ASSESSMENT FOR LEARNING

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Traditionally, assessment at the school level has been rote-based, with very little focus on understanding or application of concepts. We find this to be true, especially in India, based on our analysis of school papers. Questions such as 'What is photosynthesis? Explain with the help of a neat and labelled diagram.' are commonly found in school papers, and do not distinguish between a student who has understood the concept and a student who has simply memorized facts. Unsurprisingly, when you ask a person about what they learnt in school, a very common answer is ''Well, I've forgotten most of it…"

An obvious reason for the prevalence of such assessments is that they are easier to build and score. Another reason is that rote-based assessments may have served the needs of the system in the past. However, they are completely inadequate for the skills needed in today's world. We need to create critical thinkers who are able to address the challenges of a rapidly-changing world. Real learning, i.e., conceptual understanding and the ability to apply and analyse information drives innovation – a crucial need in our society. There is, thus, a disconnect between what is needed in the world today, and what our system of education is geared towards producing.

Assessments that are comprehensive, focusing on key ideas that form the foundation of learning, are essential to changing how concepts are handled in the classroom. Moreover, it is universally accepted that learners will acquire a skill sooner, if given frequent feedback about what they have done, while they are doing it. Imagine that you're teaching a child how to swim – the natural method of teaching would involve constant monitoring and giving feedback necessary for her to learn to swim. The notion of instructing a child on how to move her arms and legs on day 1 and then directly checking whether she has learnt to swim on day 7 may seem quite bizarre. Yet, this is what occurs in our classrooms. The constructive loop of instruction, evaluation and feedback never seems to occur, as most assessments take place at the end of a unit, not while the unit is being taught.

Formative assessment, or assessment for learning, is where real-time feedback from students is used to modify instruction in the classroom and can help teachers understand exactly what the students are learning, so that an adequate response can be given immediately. Currently, formative assessments are often done in the form of field trips, quizzes, essays, projects, etc. While these are important, their end goal must be to reveal evidence of true learning. For example, if students are given the task of building a magnetic toy, they should also be required to give a documented explanation of how the magnets interact, as well as the reasons for such observations. Without the latter part of the task, students may fail to integrate what they have learnt with their observations or practical experience. In many cases, the activity is done for the sake of doing something new, rather than to seek information about what the student has learnt. While fun is vital to the process of learning, such tasks fail to help either the teacher or the student in the entire process.

An ideal formative assessment should have a set of granular, engaging questions that search for true learning within a concept. It should give the teacher a clear view of how learning is progressing, with details of specific areas that need more focus. The first challenge in building such assessments is that they need time, effort and expertise. For instance, in the topic of Light, making a list of key ideas allows us to distinguish the ideas that reflect true understanding versus the information that may not really affect how students learn (shown in Figure 1).

Key ideas that should definitely be tested
Light travels in a straight line.
A beam of light can be reflected using objects.
We see objects when light reflects off objects and enters our eyes.
Important to know, but not essential to test
Light is composed of different wavelengths.
The Sun is a source of light.

Figure 1: List of key ideas

However, in spite of having this list, the ability to make discerning questions should not be taken for granted. For example, when we compare the two questions shown in Figure 2, we can see that item (i) fails to check for understanding while item (ii) can glean information about how students think and is very helpful. (Do note that item (i) is actually faulty - all the answers can be correct!)

(i) What do we need in order to see an object?
A. source of light
B. an object
C. eyes
D. all of the above

(ii) Rachna is in a room that has been made COMPLETELY DARK. No light enters the room. Will she be able to see her hand in front of her?
A. No, because light has to enter her eyes for her to see her hand.
B. No, but she can see objects that are either black or a shade of gray.
C. Yes, because her eyes will get adjusted to the total darkness after a few minutes.
D. Yes, because light from her eyes will fall on her hand and reflect back to her eyes.

Figure 2: Comparison of two items on the same idea

The second challenge is that feedback from formative assessment should be available to the teacher as soon as possible, with the least possible effort, so that it can be used to drive instruction and close the loop efficiently. In most cases, given the high student-teacher ratio and multiple responsibilities of a teacher, there is not enough time to do this satisfactorily when done manually, especially with open-ended questions. Well-designed multiple choice questions (MCQs) supply a neat solution, which can be scaled up to high student-teacher ratios.

