKHTIYARPUR	19	100.0	0.0	78.9	21.1
UMS AMBEDKARNAGAR MOKHTIYARPUR	7	85.7	14.3	85.7	14.3
Average for Cluster	213	79.8	13.1	57.3	29.1

Note: Shaded cells have very few tested students

almost all have less than 15% children reading at grade level. In three schools – (Dohatta Musahri, Jagdishpur and Samudayak Bhavan Jagdishpur) more than 80% children are not able to read more than letters even after two years of schooling.

Across schools, there are two interesting trends. First, the schools which have done well in reading (UMS Dohatta and UMS Kanya Kavia) are not the ones that have done relatively well in arithmetic. But there are schools that are very weak both in reading and arithmetic, and need immediate attention (UMS Jagdishpur, MS Kavia and NPS Samudayak Bhawan Jagdishpur). Second, all schools are performing better in arithmetic than in reading. For the cluster as whole, close to 30% are at grade level in arithmetic by our definition. But less than 15% are at grade level in reading. This is serious not only because in two years many more children should have been reading but also because not being able to read will seriously constrain them from making progress in language as well as in all other subjects as they are "promoted" to higher classes.

Table 6.7 Std 4 and Std 6 oral assessments

CLUSTER: MS KABIYA	Maths	Reading	
School Name	Std 4: % Children who can do two digit subtraction with borrowing	Std 4: % Children who can read Std 2 level text	Std 6: % Children who can read Std 2 level text
PS BANAULI	90.9	45.5	na
PS DOHATTA MUSAHRI	38.5	15.4	na
UMS DOHATTA	76.2	52.4	51.6
UMS JAGDISHPUR	27.9	23.3	64.7
MS KAVIA	60.0	28.6	45.3
NPS SAMUDAYAK BHAWAN JAGDISHPUR	6.3	6.3	Na
UMS KANYA KAVIA	66.7	47.6	57.7
MS MOKHTIYARPUR	60.0	32.0	59.6
NPS HARJAIN POKHAR	42.9	28.6	na
NPS MAHTO TOLA MOKHTIYARPUR	25.0	25.0	na
PS MUSAHRI MOKHTIYARPUR	100.0	66.7	na
UMS AMBEDKARNAGAR MOKHTIYARPUR	20.0	20.0	18.2
Total Cluster	**44.7**	**28.7**	**53.5**

Note: Shaded cells have very few tested children

Table 6.7 shows the performance of children in the oral tests for Std 4 and Std 6. In Std 4 maths and in reading there is wide variation across schools. The best performing school in maths is PS Banauli where over 90% children are able to do subtraction, as compared to NPS Samudayak Bhawan Jagdishpur.

It is noticeable that in the middle schools, the range of variation in students' performances is much less. But here too, in Std 6 about half of all children still cannot read fluently at Std 2 level. In some schools, there are substantial differences by cohort. For example in UMS Dohatta, the same proportion of Std 4 children are at story level as Std 6 children. Similarly in UMS Ambedkarnagar Mokhtiyarpur. In Std 4 as well, overall performance in maths is better than in reading.

Table 6.8 Std 4 and Std 6 written assessments				
CLUSTER: MS KABIYA	Std 4		Std 6	
School Name	Average percentage scores in language (written)	Average percentage scores in math (written)	Average percentage scores in language (written)	Average percentage scores in math (written)
PS BANAULI	35.6	47.6	na	na
PS DOHATTA MUSAHRI	41.7	34.4	na	na
UMS DOHATTA	42.1	44.0	25.8	48.2
UMS JAGDISPUR	43.8	27.2	23.8	33.8
MS KAVIA	48.8	39.5	31.5	37.8
NPS SAMUDAYAK BHAWAN JADISHPUR	22.1	8.8	na	na
UMS KANYA KAVIA	42.9	48.5	32.9	35.6
MS MOKHTIYARPUR	29.7	26.6	33.5	41.8
NPS HARJAIN POKHAR	60.7	37.8	na	na
NPS MAHTO TOLA MOKHTIYARPUR	33.3	11.8	na	na
PS MUSAHRI MOKHTIYARPUR	66.7	68.6	na	na
UMS AMBEDKARNAGAR MOKHTIYARPUR	23.9	15.7	19.2	28.6
Average for Cluster	37.9	30.6	29.0	38.4

Concluding thoughts

Looking at a cluster report card, several things become very clear. Overall, basic foundations in reading and math need to be strengthened across all schools. However, in a relative sense, there are schools that are performing well and schools where the situation is exactly the opposite. For the weaker schools, extra attention is needed. Also, at the local level is worth thinking about how the schools which are doing relatively better than the others can be a resource or a "model" for the other schools in the cluster.

This kind of school based cluster report cards can be used to track children's progress over time, to think about which schools need what kinds of inputs, which teachers need what kind of training, how cluster coordinators and others should prioritize their time and effort for improving teaching processes and learning outcomes across schools.

School functioning and learning outcomes

7

Introduction

Children's academic achievement or learning is an outcome of many influences, a combination of a range of factors at different levels. These factors may include household environment, school characteristics and the socio-economic background of the child. One of the major objectives of any large scale learning assessment is to identify factors at various levels that might influence learning outcomes. With this objective in mind, this study was designed to not only assess children's learning outcomes but also collect detailed school information which could help identify factors at the school level that influence learning outcomes of students. For this, an extensive format for data collection was prepared to cover a whole range of indicators. This chapter is dedicated to an analysis of various school level variables and their relationship with student learning outcomes. It is hoped that this evidence will be useful to policy makers and practitioners to think about interventions that can help improve children's learning outcomes.

The school information questionnaire was divided into broad sections that covered a rich set of questions on various school indicators or characteristics. This chapter includes an analysis of these

school indicators and their linkages with learning outcomes. These indicators are:

1. Student enrollment, teacher appointment and attendance
2. Infrastructure and facilities
3. Conditions and support for teaching and learning
4. Continuous and Comprehensive Evaluation (CCE) and Report Cards
5. School monitoring
6. Indicators for "Mission Gunwatta"

For learning outcomes we have used average percentage scores[11] of written assessments in both subjects (language and math) and for both Std 4 and Std 6.

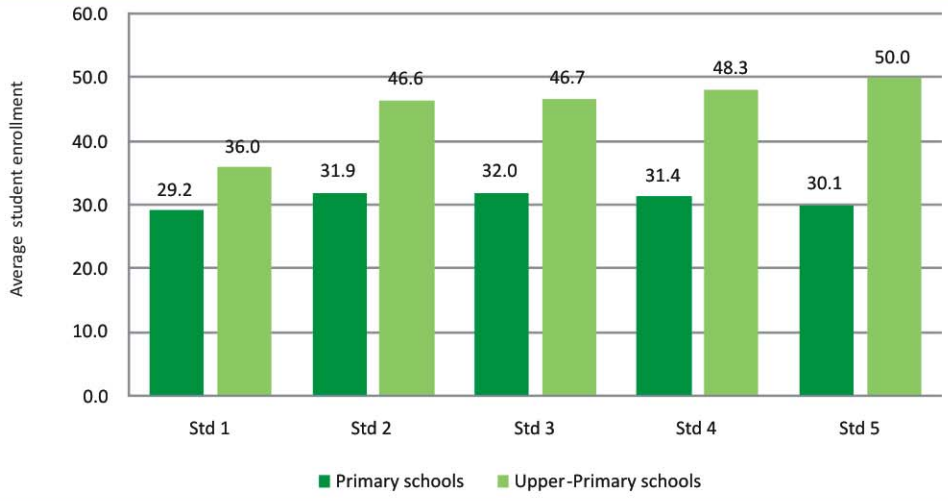
1. Student enrollment, teacher appointment and attendance

Information on student enrollment was collected for each grade from the school enrollment register. The survey teams were in the school for 2-4 days. For all days of the survey, attendance was measured by headcount for each grade. In case of teachers, data on the number of teachers appointed to each school and their attendance was recorded.