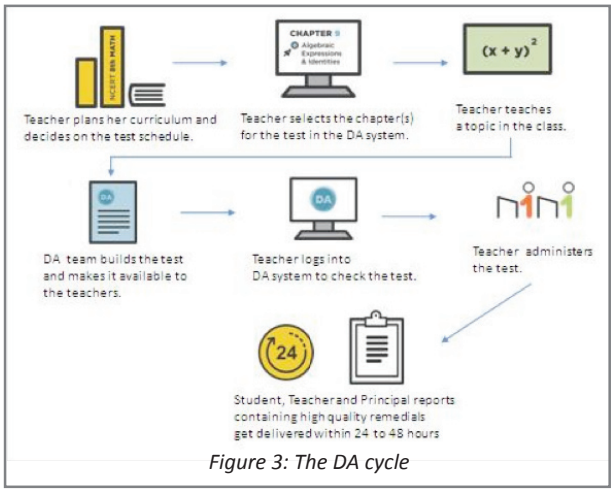


Figure 3: The DA cycle

One of our offerings, Detailed Assessment (DA) tackles both the challenges of formative assessments by using a set of sound, relevant and granular questions within a particular topic and providing feedback on the test within a short span of time, shown in Figure 3. Consider the following scenario: A teacher decides to conduct a test on fractions on Monday, while she teaches the unit. She continues teaching on Tuesday, and by Wednesday, she has detailed reports on how her students are doing within the unit, which allows her to make changes to her method of instruction, if needed. The administration and analysis takes place within 3 days, with the teacher having to spend only about an hour or two of her time. If done manually, an equivalent exercise would easily take a minimum of about 3 days of her time!

Part of a test on fractions and decimals for class 7, is shown in Figure 4. The questions are designed and put together in such a way as to

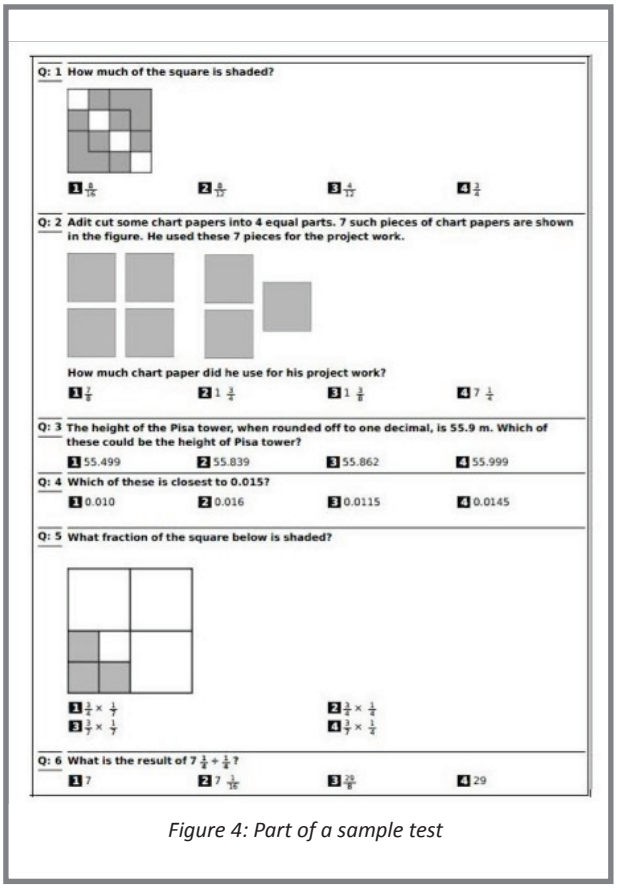


Figure 4: Part of a sample test

reveal important information about how students have learnt and internalized concepts linked to fractions and decimals.

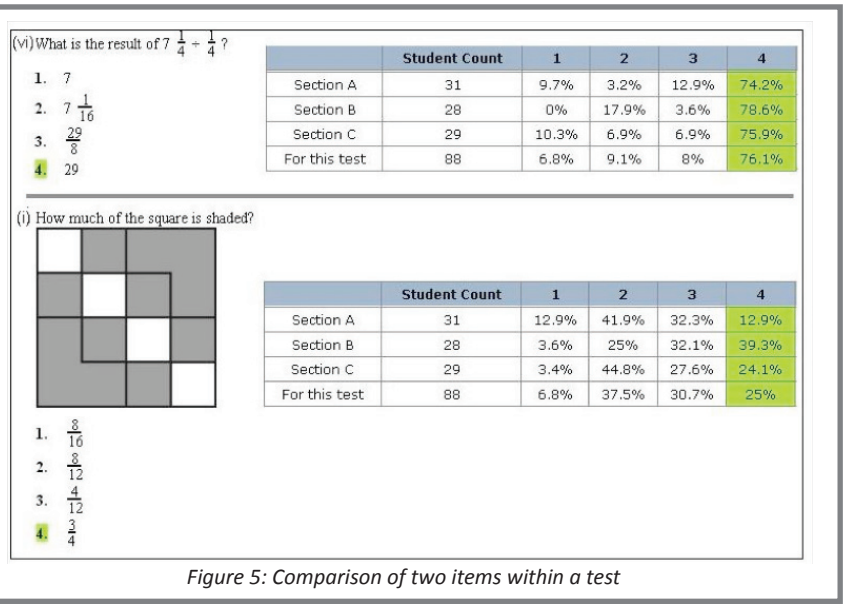
The reports contain information in various forms –Figure 5 shows the student responses for two specific items from this particular paper. We find that a whopping 76% of the students have chosen the correct answer in item (vi), which checks whether students are able to manipulate fractions using a standard procedure. Contrast this with the performance on item (i), which checks for a deeper understanding of fractions - only 25% of the total students have chosen the correct answer. This insight lets a teacher know that the students from this particular class need help in understanding the fundamental meaning of a fraction. Using such examples, we often find that students are comfortable with procedural questions, and yet, may not truly understand what they're doing.