School size

There are a total of 1,047 schools in the sample of which approximately 58% were primary schools while the remaining 42% were upper-primary schools[12]. Overall, upper-primary schools had higher total enrollment compared to primary schools. If we compare the number of students enrolled in Std 1 to 5 across both school types, we see that the average class size in upper-primary schools is higher than in primary schools for each of these classes (Chart 7.1). Also noticeable is the fact that the average class size increases with each grade for primary classes in upper-primary schools.

Chart 7.1 Average student enrollment in each Std by school-type



[11] Since the assessment data is child-wise, to calculate aggregate measure of scores at the school level the mean of children's percentage scores was taken for each school.

[12] Less than 1% schools in the study were found to have only grades 6 to 8. For the purposes of this analysis, these schools have been included in the category of upper-primary schools with Std 1 to 8.

Given that the average size of a class differs significantly by school type, in order to see the effects of school size on learning, schools have been categorized as "small", "medium" and "large" based on their total student enrollment. The distribution of enrollment across the two school types have been used to define respective ranges within these categories (Table 7.1).

Table 7.1 Categories of school size by school-type

School Type	Range of total school enrollment		
	Small	Medium	Large
Primary	Up to 119	120 to 169	170 and above
Upper- Primary	Up to 319	320 to 469	470 and above

Let us look at average percentage scores of students by school size[13] based on the criteria stated above. Table 7.2 below shows the proportion of schools by type in each 'school size' category and the corresponding average percentage scores for Std 4 in language and math respectively.

Average scores in language for Std 4 in primary schools decline as we move from "small" to "large" school size category. This trend is also visible in upper-primary schools but the decline of scores across is comparatively small. In math, there does not seem to be much of a trend. The school size does not appear to affect average scores in upper primary schools.

Table 7.2 Std 4 language and math: Average percentage scores by school size

Std 4	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Primary Schools			
Small (less than 120)	36.3	50.5	43.9
Medium (120 to 170)	31.3	49.2	42.7
Large (170 above)	32.3	45.5	42.0
All	**100**	**48.46**	**42.9**
Upper-Primary Schools			
Small (less than 320)	33.6	49.1	44.7
Medium (320 to 470)	33.3	47.2	42.7
Large (470 above)	33.1	47.0	45.3
All	**100**	**47.75**	**44.2**

Pupil Teacher Ratio

Using the same logic as in the case of total enrollment and school size, a pupil teacher ratio[14] (PTR) was created for schools based on the distribution of total enrollment and total number of teachers appointed, separately for each school-type (Table 7.3).

[13]Unless specified otherwise, comparison of scores by school type are based only on Std 4 results as results for Std 6 are available only for upper-primary schools.

[14]PTR= Total enrollment/Total Teachers

Table 7.3 Categories of pupil-teacher ratio by school-type			
School Type	Range of Pupil Teacher Ratio		
	Good	Medium	High
Primary	Up to 34	35 to 56	57 and above
Upper- Primary	Up to 39	40 to 57	58 and above

One can observe from Table 7.4 that in both primary and upper primary schools, the average percentage scores are higher for schools where the PTR is in the "good" category as compared to the "high" category for both language and math. In case of language there is a decrease of close to 4 percentage points as one move from "good" to "high" PTR (both primary and upper-primary) .

However, for primary schools an important thing to notice is that the falling trend is not consistent across categories. For example for both the subjects, the lowest average scores were in the "medium" category for primary schools suggesting there may not be a simple linear relationship between PTR and learning outcomes.

Table 7.4 Std 4 Language and math: Average percentage scores by pupil teacher ratio			
Std 4	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Primary Schools			
Good	33.2	51.6	47.2
Medium	33.5	46.3	39.3
High	33.3	47.4	42.6
Total	**100**	**48.5**	**42.9**
Upper-Primary Schools			
Good	33.6	49.2	44.7
Medium	32.9	48.2	44.4
High	33.6	45.8	43.5
Total	**100**	**47.8**	**44.2**

Another way to look at PTR is to compare it with Right to Education (RTE) norms. The RTE norm for PTR is 30:1 for primary and 35:1 for upper-primary schools[15].

Chart 7.2 Primary schools and PTR (%)

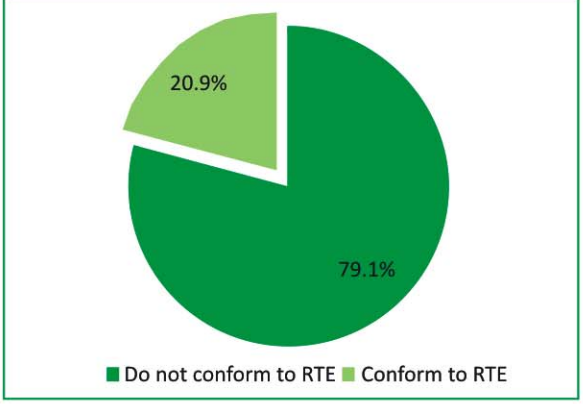
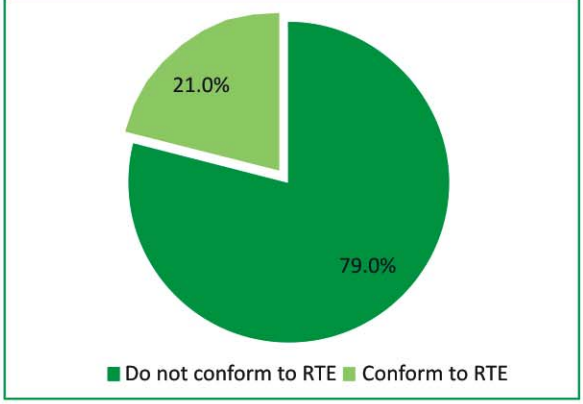


Chart 7.3 Upper-primary schools and PTR (%)

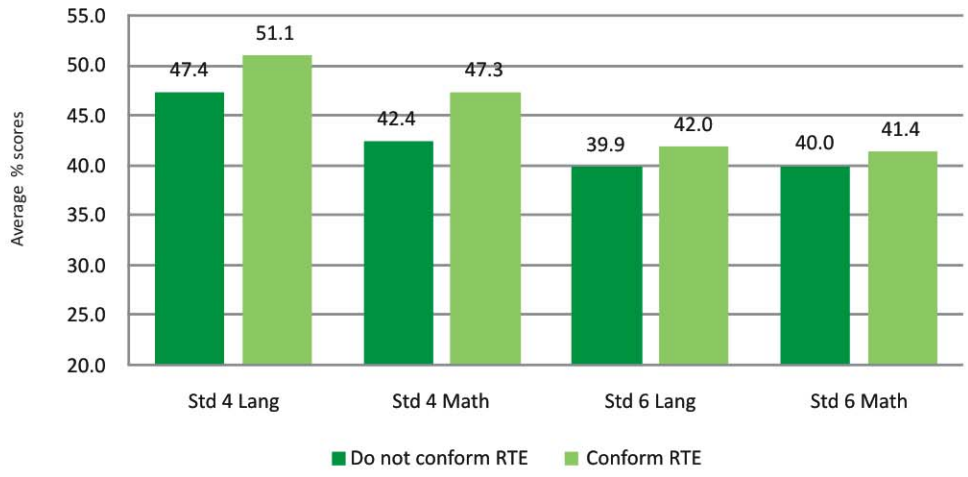


[15]The Right of Children to Free and Compulsory Education Act,2009

As seen in Chart 7.2 and 7.3, a similar proportion of primary and upper primary schools were found to conform to the RTE norm on PTR.

We now examine the link between PTR as per RTE norms and learning outcomes .The following graph (Chart 7.4) shows the difference in scores for those schools which conform to PTR norms and those which do not. As can be seen for all the written assessments the learning outcomes are slightly better for those schools which conform to the RTE norm for PTR as opposed to those which do not especially in Std 4.

Chart 7.4 Std 4, 6 language and math: Average percentage scores by PTR norms of RTE



Student attendance

As mentioned earlier student attendance was collected on each day of the school visit. The school visit varied from 2 to 4 days depending on the size of the student body and how long it took to complete the assessment. Since in some schools the survey was completed in two days, attendance information for the third and fourth day is missing in those schools. Therefore, we have not included attendance for the third and fourth day of the survey in our analysis.

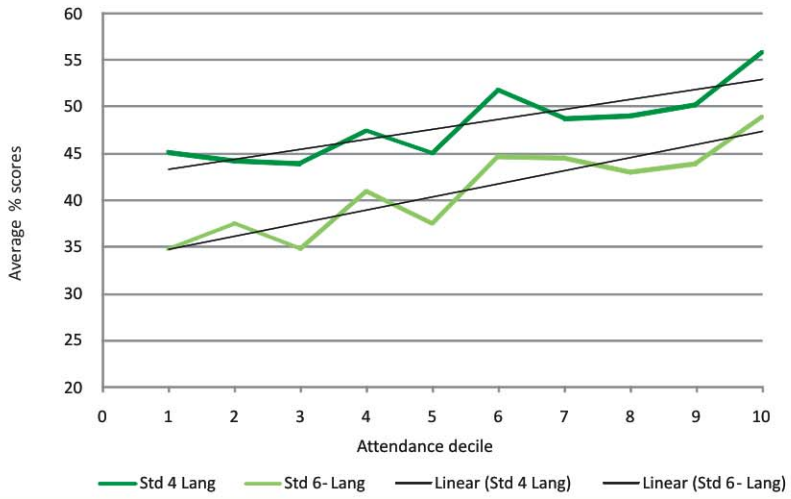
The link between average scores and attendance is depicted in the charts below. In Chart 7.5 the average percentage scores in language is plotted against the mean school attendance[17] on day 1 of school visit[18]. On the x-axis, attendance runs from lowest to highest decile. From the chart an increasing trend is visible in average percentage scores as one move from lower to higher attendance levels.

[16]Henceforth, scores for Std 4 include scores for all schools i.e. both primary and upper-primary schools whereas Std 6 scores are available only for upper-primary schools.

[17]Since we have standard wise data for attendance and enrollment at the school level, the average attendance was derived by first calculating the percentage attendance for each standard and then taking the average of the same. The average attendance at school level was then used to calculate mean attendance in each decile class.

[18]We have shown data only for Day 1 as Day 2 showed similar trends of the learning curve.

Chart 7.5 Std 4,6 language: Average percentage scores by attendance decile



This positive relationship between percentage scores and attendance becomes more evident as we look into broader attendance categories and the mean scores within each. Table 7.5 shows the percentage schools within each attendance category (for day 2) and their corresponding language mean scores[19]. For both Std 4 and Std 6 the tables show improvement in mean scores as we move from the less than 40% to more than 60% attendance range.

Table 7.5 Std 4,6 language and math: Average percentage scores by attendance range

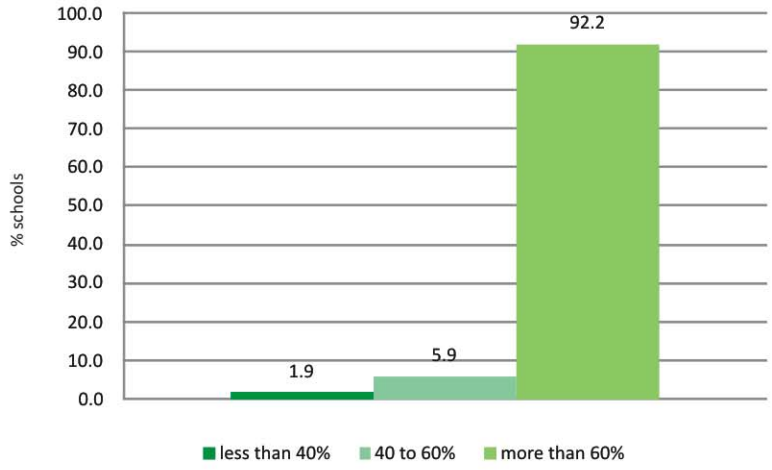
Attendance Range	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Std 4			
less than 40%	17.2	43.8	38.9
40 to 60%	43.7	47.0	41.8
more than 60%	39.1	51.3	47.2
Total	**100**	**48.1**	**43.4**
Std 6			
less than 40%	18.9	35.7	37.3
40 to 60%	49.3	38.9	39.2
more than 60%	31.8	45.1	43.7
Total	**100**	**40.3**	**40.3**

Teacher attendance

Data on teacher attendance was also recorded for all days of school visit. Overall, the mean teacher attendance both on day 1 and day 2 was very high (88 % on day 1 and 85% on day 2). Using by the same attendance category as for students we see a very small percentage of schools having attendance in the lower category. More than 90% of schools had teacher attendance of more than 60% (Chart 7.6).

[19]Student attendance on Day 2 of the survey was higher than that on Day 1 in most schools.

Chart 7.6 Percent of schools by teacher attendance category (day 1)



The relationship between teacher attendance and average scores did not show much of a trend but this is most likely due to the fact that for the days of the assessment teacher attendance in most schools was very high.

2. Infrastructure and facilities

The Right to Education Act has laid down various parameters for school inputs which are considered essential for proper school functioning. Data was collected on a number of such indicators for school infrastructure and facilities, these include -

- Pukka rooms in school
- School office
- School boundary wall
- Playground in school
- Hand pump or any other drinking water facility
- Girl's toilet

Looking at the relationship between the presence of these facilities and learning Table 7.6 lists the average scores for all assessments by infrastructure facilities. For comparison, we created three categories of schools based on the availability of facilities listed above, these are:

- schools with less than 2 of these 6 facilities
- schools with 3 to 4 facilities
- schools with 5 to 6 facilities.

Table 7.6 Std 4,6 language and math-Average percentage scores by number of infrastructure facilities			
Number of Infrastructure facilities	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Std 4			
Less than 2	16.4	48.4	41.1
3 to 4	42.1	49.1	44.5
5 to 6	41.4	47.1	43.3
Total	**100**	**48.2**	**43.4**
Std 6			
Less than 2	2.8	43.0	43.4
3 to 4	35.8	40.7	41.5
5 to 6	61.5	39.9	39.3
Total	**100**	**40.3**	**40.2**

The data above suggests that there is no direct link between the availability of school facilities and mean student scores.