The general class performance on the test, shown in Figure 6 also helps a teacher gauge overall levels of learning within her class.

Such information can help the teacher get a quick idea of where her class stands, but when checked in tandem with the detailed analysis, it can act as a powerful tool for a teacher. The detailed analysis also includes a misconception report for some questions as shown in Fig. 7.

The conveniently short time frame within which such tests and reports are made available to the teacher empower and enable her to devote more time to teaching within the classroom. However, the true strength of DA lies in the quality of questions being tested. While DA has harnessed technology to the benefit of the system, it is quite the opposite of dumping trivial and unhelpful questions on to tablets or computers. The questions and reports of DA are leading to changes in the way topics are being taught in classrooms. Some teachers have shared personal accounts of how the questions helped them understand some concepts better, thus aiding them in planning their instruction. Additionally, DA is effecting change at a more systemic level – e.g., a school in Mumbai decided to change their curriculum based on our analysis to one with a higher focus on conceptual understanding. A similar instance occurred in a state board school, when we analysed their curriculum prior to the DA program, and found that their textbooks emphasized greatly on unnecessary facts, leaving little space for key ideas within various concepts. Based on the initial DA analysis, this school agreed to change their textbooks to a national level textbook closely aligned to the National Curriculum Framework, which has resulted in more time for the students to absorb concepts, rather than memorize facts.

Teachers and school principals have accepted that well-designed assessments can play a role as important as that of the curriculum or lesson plans.



(vi) What is the result of $7\frac{1}{4} \div \frac{1}{4}$?

1. 7
2. $7\frac{1}{16}$
3. $\frac{29}{8}$
4. 29

	Student Count	1	2	3	4
Section A	31	9.7%	3.2%	12.9%	74.2%
Section B	28	0%	17.9%	3.6%	78.6%
Section C	29	10.3%	6.9%	6.9%	75.9%
For this test	88	6.8%	9.1%	8%	76.1%

(i) How much of the square is shaded?

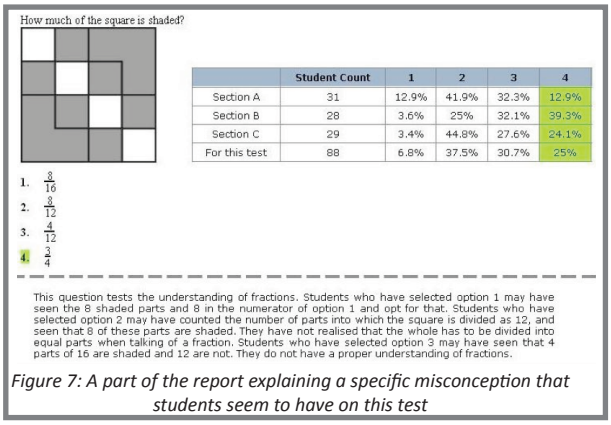
1. $\frac{8}{16}$
2. $\frac{8}{12}$
3. $\frac{4}{12}$
4. $\frac{3}{4}$

	Student Count	1	2	3	4
Section A	31	12.9%	41.9%	32.3%	12.9%
Section B	28	3.6%	25%	32.1%	39.3%
Section C	29	3.4%	44.8%	27.6%	24.1%
For this test	88	6.8%	37.5%	30.7%	25%

Figure 5: Comparison of two items within a test

	Question No.	1	2	3			Average
Understanding fractions	% of students answering correctly	24	55	34			38
		4	5	6	7	8	
Operations on fractions	% of students answering correctly	69	59	76	17	14	47
		9	10	11			
Word problems involving operations on fractions	% of students answering correctly	66	34	62			54
		12	13	14			
Understanding decimals	% of students answering correctly	52	26	3			28
		15	16	17	18	19	
Operations on decimals	% of students answering correctly	55	24	59	17	10	33
		20	21	22	23		
Recurring decimals and rounding off decimals	% of students answering correctly	72	83	24	31		53

Figure 6: Overall performance of the class on various sections of the test



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This question tests the understanding of fractions. Students who have selected option 1 may have seen the 8 shaded parts and 8 in the numerator of option 1 and opt for that. Students who have selected option 2 may have counted the number of parts into which the square is divided as 12, and seen that 8 of these parts are shaded. They have not realised that the whole has to be divided into equal parts when talking of a fraction. Students who have selected option 3 may have seen that 4 parts of 16 are shaded and 12 are not. They do not have a proper understanding of fractions.

Figure 7: A part of the report explaining a specific misconception that students seem to have on this test

We need to ensure that assessments are being used to the best possible extent by incorporating them within the classroom in a seamless manner, with a shorter cycle of administration, which keeps alive the focus on assessing conceptual understanding throughout the year, rather than being an exercise that occurs only twice or thrice in the entire year.

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