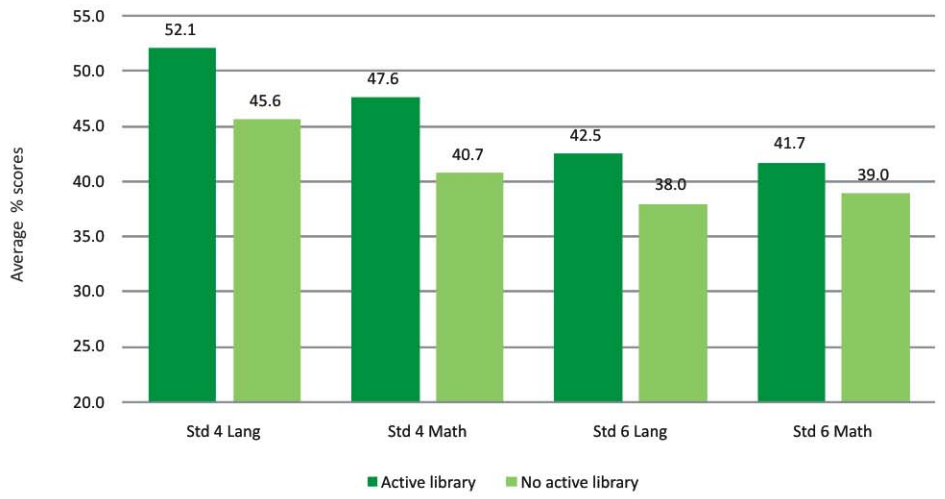
3. Conditions and support for teaching-learning

In the entire process and structure of education delivery, perhaps the hardest domains to measure are those related to teaching-learning activities and classroom practices. In this section, we focus on indicators that are linked to the teaching and learning environment of the school. Such indicators include variables that proxy the organization of time (e.g. timetables), variables that suggest how students are organized (e.g. multigrade classrooms), materials such as teaching-learning materials and libraries, and manuals like the Learning Facilitation Manual. These specific classroom indicators were recorded for Std 2, 4 and 6 since these were the target grades for assessment.

Library and timetable (or routine)

The data on libraries was collected in the following way. First investigators asked if the school had a library (library implies all books other than textbooks;including books kept inside a cupboard). If there was a library, surveyors were asked to observe if they saw children using books and other materials from the library. In the graph below (Chart 7.7) “active library” implies that the schools had a library and children were observed using material from the library. Overall about 71% of the schools had a library while the proportion of schools with an "active library" was close to 35%.In terms of student scores, the graph indicates that schools that have an active library perform better than those schools that do not have an active library. The influence of a “library” on student performance is probably a proxy for a variety of other influences as well that have to do with how much importance is accorded to reading and books in the school. Interestingly, the relationship between the presence of an active library and student scores is seen both in language and math.

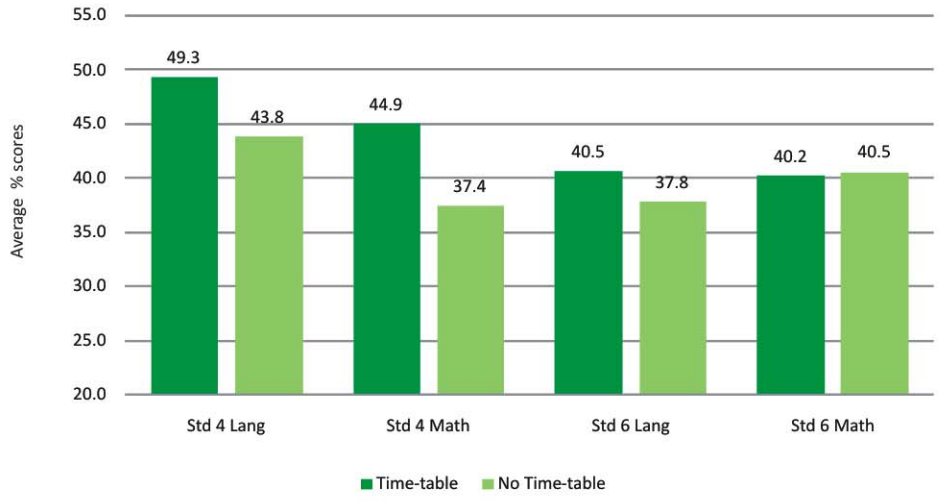
Chart 7.7 Std 4,6 language and math: Average percentage scores by library facility



Ideally a timetable is a mechanism for deciding how time should be used for different subjects and different activities. For investigating the presence of a time-table, surveyors asked the main respondent in a school whether there was a time table in the school. Further, they were asked to record where they observed the timetable. Options included whether it was visible in the Head Teacher's office, whether it was with the teacher or whether it was in the classroom or some other place in school. Timetable was seen in close to 78% of schools and mostly in the Head Teacher's office (81%).

Like libraries, existence of a time table in schools also shows similar differences in student performance in favour of schools that have a time-table (Chart 7.8).

Chart 7.8 Std 4,6 language and math: Average percentage scores by time-table



Multi-grade classrooms and Teaching and Learning Material (TLM) for Std 4 and 6

Information on multi-grade classrooms was collected for Std 2, 4 and 6. However for the purpose of looking at the link between multi-grade classrooms and student performance we are only using the average scores for Std 4 and 6. The data below shows that average percentage scores are higher for schools where there are single grades as opposed to multi-grade classrooms. (Chart 7.9)

Chart 7.9 Std 4,6 language and math: Average percentage scores by Multi-grade classes

In addition to textbooks, other teaching-learning materials (TLM) can provide important inputs into how and what children learn[20]. Similarly teachers' guides or other instructional materials can assist and support teachers in the process of teaching. There seems to be a link between TLM and student score with higher scores visible in classrooms where there was TLM (Table 7.7).

Table 7.7 Std 4,6 language and math-Average percentage scores by TLM

TLM	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Std 4			
No	41.4	45.1	41.1
Yes	58.6	50.4	45.7
Total	**100**	**48.2**	**43.8**
Std 6			
No	39.4	36.6	37.3
Yes	60.6	42.6	41.9
Total	**100**	**40.2**	**40.1**

Lastly, we look at teaching support through questions on the availability of the Learning Facilitation Manual (LFM) and its use. Once again, teachers of Std 2, 4 and 6 were asked about LFM. With respect to LFM. First, teachers were asked if they had received LFM. Then they were requested to show a copy of the LFM to the surveyor and finally teachers were asked to comment if they found the LFM to be useful or not.

The data indicates that while most of the teachers of Std 4 have received LFM (close to 81%) the figure for Std 6 teachers is relatively lower (approx. 67%). To compare student scores across schools which

[20]Blackboards were seen in approximately 88% of schools. The proportion of upper-primary schools which have blackboards is higher as compared to primary schools (close to 92% and 87% respectively). Not much variation in scores was seen due to availability of blackboard.

"used" LFM, we have categorized the use of LFM under two broad headings – 'Use LFM' and 'Not use LFM'. Here,'Use LFM' includes all those schools where:

- teachers have received LFM
- LFM was seen in the school and
- teachers found it useful

The 'Not use LFM' includes all those schools where teachers have either not received the manual or it was not seen in school or they reported that they do not find it useful. In Table 7.8 we can see that for Std 4 the learning outcomes are higher for schools which 'Use LFM'. In Std 6, we do not see much variation in scores by the LFM use category.

Table7.8 Std 4,6 language and math: Average percentage scores by LFM

TLM	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Std 4			
Not use LFM	30.2	45.9	41.7
Use LFM	69.8	49.4	44.6
Total	**100**	**48.3**	**43.7**
Std 6			
Not use LFM	48.8	40.2	39.7
Use LFM	51.2	41.0	40.6
Total	**100**	**40.6**	**40.2**

4. CCE and Report Cards

Standard specific information on CCE was collected with reference to the academic year 2013-14. Teachers were asked questions not only related to their awareness about CCE or availability of CCE related materials but also on whether or not they were using those materials.

Most teachers in both Std 4 and 6 knew about CCE (approx.87% in both). In case of report cards, for Std 4 about 73% of teachers said they have received report cards while for Std 6 the number was close to 43% .

Apart from awareness and availability of materials we also asked questions related to implementation of the programs. Once again scores were compared under two categories – 'Follow' and 'Do not follow'. In case of school report cards , 'Follow' implied –

- schools where teachers reported they received report cards
- report cards were seen in school and
- report cards were filled

All other schools where teachers have either not received or showed or not filled the report cards were put in the 'Do not follow' category. The same was done for CCE . All schools where teachers (of Std 4 and 6) knew about CCE and showed filled registers were put in the 'Follow' category.

For Std 4 teachers Table 7.9 shows the proportion schools under the 'follow' and 'do not follow' category for both CCE and report cards and the average percentage scores within each. It can be seen that for both subjects, scores are higher on an average for schools that 'follow' the policy. This is true for both CCE and report cards.

Table 7.9 Std 4 language and math: Average percentage scores by various indicators of CCE report card

Std 4	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
CCE			
Do not follow	64.0	46.9	42.4
Follow	36.0	50.6	46.0
Total	**100**	**48.3**	**43.7**
Report card			
Do not follow	56.5	46.1	41.3
Follow	43.5	50.6	46.2
Total	**100**	**48.1**	**43.5**

For Std 6 (Table 7.10) in case of CCE the percentage scores are higher for schools which come under the 'Follow' category while the differences between the two categories are smaller report cards .

Table 7.10 :Std 4,6 language and math: Average percentage scores by various indicators of CCE report card

Std 6	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
CCE			
Do not follow	63.9	38.5	38.9
Follow	36.1	43.0	42.4
All	**100**	**40.1**	**40.1**
Report card			
Do not follow	74.9	39.8	39.9
Follow	25.1	40.9	40.8
Total	**100**	**40.1**	**40.2**

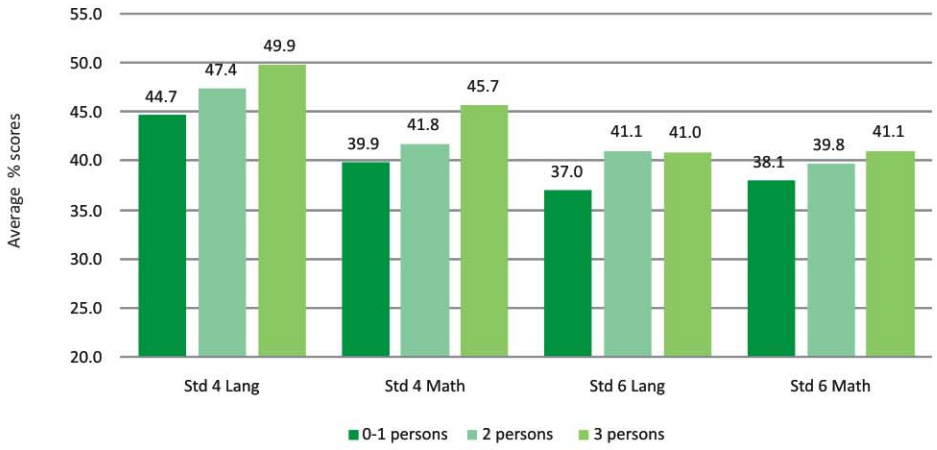
5. Monitoring visits

The head teacher of the schools was asked questions regarding monitoring visits conducted in their schools. Questions like whether the CRCC, BRCC or BEO had visited the school since January 2014 were asked.

Close to 96% of the schools reported that the CRCC had paid a visit to their schools at least once since January 2014. 69% schools said the BRCC and 66% said that the BEO had visited their school.

When looked individually we did not find much difference in scores by any single person's visit to the school but when we compared schools that were visited by only one person as opposed to schools visited by two or three persons (CRCC, BRCC, BEO) some clear differences were seen. Chart 7.10 shows significant differences in scores between schools visited by one person as opposed to those visited by all three.

Chart 7.10 Std 4,6 language and math: Average percentage scores by number of monitoring persons



The data suggests that visits matter. We don't know why some schools are visited by many functionaries and why some are not but we can say that schools can benefit from visits by others in the system.

6. Mission Gunwatta

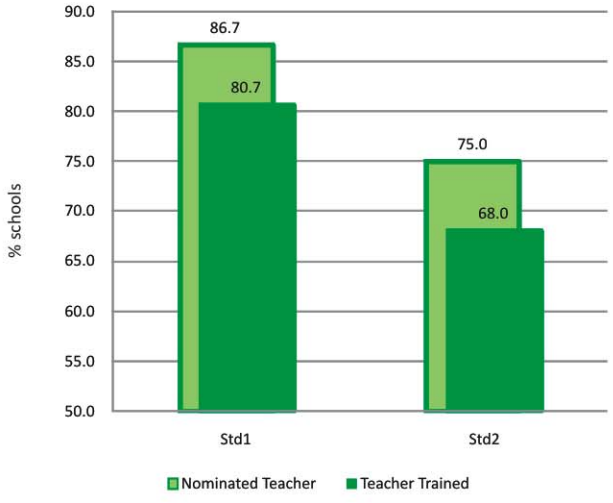
This part of the questionnaire probes into one of the programs adopted by the Bihar government for improving the quality of learning in primary school. Two important parts of the program were the following:

- To improve the basic foundations of learning, in early grades specific teachers in each school were nominated to be the teachers for Std 1 and 2. These teachers received special training.
- To help to build basic reading and arithmetic skills for children in Std 3, 4 and 5, for 1-2 hours each day, children were grouped by level (rather than by grade) and taught.

This section explores to what extent these activities were carried out in the schools and whether they were linked to student performance.

Chart 7.11 describes the situation with nominated teachers for Std 1 and 2.

Chart 7.11:Percentage schools with teachers for Std 1 and 2 nominated and trained



As can be seen, a majority of schools had nominated a teacher for Std 1 and most of these teachers were trained. For Std 2, three-fourths of the schools had nominated a teacher of which close to 68% were trained. Std 1 had more trained teachers as compared to Std 2.

Next we look into the grouping of children in Std 3-5 based on their learning level. The data shows that close to 80% of the schools were following this process. It can be seen from Table 7.11 that those schools where groups were formed had a higher average percentage score compared to those where no grouping was reported. Since the focus of the program was on Std 3 to 5, we look only at the variation in scores of children in Std 4.

Table 7.11 Std 4 language and math: Average percentage scores by group formation

Std 4	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Groups not formed	20.6	46.8	41.5
Groups formed	79.4	48.5	43.7
Total	**100.0**	**48.1**	**43.3**

The surveyors collected information on other aspects of the program like process of formation of groups and materials for the mission. Out of those schools where groups were formed close to 90% reported following the specified process of group formation[21]. A little over than 70% of schools said that they have received the materials required for the program.

Comparison of average scores was also done based whether the schools 'Follow' or 'Do not follow' the program. The 'Follow' category implies –

- schools where groups were formed
- groups were formed following the right method, and
- material for Mission Gunwatta was received.

All other schools fall in the 'Do not follow' category.

Table 7.12 Std 4 language and math: Average percentage scores by various Mission Gunwatta indicators

TLM	Percentage of schools	Average Percentage scores Language	Average Percentage scores Math
Std 4			
Do not follow	50.7	47.2	42.5
Follow	49.3	49.1	44.4
Total	**100**	**48.1**	**43.4**

As can been seen from Table 7.12 the schools which 'Follow' have a percentage score higher than those which do not.

[21]This process of forming groups is when children are grouped based on the levels derived from testing.

Regression analysis

Till now we have focused on a bivariate analysis to examine correlations between different variables and students' learning outcomes. We now consider all these variables together to understand how they are jointly related to the average percent scores. For this we used regression analysis to identify variables that have a significant effect on learning outcomes when other factors are controlled for.

Since the data is at the cluster level, it is important to control for other cluster level variables that might affect learning outcomes. These could include geographical variables like distance from district headquarters etc. As the data set does not have information on such unobserved variables, the regressions include a cluster fixed effect to account for them.

Table 7.13 presents the regression results with average percentage scores for each standard as the dependant variable.

Table 7.13 Regression results for all the school-level variables

Number of Observations (unit of observation is the school)	Std 4 Lang	Std 4 Math	Std 6 Lang	Std 6 Math
	697	697	232	232
Variables	**Coefficient (Standard error)**	**Coefficient (Standard error)**	**Coefficient (Standard error)**	**Coefficient (Standard error)**
School Type	-3.421*	-1.549	Omitted	Omitted
	(1.329)	(1.490)	(.)	(.)
School Size	-1.520	0.767	-0.350	1.313
	(0.892)	(1.001)	(1.684)	(1.340)
Pupil Teacher Ratio (PTR)	-0.636	-1.577	0.421	-0.294
	(0.829)	(0.930)	(1.585)	(1.261)
Student Average Attendance	0.111*	0.160**	0.229**	0.119
	(0.0439)	(0.0493)	(0.0836)	(0.0665)
Teacher Average Attendance	0.0228	0.00408	0.0702	0.0132
	(0.0346)	(0.0388)	(0.0667)	(0.0530)
Infrastructure	-1.720	-2.200*	-3.498	-3.231*
	(0.943)	(1.058)	(2.013)	(1.601)
Active school library	4.449***	3.850*	2.909	1.131
	(1.330)	(1.491)	(2.091)	(1.663)
Time-table	3.960*	5.936***	-1.059	0.00160
	(1.576)	(1.768)	(3.679)	(2.927)
Multigrade	-2.536*	-2.436*	-3.130	-0.792
	(1.102)	(1.237)	(2.173)	(1.729)
TLM	-0.565	-1.247	5.752*	3.833*
	(1.304)	(1.462)	(2.317)	(1.844)
LFM	0.174	-0.768	-3.697	-2.190
	(1.334)	(1.497)	(2.277)	(1.811)
CCE	2.855*	1.688	7.058**	6.804***
	(1.331)	(1.493)	(2.283)	(1.817)
Report Card	3.347**	4.290**	-3.270	-2.974
	(1.269)	(1.423)	(2.283)	(1.817)
Monitoring	2.180**	1.917*	0.123	-0.493
	(0.760)	(0.853)	(1.329)	(1.057)
Mission Gunwatta indicators	0.524	0.0275	1.049	0.0452
	(1.204)	(1.350)	(2.137)	(1.700)
Constant	35.17***	28.61***	23.86**	34.52***
	(4.695)	(5.266)	(9.051)	(7.201)

Significance level		
* p<0.05	p<0.01	*** p<0.001
5 percent	1 percent	0.1 percent

The regression analysis confirms the relationships that were seen in the bivariate analysis. Many of the indicators directly linked to teaching and learning have a positive and significant influence on student scores. For Std 4, variables that were significant for both language and math include student attendance, presence of a library, existence of time-tables, use of report cards and the incidence of monitoring.

For Std 6 the only variables that had a significant effect on learning outcomes for both language and math were-TLM and CCE. However, note that the sample-size for Std 6 regressions is only 232[22]. The fact that most of the variables for Std 6 turned out to be insignificant in these regressions could be because of this small sample size.

Summary

The analysis in this section highlights variables at the school level that influence student learning outcomes whether directly or indirectly. These simple correlation provide much food for thought. The evidence presented here can serve as inputs for further analysis and policy discussions which can help frame actions for improving the quality of education of elementary schools in Bihar.

- In the case of primary schools, schools which were smaller in size (enrollment less than 170) overall performed better than large schools (enrollment above 170)
- Although close to 20% of schools conform to the Pupil Teacher Ratio norm of RTE, schools which conform to PTR norm performed slightly better than those which do not.
- Student attendance matters. Schools with higher attendance have better average scores.
- Teacher attendance was uniformly high during the period of the assessment, therefore no relationship between teacher presence and student performance can be seen.
- The relationship between school facilities and student performance was not clear in this data set. But these are RTE norms, and are mandated for the proper functioning of a school.

[22] As Std 6 assessments were administered in upper-primary schools only, the sample size is much smaller.

- Specifically with respect to variables linked directly to teaching and learning, we find that schools with library and time-table had better learning outcomes compared to schools with no library or time table. Schools with TLM in the classrooms had higher average scores than schools without TLM (Std 4 and 6).
- Teaching support through Learning Facilitation Manual was more prevalent for Std 4 teachers (close to 81% have LFM) while teachers in Std 6 were relatively less informed about the same (close to 67% have LFM). For Std 4 schools where teachers used LFM (self reported) had higher average scores than schools where teachers did not use it.
- For both Std 4 and 6 the results were better for those schools where CCE was followed. Use of report cards was prevalent in Std 4 but for Std 6 they were not used much.
- In case of Monitoring, we see that more is better. Monitoring vists have a positive influence on average scores if there are more persons visiting the school as opposed to just one of the BRCC, CRCC or BEO visiting the school.
- Most of the schools have a nominated teacher for Std 1 and close to 80% of them are trained. Though for Std 2 comparatively less teachers were nominated and trained (68% of nominated teachers received training). The results for Std 4 were better for schools which not only received the material but also reported groups for Std 3-5 were formed using the appropriate methodology under 'Mission Gunwatta'.

Lessons and learnings from the May assessment exercise in Bihar

8

Some concluding thoughts

The assessment exercise carried out in May 2014 jointly by Bihar Government, ASER Centre/Pratham and UNICEF has been an important source of learnings. There are lessons in it for the way forward not only for how to organize and conduct future assessments, but also for what can be done to improve teaching practices and learning outcomes.

Large scale assessments as opportunities for capacity building

To begin with, collaboration between the three participating organizations meant that the strengths of each of the partners could be brought into the project. Cross fertilization of ideas and partnership implied that the learnings from the process could be absorbed more easily by all parties not just from the findings but also from the process of carrying out the exercise. During the design and decision making phase, 20-25 people were actively involved; these were state level officials of the government

of Bihar, senior staff from ASER Centre/Pratham, and UNICEF. Once the basic structure and content was in place, a team of 200+ people from the government and from ASER/Pratham led the three week effort from start to finish. Then the focus of activities moved to the districts. Here 2,500 surveyors (DIET students and Cluster Coordinators) spent almost a week in over 1,000 schools across the state. The teams interacted with approximately 65,000 children. Despite the heat of the summer and the pre-monsoon storms, one of the unique things about this initiative was the energetic participation of a large number of people (adults and children) from within the education system and outside.

Large scale assessments of student achievement are fast becoming a common feature of the academic calendar in all states. Often the main activity remains limited to being a data collection effort. One of the major lessons from the experience in May 2014 in Bihar is that such an assessment exercise can be an excellent platform for capacity building and hands-on learning. The big challenge is how to productively use the time that becomes available during these large scale assessments for maximizing the potential of human interactions (adults with children, children with children and adults with adults) to improve our understanding of how children can learn better.

Rapport building with children

The design of the May assessment was such that each team of two surveyors/evaluators spent several days continuously in a school. For two outsiders, going to a school daily for several days is a good way to get to know the school and the children. In addition, we also wanted to make sure that all activities were taking place in a non-threatening environment. As warm-up activities for rapport building, we trained all surveyors to play simple group games with children – some games were based on language skills and some on maths. A booklet called "Aao Khelein" was given to all participants which contained many such games and ideas.

Figure 8.1 "Aao Khelein" - An interactive games booklet for children

Solving problems together

After the written tests were done, many children wanted to know how they had performed. A simple activity that was both effective and fun was to solve each question from the test paper together with children. For example, children in Std 6 discussed the question, both what had to be done and how to do it and then solved it or came up with the answers. This was sometimes done individually and sometimes in groups. In a very direct way, the benefit of such activities is that the children can learn immediately from the assessment tasks. This interaction also gave the test administrators an opportunity to interact with children around teaching-learning.

Discussions with teachers

The presence of the assessment team in a school for several days in a row (as well as visits by the Master Trainers) naturally led to many conversations about assessment, instruction, curriculum and learning. Although there is meant to be ongoing school based activities on assessment such as CCE and child wise report cards, there is usually not much opportunity to have on-going discussions about why to measure, what to measure, how to measure or about ways to convert the learnings from the measurement into actual action at the school level. In future, assessment teams could be oriented with some guidelines for content and structure about how to initiate and sustain such discussions with teachers. Also, due to the fact that many children were absent, there were extra blank test papers available after the assessment was done. Often, teachers wanted to keep these papers as examples that they could use both to create similar exercises and also to use with children. This can be a suggestion that is given to future assessment programs as a way to use extra material.

Capacity building built into the assessment activity

Throughout the May exercise, there was a conscious attempt to integrate capacity building about assessments into ongoing activities wherever possible. For example, during the state level training of Master Trainers, there were sessions that introduced some of the basic concepts of assessment.

The team of surveyors at the district level were either DIET students or Cluster Coordinators. Both such groups are either already closely linked to the life of schools or are likely to become so in the very near future. During the district level training also, efforts were made to introduce some of the nuts and bolts of assessment practices. In the future, more such sessions could be included as part of district-level training.

Further, each day after school time was over, all the surveyors along with their Master Trainers gathered together in a convenient place (cluster or block resource centres, or in the DIET or district headquarters) to discuss the day's proceedings and to grade the papers. All the written tests were graded by the surveyors for the schools assigned to them under the supervision of the Master Trainers and based on the guidelines for grading that had been provided to them. Grading papers helped the evaluators and the Master Trainers to identify common patterns of mistakes and weaknesses and also to link experiences (of the class/school they were visiting) with evidence (what children had been doing). In the stray incidents of copying, this close look at the test papers the same day as the assessment helped to sort out what was to be done. In future, such exercises can also maximize learnings from using these daily sessions better than was done in this round.

Assessment courses and dissemination workshops

Now that this state level student assessment exercise is complete, the findings and the lessons learned are a good starting point for a basic level course on measurement that can be conducted at the state level. Such discussions are currently on between ASER Centre/Pratham, the state government and UNICEF. Also a series of workshops is being planned for district level teams as well as for Cluster Coordinators to disseminate the findings from the assessment exercise. Participation from each district and DIET would mean that capability for carrying out a similarly useful exercises would increase across the board along with the ability to translate evidence into action.

Overall, the participatory nature of the May assessment opened the doors for building capacity. We believe that feedback loops at every level are critical for the evolution, development and improvement of any activity. This work in Bihar shows that assessments can be designed with feedback built in – feedback to children via solving questions together and feedback to teachers via discussions. Our experience also suggests that data and findings make much more sense to all stake holders, especially those at the field level when there has been participation in the entire process. When surveyors/test administrators have understood the framework, implemented the assessment, interacted with the assessed children and graded papers, they are in a much better place to appreciate findings. Ownership is also much greater when there is direct engagement in the implementation and when key people are not just the passive recipients of a report. For these reasons, who participates and how they participate in such exercises is an important consideration for future use of data.

Lessons for future assessments

The almost month long immersion in an assessment activity meant that a large number of people were constantly and actively thinking about the entire process. Key thoughts and lessons are outlined here.

Importance of reading as a fundamental and foundational skill

The Bihar May 2014 assessment is perhaps the first, recent large scale state level assessment that included the assessment of basic reading as a core part of the exercise along with the more common practice of using pen-paper written tests. As is well known, if a child cannot read fluently and comprehend, the chances that she or he will succeed in the education system are low. Hence reading is one of the most fundamental skills that needs to be built in the primary grades. The reading assessment in the May exercise led to several major learnings:

- *High incidence of children who cannot read fluently:* There are substantial number of children in Std 4 and even in Std 6 who have difficulty in reading Std 2 level text fluently. We need to think about how to help these children "catch up" with others.
- *Reading assessment can only be carried out individually one-on-one:* Most assessments in India, like NCERT's National Achievement Surveys or those done by other agencies, are done with groups of children. However, there is only one way to assess children's reading ability: work with children one by one. This is more time consuming and needs more training to make sure that the assessment is being done consistently and systematically. However to really understand children's reading levels there is no other way.
- *Availability of data makes a problem visible and its solution possible:* The availability of data on reading (for example – how many children in which grade cannot read) makes it possible for the government to develop plans and programs for how children's reading skills can be strengthened. Without such data, remedial or learning support activities cannot be planned. In the past, despite the availability of data from the annual ASER reports, reading has not been directly tested in government surveys. Without measurement by the government, the crisis in reading has remained invisible. Now with government data becoming available for primary and upper primary grades, it is possible to design and carry out activities that help to solve this problem.

- *Inability to read affects performance in maths:* The data generated in this exercise shows how the inability to read strongly influences the performance of children in maths as well. Other subjects were not assessed in May but it is likely that the ability to read is strongly correlated with how children cope with content in other subjects as well.
- *If a child cannot read, she or he cannot do pen-paper written tests:* This is common sense and data from May strongly confirm this statement. Almost all large scale student achievement surveys are entirely based on written tests. As more and more states do large scale assessments of the pen-paper kind, this fact should be kept in mind. Administering written tests to children who cannot read excludes information about their abilities from the evidence and makes it unlikely that their problems will be the focus of attention. There are equity implications of such exclusion. In future assessments, a test of basic reading could be used as a "screener" before the child is asked to take a written test.

Test the curriculum or test children?

In designing assessment frameworks for any exercise, it is important to be clear about their purpose. If the objective is to see how children's performance compares with curricular expectations of a particular grade, then the domains and items should be based on grade level curriculum standards. However if the objective is to understand what children can do and what they cannot do, then the framework needs to have tasks that range in difficulty from very easy to difficult. If most items are above the current level of most children, then the assessment will not be able to provide useful inputs for what needs to be done to help **all** children improve.

Available data for India suggests that a large fraction of children at every grade are several years below their grade level. Hence it is imperative that large scale assessments developed for use in Indian elementary schools have a diverse range of tasks so that useful evidence can become available for use in planning appropriate teacher training programs, as well as teaching learning activities and materials for children. Such actions will be needed to help children move from the level at which they are, to the level at which they are expected to be.

Children are not familiar with multiple choice formats

In the May assessment, care was taken before every written assessment to explain how multiple choice questions had to be handled. There were examples in the test paper and there were repeated demonstrations with children. Yet an analysis of the mistakes for the multiple choice questions in the written papers shows that a significant proportion of children did not understand how to handle the multiple choice format. Although multiple choice formats are the most convenient form for grading, depending on the context and age of children, they may not be the best format for understanding children's learning.

How quickly do children get tired?

Testing theory suggests that multiple items are needed to get at the true estimate of a child's competency level. However, tests should also be designed keeping in mind how long an average child in

a given grade in a given context can remain focussed on a pen-paper exercise. For example, from watching the May 2014 assessment activity closely, it was clear that for the Std 4 children an hour for each subject was simply too long. How to balance the desirable properties of a test with the realities of our children is a challenge.

School-based versus household-based assessments

At the beginning of this exercise, there were discussions about the pros and cons of school-based versus household-based assessments. The school environment provides a better setting for comprehensive testing of students' skills. Also availability of school based data and participation of key people from the education department makes it more likely that the findings from school assessments will be ploughed into planning and action for the future. However, in the case of this study, the absence from school of almost half of all enrolled children during the assessment makes it difficult to extrapolate the current findings to all enrolled children unless there is evidence that the non-attending children are very similar to the attending children. Constraints of time did not permit surveyors to go and find the non-attending children in the village. It should also be noted that at least in the case of reading and math, the estimates from the school-based assessment data are very similar to that from household surveys like ASER.

Implications for action

The study focussed on children who had just completed Std 2, Std 4 and Std 6. The assessments were of basic language and math skills. Although this was a cross-sectional study, still it gives clues about what needs to be done to improve basic learning along a continuum of grades from early in the primary school stage to the middle of the middle school stage.

Three clear lessons emerge from the data. Many of these points have been elaborated in the main body of the report and will simply be outlined here:

Basic skills – reading and arithmetic

First, foundational skills like reading and basic math need urgent attention across all grades that were studied. If by the end of Std 2, most children are able to read and understand simple text, then many of the problems that we see today in higher grades can be avoided. Similarly, if number knowledge till 100 and the ability to do basic operations at least addition and subtraction are in place by the end of Std 2, children can gain math knowledge and skills in subsequent grades quite easily. In the 2014-15 school year, there should be serious efforts to ensure that all children attain these learning goals in Std 2. For higher grades, special efforts need to be made to ensure that those who have not attained basic skills are able to do so. Without these skills, children will not be able to benefit much from continuing to be in school. To achieve such targets, the education system needs to clearly specify learning goals by stages and align all teaching learning activity (such as training, materials and monitoring) systematically to the goals.

Discussion, expression and critical thinking

Although reading is a critical and necessary skill, the data especially for Std 4 and Std 6 shows that it is not a sufficient condition for dealing comfortably with different types of texts. For example, children who read fluently can do direct fact retrieval tasks from given texts but are unable to do tasks that require them to go in depth into the content of informative or narrative texts. In particular, tasks that require children to go to different parts of the text, to synthesize meaning, to summarize or to make inferences – all seem to be too difficult to do even with text that is not hard to read. This suggests that in classroom interactions, teachers and children need to spend much more time discussing what has been read and linking that content to what they already know or connect reading material and ideas to everyday life. Typically, much of the time in the classroom in our schools is spent on reading aloud from the textbook and writing on the blackboard ("chalk" time) accompanied by rote learning of textbook material. This kind of teaching practice needs to be transformed to include much more "talk" time with actual discussions and interpretations of what is in the textbook and beyond. Such practices are needed in language classes and even more so in other subjects.

Moving beyond numerical computations to applied thinking and problem solving

One of the interesting facts about Bihar that comes through in most studies of student achievement in the state, is that students perform better in math than in language. This is the case here as well. The data on maths from Std 4 and Std 6 also indicates that while numerical sums are relatively easy to do, the same operations in a word problem form are much more difficult for children to solve. Again this suggests the importance of "talk" and discussion in our classrooms as a way of promoting problem solving skills. It also indicates that all concepts need to be dealt with not just in the traditional numerical form but in a variety of ways that enable children to apply their skills in different contexts. For such practices to take hold in schools, it may be necessary to bring "problem solving" activities into teacher training. This can be achieved by getting teachers to explain problems, encouraging teachers to generate their own word problems, modelling and demonstrations of how this is to be done in high performance schools and by visiting CRCCs and others.

How to deal with a varied range of learning levels in the classroom

The data from May also underlines the existence of wide variations in the abilities of children in the same grade. For example in Std 4 there are a substantial number of children who are at Std 1 level, another set of children who are at Std 2 level and less than 20% children who are at grade level. We need to think about how to train, equip and support teachers to simultaneously deal with these multiple groups in the same grade. Alternatively schools need to think about how to reorganize groups across grades to have children at the same level being taught together.

The evidence from this exercise leads us to think of two major changes that are needed in the education system. One has to do with basic skills of children and the other is related to curriculum and

expectations. If current curricular expectations have to be met, then teaching-learning activities and conditions have to be reorganized and reworked so that most teachers can help most children to achieve them. At the same time, it is also worth thinking about whether our curricular standards and textbook content are unrealistically high.[23]

How to handle differences in performance across schools in the same cluster? This study reinforces what is commonly known and experienced – in every cluster there are schools that function relatively well and there are schools that need attention. Looking closely at the cluster report cards we can clearly see these variations. The challenge for the administration is to figure out ways in which we can productively use these variations to improve school functioning and student performance of all schools. Immediate steps could include:

- Detailed discussion and dissemination of cluster report cards with the respective Cluster Coordinators as well as similar discussions with DIETs and all Cluster Coordinators in a district. If the two sampled clusters are representative of clusters in the state, what kinds of actions need to be taken to improve current status?
- Evidence based movement plans can be drawn up by Cluster Coordinators for monitoring schools in the cluster. The CRCC could spend more time in the relatively weaker performing schools. Actual instruction by CRCCs, modelling of how lessons can be taught, special training of teachers, reorganization of groups for teaching, increase in facilities/inputs directly needed for teaching-learning – are all things that can be tried.
- The better performing schools and good teachers can be used as "models" for others. This can be done by holding meetings or "guru goshtis" in rotation in the well performing schools so that actual classes can be seen by others or by taking such teachers from time to time to other schools to demonstrate how they organize teaching and how they carry out instruction. Pairing of "good" schools with "weaker" schools can also be a strategy.

Conclusion

Large scale assessments of student achievement provide opportunities for doing a lot more than data collection. Taking advantage of these opportunities, it is essential that we think about how this can lead to building capacities for assessment and instruction, for trying new and more appropriate measurement methods, discussing learnings from the process, understanding findings and connecting them to the next stage of planning and implementation.

[23]According to the paper "The negative consequences of overambitious curricula in developing countries", August 2012 by Lant Prtichett and Amanda Beatty, if the curricular pace - the level and material teachers are expected to teach - moves faster than actual student learning, this alone can generate enormous differences in cumulative learning.

Bihar

Elementary

School

Study

May 2014

unicef
unite for children

असर
ASER
Evidence for Action